

THE ART OF HYBRIDIZING

by Oscie B. Whatley, Jr., Missouri

A series of seven articles taken from *The Daylily Journal*

Spring 1988 – Fall 1989

Published by the American Hemerocallis Society © 1990

Part I

INTRODUCTION

After a period of almost 30 years devoted to growing and hybridizing daylilies, this may be the appropriate time to reflect on its worth. I have few regrets over the time spent because most of the frustrations were offset by some limited successes. As much as I have enjoyed growing these plants, the pleasure of hybridizing them has been even greater.

I hope this series of articles will encourage many more "just growers" to share the enjoyment of breeding daylilies—to hybridize with a sense of orderly progress and to hold distinction as an essential goal.

The opportunity to create new things is ever on the increase and true improvements are much in demand. Rather than trying to define "true improvements" let us just try for "uniqueness" and allow time and testing to determine if there is a real advancement.

Of course there are some hazards in hybridizing. It is not always popular with other family members—just look at what happened to Adam and Eve when they tried to improve the apple.

THE METHOD

Hybridizing can be divided into two methods: Intuitive (art) and Genetic Science. Probably no one practices the pure form of either method, but instead finds a comfortable proportion of each process. Creating new things seems to come about regardless of where the emphasis lies. The two methods never compete but instead complement and add variety to the building blocks that make up our heritage of good parent material.

The majority of hybridizers today are stronger on breeding as an art. At the same time, we try to utilize whatever genetic science we can digest from our more formally educated friends. It would appear to be a good arrangement with everyone finding a niche for himself. There is good reason to believe that the two approaches will continue to support each other.

The art form of hybridizing intrigues me the most because I am a romanticist and to me the greatest enjoyment is derived from this method. Therefore, these articles will deal mostly with an artistic viewpoint and will apply scientific principles only in their simplest form.

The artistic approach is not without direction any more than are scientific actions. Collecting data from observations and allowing the subconscious to rationalize is not a new theory. Both methods require knowledge, reasoning, and work. The basic difference for our purpose here is that conscious decisions are "scientific" and subconscious decisions may be termed artistic.

There will always be some frustration about what to cross, what to select, and what to introduce; but intuition should become more natural and come easier with use. It is like throwing the reins over the horse's head and telling him to go home. Just be sure he has been shown where home is.

Moving pollen from one flower to another does not make a hybridizer any more than clicking a camera makes a photographer. There are several facets to hybridizing that play important roles in leading up to and following the actual cross. Being aware of and improving the skill in these supporting activities will greatly increase the chances of hybridizing success.

The first and most important of these supporting activities is setting your goals. How many objectives? How do we limit these objectives? How should we formulate them? These are some of the questions we will deal with in Part I.

GOAL SETTING

In my earlier endeavors as a hybridizer I hung onto every word of the old masters (Hall, Fay and others) in the hope that they would reveal the secrets of their success in flower breeding. There was every opportunity for me to observe and learn from these accomplished hybridizers; yet it took many years to understand what they had outright told me.

I suppose magic, mystery, and gimmicks were what I was looking for and this pursuit blinded me from seeing what was really happening. When Orville Fay told me he pursued only one goal at a time I thought, "How dumb! I'll pursue 10 objectives and pass him up." If I had listened to his next piece of advice, "don't dilute your efforts," I could have saved many wasted years.

The point is that one must start with a very low number of objectives and give them strong, undeviating attention.

There are several ways to set good objectives. The imagination is the workhorse of creativity; but it must be fed by observation, research, and statistics. And it must be allowed time to develop.

Let us start with other plants and note characteristics that would be desirable in daylilies but that do not yet exist. It doesn't have to be totally nonexistent but rather perhaps just not in the color or form or habit that you want.

Some examples might be the full form and flatness of a hibiscus or the irradiance of a red gerbera. It is necessary to reach beyond what is a practical objective and reluctantly compromise as one works toward that goal. Give the imagination time to create the image. Several images should be considered. Then eliminate the ones that do not have strong appeal or uniqueness.

Another popular method of setting goals is the process of combining existing characteristics. It probably will not yield many outstanding unique results, but it is useful for improving the line.

Now to reduce the fantasy, follow up on this method by visiting several hybridizers. Look for two things: (a) does it already exist and (b) what varieties could contribute toward specific goals.

The value of visiting other hybridizers should not be underestimated. It is by this pleasant, instructive activity that a breeder develops future insight as to the state of the art, what the competition is and is not, and what dominative characteristics from certain parents suit his own objectives.

Exchange ideas, experiences, and methods used in the pursuit of each goal.

Goal setting is a game of creating as many objectives as you can and eliminating most of them. Study the chart shown below for a brief example of how you might list and evaluate the goals.

Take note that nothing is eliminated because it is too ridiculous or too difficult. Most good ideas start as ridiculous and difficult. I remember when 2 ½" petals were considered wide. Where would we be today if the concept of a 4" wide petal had been eliminated because it was too ridiculous and difficult?

Competition. If a contestant wants to win a race he should be the best in that race. A beginner would be wise to find a unique, less competitive race and learn some techniques before tackling the heavily populated treasure hunts.

Market. We will cover marketing more in a later article but for now there are some important aspects to be considered in setting goals.

Be aware of the market trends and cycles. Color, height, sizes, color patterns, etc. will shift around every 5 or 6 years and cycle back again. Usually a unique improvement will trigger a shift so why not plan the super yellow introduction when another color is becoming commonplace. Dealers are your best source of information about market trends but most of us just do not ask until our super, unique plant is ready for marketing, and then it is too late.

Uniqueness. Uniqueness is like getting a foot in the door. It is a hard sell without it while a plant with just one unique characteristic commands attention.

There have been cultivars with a unique feature but with few other good characteristics that have soared to great popularity. I always feel relieved when this type of introduction has run its course. However, it does point out the value of uniqueness.

Our goal should be uniqueness with at least good companion features; otherwise, it is doubtful that the unique introduction will ever turn into a classic improvement.

GOAL SETTING

Idea	Competition	Market	Unique?	Remarks
Large ruffled yellow	heavy	fair	no	too many
Very early red	low	fair	yes	much needed
Sun-resistant red	med	good	yes	improving
Blue	heavy	good	yes	many names
Green-throated red	heavy	fair	no	many exist

SETTING LIMITS

Every self-satisfying hobby must have limiting factors to keep runaway daydreams in check. These parameters are:

Available time. How much of our life can we devote to this hobby without causing undue stress to our families or interference with our jobs, civic duties and religious responsibilities?

Available space. It takes a minimum space of approximately 4 feet by 6 feet to grow 100 seedlings. Keep the allocated space and number of seedlings in balance.

Money. It takes this kind of stuff to travel, to acquire parent material, to buy labor and to market your plants. Some day the hobby may become self-supporting; but until then, how much can you divert from other sources?

Advance limitation may seem to suppress our creative abilities and however much we are aware of these parameters we still rationalize the violations. Just do not become so compulsive

that the money for the kids' shoes is used for that new parent or grow too many seedlings and start eyeing your neighbor's yard.

At this point the method to be used should be clear, a few exotic goals imagined, and the limits you can live within defined and understood.

In the next issue we will look at "Collecting/Selecting and the Breeding Center."

Part II

COLLECTING & SELECTING

The new hybridizer must build a breeding collection by standing on the shoulders of past and present hybridizers. There isn't any other place to start unless a new species comes crawling out of the woods. One has only to take note of the progress made in the past 20 years to be convinced that reaching too far into the past would be like reinventing the wheel. Although collecting the absolute latest may be difficult, it is possible to collect some of the same plants our present hybridizers are still using.

There are many reasons for selecting a plant to collect. A connoisseur may select for the sake of pride in owning a rare variety. A speculator may select with an eye toward good marketing or resale value. A landscaper selects because certain characteristics will add to his garden décor. A hybridizer selects to open the door to desired objectives and to make firsthand acquaintance with state-of-the-art. Most of us are a mix of these types of collectors and one must admire the person who can wear all hats. We should be aware of the various reasons we collect, but if breeding material is the air, then one should avoid shifting priorities with every captivating variety.

Selections may be found anywhere—from the latest introductions to castaways from other gardens. New introductions have the advantage of more information on

features and probably possess improved characteristics. The disadvantages are limited testing and high cost. Veteran varieties have the advantage of multi-regional performance, more accurate parental history, and lower cost. The disadvantage is state-of-the-art lag.

It is indeed fortunate if a good hybridizer will allow a sincere beginner to browse his (post selected) seedling patch for parent material— also, an added blessing if crosses can be recorded. Great care must be taken by the beginner not to violate any agreements with the established hybridizer.

***Selecting a good parent is
not ever having to ask
why you did it.***

Descriptions, consultations, pictures, and observations are tools of the trade in selecting a parent. Getting to know the plant is a matter of how many of these sources of information you use and how intense the effort. Create subtle questions to ask a grower about an interesting variety that relates to your goals. Never fail to inquire about health and vigor.

Selecting a good parent is not ever having to ask why you did it. A check list of (pre-collection) qualifications will make you more aware of a parent's potential. Some examples are:

- 1) Is it vigorous (recovers quickly from transplanting and dividing)?
- 2) Are there signs of health problems (older leaves and roots can tell a lot but asking around can reveal more)?
- 3) Are there wide variations in performance from region to region?

- 4) Very important to know are the dominant and recessive characteristics of a parent. This can be determined only by knowing the cross and its resulting seedlings. If a high percentage have features of the parent, the inherited trait is considered dominant; if a high percentage loses a feature of the parent, this is a recessive.
- 5) Does the potential parent have a strong line in its background or is it a freaky outcross? You can count on strong line characteristics to reappear in your seedling while freaky out-crosses have fragile genetic structure and the special feature may be difficult to retain.
- 6) What characteristics are frequently or occasionally noted in its seedlings (good and bad)?
- 7) Is it an easy seed maker and/or a viable pollen producer?
- 8) Is there a hint of the characteristic peculiar to your goal in the plant or, better yet, in the parent line?
- 9) Are the chosen plants so closely related they will only perpetuate another hybridizer's line?

We hear so much about certain cultivars being good parents and wonder what it means. When this tag is put on a variety, it should refer to an identification of dominant and recessive characteristics displayed in its seedlings from various crosses. The introducer probably had excellent results with certain line crosses and, for him, it was a good parent. It's a mistake to assume the dominant/ recessive traits can be applied to all crosses; in fact, it's highly unusual for it to work that way on many different outcrosses. Don't pass over what is declared and verified as a good parent, but the best parent you will ever discover will be your own line.

***...it seems hybridizers
have a passion for
inefficiency...***

FILO (Falling in Love Obsession)

How easily we all are subject to FILO which closes our minds to any further investigation. If you haven't determined wide regional performance, habits, and background prior to selecting, then you probably never will before collecting.

FILO is a lot of fun and our hobby would be quite dull without it; however, it is a luxury that consumes much space, time, and money. Keeping your objectives posted clearly in your mind while selecting may help build a breeder collection based on facts rather than blind love.

Now with a new breeder collection in our possession, where should it be located?

THE BREEDING CENTER

Any industrial engineer could easily improve the operation of hybridizing. These engineers are trained to make a task more efficient by reducing work. On the other hand, it seems hybridizers have a passion for inefficiency by increasing the work. We think nothing of placing a pod parent to the extreme north and the pollen parent to the extreme south. Even if exercise was the motive, it would soon become a very limiting factor after a few hundred crosses. Surely there are better ways to spend this precious time than emulating a disturbed ant.

There are several benefits to a concentrated breeding center. Reducing the steps (time) from one parent to the next would appear reason enough for the center, but it also supports our decision-making task. Having both parents in view while

deciding a cross can add greatly to the insight on a resulting seedling. It's a reminder to review both parents' potentials just before mating. Also, the breeding center's concentration will pay off well during seed harvest time because this chore requires daily attention. It's a simple job to observe the crop from a single vantage point without retracing hybridizing steps.

Parents need good culture after as well as before crossing and it's an easy oversight to neglect a plant after making seed pods. The post-bloom garden is probably hot and dry and it isn't the most comfortable place to be at this time. Not that the pod plants need super culture during this forty or more days of pregnancy, but normal care must not be overlooked. Some pod parents will abort their seed pods in order to survive if neglect persists. Caring for a smaller maternal area can save much hose dragging.

Never allow the breeding center to become static. A few parents will continue to be worth the space they occupy while others will become obsolete. The beginning is usually composed of other hybridizers' work, but eventually it should evolve into a major portion of your plants. Occasionally, there will be reasons to bring other hybridizers' varieties back into the breeding center in order to outcross and start new objectives. The breeding center is for the elite parent, and only those plants living up to your standards should be allowed that space.

Parents that are no longer useful should be removed and the locations reconditioned for a new parent. Be patient in finding the right plants for replacing those that you have evicted. That empty space doesn't demand urgent replacement as if it were a missing front tooth.

Now that we have good parent material and are situated in a breeding center, we will discuss "Building a Line" and "Making Seed" next.

Part III

BUILDING A LINE

One of the most ambitious steps for a new hybridizer is transforming a dream into a powerhouse of potential parents. This powerhouse is known as a *breeding line* and is composed of parent plants that include a composite of desirable features which are closely related through incrossing.

The majority of us are *habitual outcrossers* and never build a line because we are looking for instant success. Lightning may strike habitual outcrossers occasionally but the classic improvements are rare. It should be obvious which hybridizers have breeding lines without identifying them. Ever notice what happens when a strong line is taken over by another hybridizer? If one continues to build and enrich that line, then the new breeder probably will achieve greater results than the predecessor. It may appear that the successor was a better hybridizer than the originator of the line, while in fact it may be just a case of keeping the machinery oiled.

There are some problems in starting to build a line:

- Confidence may waver over whether this is the best approach to achieve a specific objective.
- Patience will be required to work through many generations of seedlings.
- Line contamination will result if we are lured into outcrossing with every pretty flower we see.

Actually, the building of a line starts when the objective is chosen and probably will continue to improve even after that objective is accomplished. There will be times when you will want to throw down the hoe and walk away from a line, but the only good reason for aborting is that the objective has been dropped. Assuming all the right ingredients have been included, you must explore all avenues before calling it quits.

There are many hybridizers who have built good lines and never knew anything about genetics. Probably they had a natural touch for observing and reasoning and practiced some

genetic rules unknowingly. Assuming all of us are not so gifted, it might be well to acquaint ourselves with some basic genetics that can influence our hybridizing destiny.

The subject of genetics seems to turn off more would be hybridizers than any other facet of breeding. Consequently, many ignore the subject and trust to luck or intuition or bee crosses. Genetics can serve hybridizers even though they do not understand how it works. It's like driving a car and not being a mechanical engineer.

Genetics affects the hybridizer's work and it cannot be ignored (unless one has that special gift). The influence will always be there whether we can predict the outcome or not. My experience in communicating other technical subjects has taught me that complete abstinence or complete involvement is too extreme for the ambitious amateur. A little shove across the genetic threshold is sufficient for now. I hope the more learned people on this subject can appreciate this oversimplified approach as a way of opening doors, encouraging experimentations, and challenging the amateur to seek better methods for learning more on this subject. In this case, it is doubtful that a little knowledge is a dangerous thing.

Without trying to learn the genetic theories or names, let's take a short cut to performing some experiments in various types of crosses. This doesn't eliminate the need to know basic genetics, for doing so will be the only way to develop better insight into complex problems. Perhaps after experimenting with some sibling and backcrosses you will want to learn more.

Here we will give a brief description of the types of crosses and the purpose for making them. The parents in these experiments are either unrelated or related as siblings or immediate parents. However, grandparents, uncles, cousins, etc. could also be involved but with lesser effect.

Outcross: This is a cross with any other variety outside its own line or at least that is distantly related. *Purpose:* to bring desirable characteristics into a line at the risk of bringing in

unwanted features. It is also used to bring new vigor and fertility in a degenerating line.

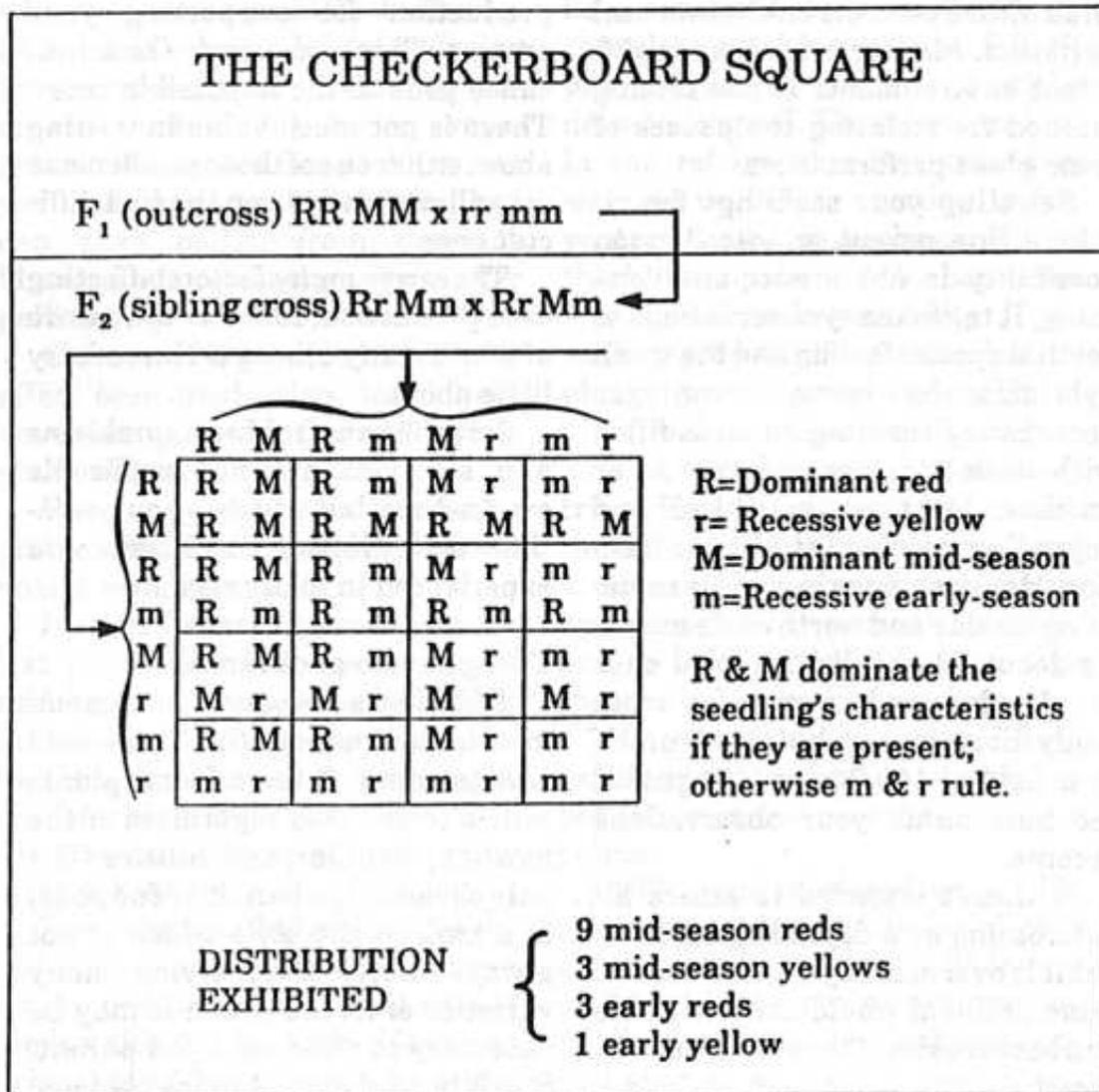
Sibling cross: Crossing of the first sister seedlings after an out-cross. *Purpose*: to exhibit hidden traits that otherwise remain inconspicuous when outcrossed. Continuing to cross siblings of the third generation or more will reduce the visible variations.

Backcross: Results from a cross of a variety back to either of its parents. *Purpose*: this can decrease some characteristic variations in the line by increasing the odds of recessive material from both parents. These backcrosses can be repeated several times back to the original parent and variations will decrease accordingly. By selecting the seedling parent with desirable features (and not selecting the bad) your backcrosses will perpetuate the good and eliminate the bad.

Self crossing is similar to sibling crossing except it is suspect of rapid line deterioration. Just for the humor of it, I believe nature put the pollen behind the stigma so fewer selfs would be made, giving the hybridizer the first opportunity to cross.

With these experimental tools at our disposal, we can examine the probability of some first and second-generation crosses. (See below.) The Punnett's square or checkerboard is a method used for illustrating the possible combinations that sibling crossing can generate. This is a very simple two-character distribution and, as you know, there are many more per plant. It does give you an idea of how characteristics can combine themselves; however, the possible combinations increase rapidly with a few more characters. The ratio was worked out by Mendel and he proved it with several hundred crosses. (It didn't get much attention at the time.) He is called the father of genetics now but he was only an amateur then. These checkerboards can give you some idea about combination ratio and how recessive characters are revealed. Don't expect exactness because there have been too many different characteristics plowed into the plants since we started hybridizing species. Any loss of "exactness"—i.e., deviation

from Mendelian ratios—arises from looking at multiple gene characters.



One must realize genetics makes the plans and our environment does the building. If either one faults they both go down the drain. It is very difficult to determine which is causing the plant to do what it does, especially with regard to habits. Breeding controls genetic variation and culture controls environmental variation. Moving selections to different environments is one testing method for isolating the causes of some plant performances.

Selecting your seedlings for either a line parent or introduction possibility is not a once-and-done thing. It takes many

observations to get that special feeling and the small hybridizer has some advantages here. Every seedling patch is filled with variations for one reason or another. Most are worthless and degrading, gaining little or no attention. However, once in a while something unique and worthwhile makes its debut. Hopefully the good ones are located and moved for more study. Sounds easy, but put yourself in a field of 100,000 seedlings and see how numb your observations become.

It wasn't intended to attack all outcrossing as a degrading method, but it is over-used by most of us. The same problem would exist with sib and backcrosses if they were done in excess.

Conclusion: Is line breeding a practical working method and worth the effort? For the amateur who has set unique objectives, I feel it is the shortest and most controllable approach. Hopefully this simple introduction to genetics might cause you to pull back the pollen from a promiscuous outcross someday, and ask, "Where am I going?"

Now with a purpose and method for building a line, we will look at making some seeds.

MAKING SEED

The making of seed is a necessary production for supporting your crosses. This may range from nuisance pods to the impossible cross. There is not much value in writing about either one of those problems so we will concentrate on the just difficult ones.

There are many factors affecting seed production; some we are aware of while many others we know very little about.

I realize my Midwest problems and solutions are not applicable everywhere but much of our weather and growing conditions are experienced in many regions.

The genetic problems:

Sterility is becoming more common in pod parents than we would care to admit. It seems some plants refuse to set seed regardless of the location, weather, and culture. The only

obvious sign (outside of no pods) is a kink in the style which is not always there. After trying many varieties of fertile pollen it may be necessary to write off a pod parent. Sterility in pollen is more obvious, especially if it is white and not powdery. I have never made a cross with such pollen. The fooler is when pods are set and the seeds fail to germinate, probably because no embryo exists. All the above are probably genetic and can be observed without magnification. Surely there are many other reasons too complicated for the layman to comprehend, and there is not much we could do about it if we did.

The environmental problems:

Weather plays a very important role because of rain, temperature, humidity, wind, etc. Although we can't change the weather (outside of a greenhouse), we can select areas where there is a little buffering. Some shade does a lot for reducing temperature and watering increases the humidity during evaporation. When rain is a problem and you still insist on hybridizing you can save pollen from previous blooms and protect the stigma after pollinating.

Culture: If it gets too bad, it may affect seed production, but I have never seen a daylily pod suffer from good culture.

Wind may not be so much of a problem but I still don't like to pollinate a wiggly flower.

Insects: Several types of bees collect pollen for their own use and robbing you of a cross doesn't bother them a bit. The best way to counter this is collect the pollen anthers the previous day or be an early riser. Also, some light-weight screening material can be used.

Temperature: Probably all varieties have a shut down temperature for the pod parent. I am not sure of the low side but the high side seems to be around 90 degrees F for tetraploids and a little higher for diploids with some variation for each variety. I believe pollen has a higher range but haven't tested it.

Humidity (or perhaps its cooling effects) must affect pollination because I have noted good sets from crossing shortly after a long morning rain.

Timing: There are some good reasons for crossing immediately after the stigma flowers because it seems more receptive at that time. However, I have not had this advantage and have crossed prior to its flowering for many years with fair success.

Pollen storage: For some time I have practiced storing pollen in gel capsules, marking with a felt tip pen, and placing them in a jar with a dehydrating gel. These jars are kept in the refrigerator but should be warmed up before opening to prevent condensation on the capsules. I think fresh pollen is the best since storing will reduce viability. If you can't use fresh, then store but replenish your supply frequently.

Persistency: Some difficult parents have come around after many tries. There is always the chance that all the things that may prevent a cross will change and that rare opportunity will present itself for only a brief period. You must be there with the pollen.

Microscopic examination: I have nothing to offer for the pod parent but pollen can be revealing on a few points.

Pollen grains placed on a slide with a drop of water under a cover glass are easiest to view. (10X is very suitable.) If the grains are opaque, swollen (due to the water) and football shaped we have a good start.

The quantity of good grains relative to the trash around them must be considered because too much trash is not good. (Trash is broken pollen grains.) In fact, I have seen cases of all trash and then I knew why pollination was impossible.

If a light is used under the slide it will generate heat. This warms the water and causes some grains to rupture and exude a liquid-like substance. This liquid—not the grain shells—is actually what goes down the style. When these ruptures are not noted I suspect inviable pollen.

The main reason for examining pollen grains is to determine if there is a good reason to concentrate your efforts, or let it go as bad stuff.

There is very little reason to protect an early cross that has its stigma loaded over with a cake of pollen. (Rain is an exception.)

After 14 or so days you can smile a little if the pod is still holding but don't count your seedlings yet. It takes approximately 42 days for the average pod to mature and .I remove them when they crack from light pressure. These pods are shelled within a few hours into small ziplock plastic bags and stored in the refrigerator for at least two weeks. Some will rot if not mature but most will remain plump, and be ready for germination.

Tagging: When crosses are made I place a snap-on plastic tag around the neck of the flower with the pollen parent name or number. If a pod is set, I add the pod parent number when I harvest the pod. These tags are the right size to fit into the plastic bags and can be used as markers until a more convenient time to replace them.

Be sure and mark your containers for storing pollen and seeds, or you might be surprised on refrigerator-cleanout day.

Now with good quantities of quality seed we will next take up "cultivating seedlings" and "selecting our best."

Part IV

Seedling Culture

The object is to turn the little black ball (seed) into a flowering plant with a minimum of time and labor expended. There may be as many methods of seed culture as there are hybridizers, most of which are quite successful.

The following method is a workable one for the Midwest and if I were to relocate to another region I would beg the local hybridizers for advice. However, it is possible that some of the

techniques mentioned below can be successfully mixed with other methods.

If the seeds are stored as directed in the previous article, they should be plump and their dormancy broken after a minimum of three weeks at around 35 degrees. Do not subject seeds to, any lengthy drying or warmth until ready for planting.

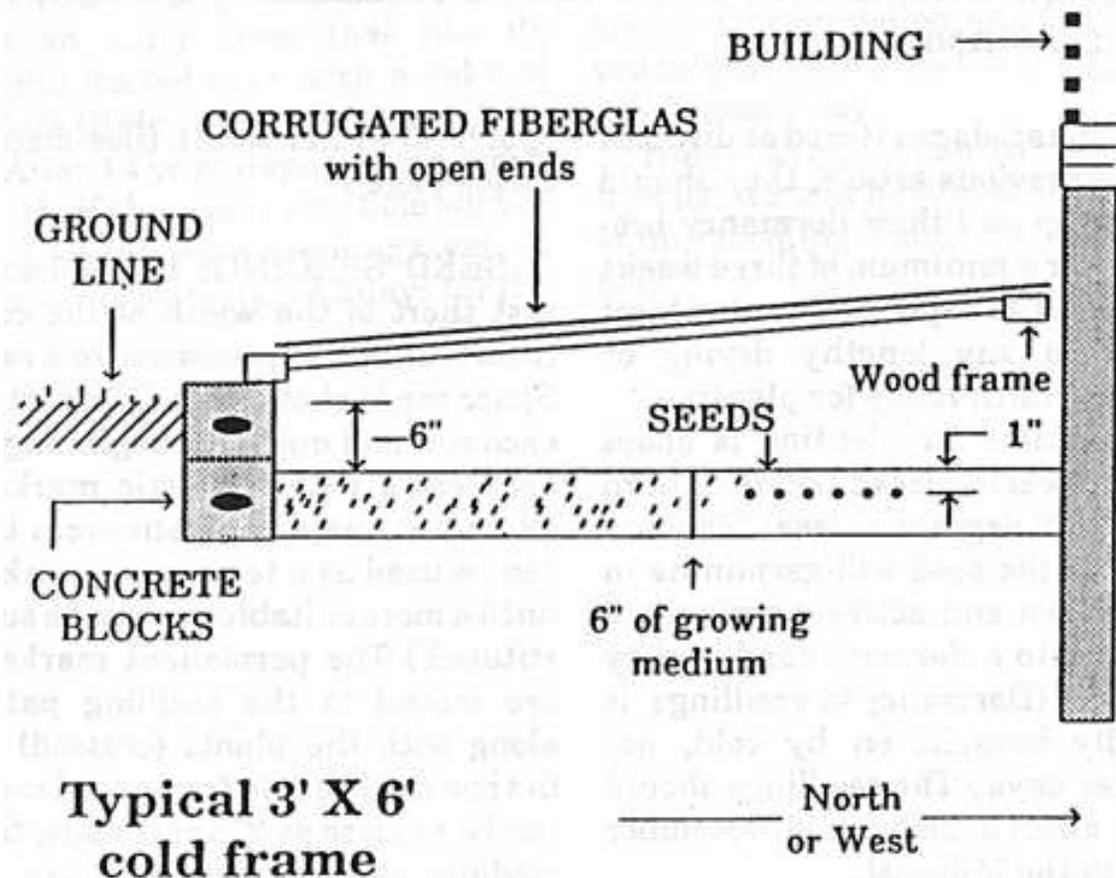
The time for planting is about ten to twelve weeks before a hard freeze (20 degrees or less). The majority of the seed will germinate in two weeks and actively grow until forced into a dormant condition by the cold. (Dormancy in seedlings is usually brought on by cold, not shorter days.) The seedlings should reach about 6" before mid-December here in the Midwest.

This method requires a cold frame with fixed ventilation and subdued light, located in a protected spot from winter winds. (See sketch)

SEED SPACING: Use a board just short of the width of the cold frame to make depressions for a row. Space seeds about 1/2 to 1" apart in each row and mark the beginning of each cross with a plastic marker. (Note: the snap-on plastic cross tag can be used as a temporary marker until a more suitable one can be substituted.) The permanent markers are moved to the seedling patch along with the plants (crossed) in the spring. The cold frame seed rows can be as close as 2" apart using the medium removed from one row to cover the last one planted.

With this spacing of seeds in the cold frame, we can place about 100 seeds per square foot or about 1500 per frame (3 foot by 6 foot size).

It is important to have the frame well ventilated, so don't seal the ends of the corrugated plastic. Keep the medium moist but not soggy until germination. Be very careful to not allow it to dry out for the first month of germination and seedling growth (check every day).



FERTILIZING: Only mild fertilizers should be used and preferably should be applied after germination. A soluble type such as 9-45-6 has worked best for us.

When the plants go dormant there is little to do except check occasionally to be sure the medium remains slightly moist (even a dormant plant must not dry out). As spring approaches, new growth will signal that watering should be increased and some light applications of fertilizer begun.

Around four to six weeks after new growth has started and outside low temperatures are above 30 degrees, you can consider lining out plants.

The preparation of seedling beds is best done in the fall. The Dutch method of 4' wide beds is preferred here; but where space and equipment are available, normal row planting is quite acceptable. The degree of preparation depends upon your particular soil conditions. If you are fortunate enough to

have good soil, there is little to do except till and mound up about 6" and wait for spring. Those less fortunate must add the materials necessary to make a bed into a fairly good nursery where seedlings can be nurtured for a season and a half.

Access to water is essential in most areas to augment the rainfall when it is insufficient for maximum growth.

Weeds cannot be tolerated and periodical elimination must be practiced. If chemical control is considered, experiment on test plots for one season before going whole-hog.

Spacing of seedlings is usually 4" within the rows and the rows themselves are spaced 5" apart. With this spacing we should get around 9 or 10 seedlings per square foot. If you should think the closeness of this spacing will hinder a plant in its bloom, just think how crowded a clump will be later.

Continuous and uniform culture cannot be overemphasized during the first year. One day of plant stress will necessitate weeks of recovery time.

Most hybridizers do not protect seedlings with a winter mulch. The theory is that tender plants will eliminate themselves, thereby assuring survival of the fittest. However, the tender plants may not be killed outright. Instead the cold may prevent blooming or cause defective flowers, which prompts the hybridizer to eliminate the affected plants anyway.

The quantity of plants to bloom in the following year could be a surprise. It is often assumed that all seedlings will bloom the second year and perhaps with super-culture it is within the realm of possibility. However, average to good culture will yield only about 50% bloom for that period, and I prefer to use average culture for elimination purposes because this comes closer to simulating conditions in the majority of gardens. If a plant doesn't bloom the second season it may be the result of culture technique; but if it is genetically restricted, then why promote a temperamental cultivar? You may grow your seedlings another year to observe what didn't bloom in the second year. However, unless cultural practices have been

decidedly lax, the chances of something worthwhile showing up are slim.

A lot of labor goes into the growing of seedlings and only the anticipation of bloom drives us on. Apparently this drive is quite formidable and with some, an obsession. If the labor causes undue stress on you and your loved ones, there is no sin in trash-canning some less desirable crosses. All this work will seem worthwhile when one special seedling unfolds its segments and your dreams become reality.

Now with seedlings in bloom we face the task of selecting the ones for future parents and possible introduction. In the next issue we will consider "Choosing our Best."

Part V

Choosing Your Best

A dear departed friend of daylily lovers was Jim McKinney. He was frequently asked for his opinion on a flowering seedling while visiting a fellow hybridizer's garden. With the skill of a diplomat and in his easy southern drawl, he might reply, "I believe it's the best in your garden today." Jim may have seemed slyly noncommittal, but I think he was sending a message that the best in your garden today doesn't necessarily constitute introductory material.

That unique selection that stirred your heart may be short lived if it cannot adapt to other gardens and give a consistent performance. "Choosing your best" of obvious features is easy compared to choosing the best of plant habits. Somehow we are so wrapped up in the obvious finger and toe characteristics that habits are taken for granted. Yet the habits will determine whether that beautiful form, color, ruffling, etc., will show frequently and in many gardens.

No introduction will give equal performances in all regions. You can hope only for an acceptable show in the majority of situations and even this is rare. Some established hybridizers have set objectives to widen

the range of places their introductions perform well. Their efforts are admirable because it isn't easy to disrupt a good line by outcrossing to cultivars that may bring as many unwanted features as they do desired ones. Just extending a tender evergreen line to include dormant hardy features can be a horrendous undertaking. If the new hybridizer builds his lines with multi-regional performance as standard equipment, he should never have to hear,

"I love your things but they don't do well for me."

Only obvious unique features can send an introduction down the road toward success, but we should be sure its habits are the right vehicle to carry it all the way.

Obvious good features have been well-defined in the literature and should require no reinforcement here. On the other hand, characteristics pertaining to habit are not so well defined, though their impact may be even greater. Two of the most important such characteristics are consistency and adaptability.

Consistency: The plant's ability to perform repetitively, displaying its obvious features within acceptable limits. Example - a flower size not varying more than 20%.

Adaptability: The plant's ability to perform in other gardens (especially other regions) in a manner that does not belie the introducer's declarations.

As previously mentioned, a plant's performance is controlled by the combination of its heredity and environment. We tend to blame the environment for any performance that falls short of the one ideal show. However, after observing certain varieties over several years (regardless of where they are located) it is easy to distinguish the plants that struggle and the ones that compete with the weeds. It seems logical to conclude that genetics controls adaptability and culture is only a crutch for the varieties that adapt poorly.

Getting to know your selections can come only from watching and comparing their performances against (a) standards set by our Society (b) previous introductions, and (c) your own

discreet objectives. Learning about your selections should be done systematically so as not to overlook important features and habits.

There are three levels of observation and evaluation of a new varietal selection.

- 1) The first encounter of a seedling whereby unique qualities are noted. This level may consist of simply counting the obvious desired features and seeing if it has special appeal.
- 2) Several follow-up encounters to determine whether the first-noted qualities are consistent within a single environment. While viewing over a series of bloom periods, you will be able to test the plant's "staying appeal."
- 3) Multi-regional encounters to determine whether the qualities are consistent when exposed to various environments. This involves placing one or more plants of the seedling in gardens of different regions for observing the plant's performance under different growing conditions.

Why not give the plant a star when it is accepted at each level before proceeding to the evaluation? By the time your plant has three stars it should have received some attention without your solicitations.

The first two evaluations can be done pretty much on your own, but the third one requires help outside your garden, that is, another region. Accurate evaluation depends on the candidness of those who feed back the data. Ask for a performance report on specific characteristics (not the general, "What do you think?")

It's best to keep plants under number on this third level evaluation because names have their side effects. There is no way to get a factual report on a poor performer when the variety has been named after the hybridizer's granddaughter. The best arrangement is to have a reciprocal agreement with a hybridizing friend where each of you will have the opportunity to factually evaluate the other's creations and avoid flattery.

While your plants are being evaluated you must try to remain indifferent and tell your selection it is only one rejection away from the compost. Set aside FILO (Falling In Love Obsession) until the tests are complete. Postpone naming until you feel the plant is worthy of a name. Naming before the test is like having children to save a marriage.

Like other hybridizers, I have wondered many times if I composted when I should have introduced and introduced when I should have composted. Absolute certainty will never exist, but through testing and evaluation we can come much closer to forecasting the potential of a proposed introduction.

An individual's success with testing and evaluation depends upon his ability to find the optimum in terms of degree. Too little testing is very common today, with the decision to introduce based on little more than a few local observations. Too much testing/evaluation and your variety could be superseded by a similar variety. Also, caring for larger numbers of varieties under test could become a heavy chore.

"Choosing your best" starts with selection of unique qualities and the verification of habits that will show these qualities wherever you choose.

With the variety now certified with three stars, in the next issue we will take up our final article —"Naming and Marketing."

Part VI

"A good name is better than precious ointment."

—Ecclesiastes 7:1

Naming

Of all the facets of hybridizing, naming seems to have been exploited to the greatest extent. If we had covered all the avenues of breeding with such thoroughness, there would be little left to accomplish. Such fervor to stake a name claim hasn't been equaled since the Oklahoma land rush.

Consequently many a good name has been gobbled up forever by cultivars soon forgotten.

Names play an important part in promotion and good names are rarer than good cultivars. If we are sloppy in choosing names, our super seedling will have to work doubly hard to make up the difference. On the other hand, good names have been known to "carry" poor cultivars for years.

A good name does not have a finite definition. However, one can quickly sense the pluses and minuses after a little analyzing.

First, let us identify the various types of names and note some of their effects.

FITTING SOURCES

Descriptive names: This is the most popular and effective type in use. The public will react more quickly and positively to descriptive names than any other type. Unfortunately, they are also the most exploited.

People's names: We use these names on daylily varieties to honor some worthy individual. Don't depend on the popularity of the person to carry the variety to success and do consider the name for "sound appeal." Not all handles ring bells.

Geographical names: These names must not have a bad connotation regardless of their sonority. Popular names in the news are very tempting but one must avoid places with political instability.

Prefixed names: The first word usually indicates the geographic origin or the breeder. This method gives wide access to many already used names, but selecting the prefix should be done with care. Otherwise, it may sound peculiar in conjunction with other names.

Mythical and fantasy names: Such words have no physical reality but are used in literature. These words go down well since they have a built-in charm and fascination.

Coined names: Some fine words come from creating or combining your own. Follow the rules for effect and limit this

type to a small number. It's a good idea to have poetic or romantic reasons for coining names.

FROM NOTIONS TO NAMES

The psychological effects of a name can range from good to bad in the realm of public reaction. These effects will apply to all the above type names; however, non-descript ones should be given the most scrutiny. Subject your names to stringent analysis before making that final move. Consider the following:

Connotation: Any name will have subconscious meanings that are perceived from association. The cause of these underlying meanings may have root in misunderstandings or exploitation of political and social events (especially true of people and places). Connotations are somewhat intangible, inconsistent, and will not make the dictionary until years later. The most difficult problem in dealing with word connotations is their inconsistency due to people's varied experiences. You will have to give weight to the most popular acceptance. Example: "Snow," usually suggests white and beauty but to some it may mean cold and bleak.

As difficult as connotations are to predict with a name, they are nonetheless very real and will affect your product.

Nostalgia: This is a specialized building block of connotation, but reaches far back in our history for the experience. Childhood memories that bring about good feelings can be made into excellent names.

Controlled connotation: It would be very difficult to create a connotation for a word; instead, we must be astute to what fantasized meanings attach themselves to words. Once these meanings are understood, evaluated for positive feelings and strength, we can apply the word (name) to our favorite object. Example: The word, "Mustang", was selected so that owners of these cars would think of their vehicles as wild, fast, powerful, and sleek (a positive feeling). On the other hand, you might name a miniature daylily "Termite" — a good sounder — but wouldn't this name also suggest destruction, costly repair, and menace to our home (a negative feeling)?

Always ask yourself and others what connotation generally accompanies the selected word. Make it work for you and avoid the ones that are even faintly suspect.

HARD ROCK OR MUSIC

The sound of names can be as pleasant as any well loved music or as unpleasant as falling pots and pans. There are a few rules that are known to produce good sounding names but don't limit yourself to just these examples. Study commercial advertisements (the real pros) and note their methods.

Rhythm: If we follow the reasoning of song writers who find it easier to write lyrics in romance languages, we would tend to select names with the words and syllables that usually end in vowels. This makes a smooth transition from one sound to the next and the overall effect is rhythmic. This is what makes the words of a song easier to remember than a speech and names need this quality. Examples: Casaba, Omega, Piano.

Rhyme: Double names that rhyme are attention getters and have pleasing sounds or alliteration. Examples: Seven Eleven, Super Duper, Fat Cat.

Hard consonants: There are double names in commerce today with beginning sounds that are hard and strong. No doubt they are successful, but still a little harsh when applied to objects of beauty. Examples: Big Mac, Red Roof, Gem Stone.

These are rules and examples for developing a publicly acceptable name and they should not conflict with American Hemerocallis rules for naming. You must comply with the Society's rules or otherwise chaos would eventually destroy our system. Refer to the recent published rules in Journal Vol. 43 No. 3, Fall 1988. It behooves all hybridizers registering daylilies to review the rules frequently.

Computerized search has greatly expedited our registrar's task in preventing duplication, etc, but needless correspondence could be avoided if the hybridizer would research the *Check List* prior to application.

It may be an overstatement to suggest we are testing a name but it does need scrutinizing for appeal, checking for availability by AHS rules, and just trying on for size.

Jot down names as they come to mind and separate the wheat from the chaff later. When you try for a match with a variety, just look at the flower (or picture) and ask if it really looks like a so-and-so. In time, names grow on varieties and the first look-see seldom jibes with the final feeling.

The art of naming can be as self-satisfying as the other facets of hybridizing. Much like a unique variety, a super name is something to behold.

Now that the new name has survived. the pre-introduction test and been married to a fine variety, you must prepare the couple for the cruel world by "promotion and marketing" (our final article of this series).

Part VII - Final in a Series

PROMOTION AND MARKETING

Prior to this phase of hybridizing, the new breeder's work has been his own private business. He hasn't asked anyone to share his good fortune in developing new cultivars, but when he promotes and markets a new introduction, he is in effect telling the public that he is willing to share his accomplishments at a price. He is putting his credibility on the line for being able to breed, select, and communicate the quality of his cultivar. Now the new introduction is out of his control, and it must stand on its own. Nevertheless, the cultivar's performance will continue to reflect more on the introducer than on the grower.

In the early history of marketing daylilies, we allowed the cultivar to do its own promotion. The spread of a good daylily resulted mostly from first hand observation rather than the "take my word for it" approach.

We have moved into a different world now where promotion through advertisement is as acceptable in daylilies as it is with soap. Other types of promotion have also become more

sophisticated as our Society has expanded. The bulk of daylily sales today are based on someone else's word for the plant's quality. In spite of what most of us wish, we actually observe only a few choices before buying.

The majority of us are buyers as well as sellers, so we surely can take an empathic approach in putting together a selling promotion that carries the integrity we would accept as a buyer.

It seems promotion and marketing are very much integrated, and we will not try to separate them here. However, one can sense that the introduction of the new plant seems more promotional, and the continued selling of it leans more toward marketing.

With an unlimited budget, it takes very little ability to promote and market a new introduction, but most of us feel the need to balance our budget after some initial investment. Also, continuous lavish promotion, in addition to being a drain on the budget, could cause suspicion that your cultivars cannot carry their own weight.

After pouring time and money into developing a nice introduction, the new hybridizer may be reluctant to invest even more. Unfortunately, regardless of how good the novice may be, the world will not beat a path to his/her garden unless there is initial promotion. The obstacles in getting that first attention will not be overcome by hybridizing ability, but instead "the new kid on the block" must learn and use the power of promotion.

Many good hybridizers stop right at this point and deprive the world of their creations. They may feel that they cannot compete with the high rollers who are out there promoting mediocrity. All I can advise is that if you think you have the right stuff, jump into the promotional arena, and have faith that quality will prevail.

The new hybridizer can choose a variety of promotional methods ranging from the low budget type such as guest plants to the most expensive color catalogues. Let's examine some of the methods and comment on the worth of each one.

PROMOTIONAL METHODS

- *GUEST PLANTS.* This is the most economical method and fits the needs of buyers who must see a cultivar in action. It also places the new introduction on the public's path such as on national and regional tours. Display and popular gardens are also good choices, but prearrangements should always be made with the grower before sending the plants. Don't be embarrassed to ask someone to host your plants because there are many good growers who are willing and able to host a few good cultivars.

- *COLOR SLIDES.* If you are a good photographer, put this talent to work as a promotional tool. If you are not a good photographer, consider educating yourself on the subject and buying one of the new automatic cameras that bypasses the need for much skill. *Using quality pictures of quality flowers is the only way slides can promote your plant.* Besides a legible name, take time to add the seedling number, size, and perhaps the parents to the slide. This will add interest for the viewer. Take advantage of the programs offered by our Society at conventions, contests, libraries, etc., to display your creations. Also, ask some of your friends to view them and perhaps show them in local slide programs.

A word of caution about slides: Most slides represent one ideal flower of a cultivar. They do not represent habits such as consistent performance within the boundaries of average culture and weather conditions. If the cultivar being shown is a good performer, say so; if not, do not allow a single good flower picture to misrepresent its overall performance.

- *ARTICLES.* Getting the name of your introduction in print (other than in purchased space) is a high-impact promotional advantage. We all love to read about new developments for creating our want lists. The names of worthy cultivars may eventually find their way into such printings as tour reports, Popularity Polls, Awards & Honors, show winners, and articles — if you are patient. If patience isn't your virtue, then put your super variety on the stage and let it perform for all to see. Where and how you stage your cultivars

is within your right to promote, but if you are encouraging articles, you should stop short of crossing the sensitive line between useful information and free advertisement.

Normally, editors can sort out interesting and beneficial material for all the members from that of special interest. However, no article, whether informative or honorary, can be totally free of promotion if names and pictures are used. Many hybridizers compensate for this by paying the cost of color separations (expensive, but a good deal for all).

- **SHOWS.** This type of promotion brings more attention to the new growers than to the cultivars. However, winning accredited show events is one way to get your cultivar's name in the Journal.
- **AWARDS.** Receiving an award does bring attention, and regardless of the pros and cons of the system, this is a promotional effect worth-striving for. You can be justly proud of any award that was won solely on the merits of your cultivar.

TO MARKET, TO MARKET

By now, if the promotional methods have had their effect on demand, we are ready to make our marketing pitch. Our most common system of marketing is by direct solicitation (hybridizer or dealer to the customer). This serves as more than just an opportunity to sell or buy, since it is a communication link within our Society for all to appreciate the state of the art.

It would be wise for the new hybridizer to start with a less expensive newsletter ad and single price list, then work up to more sophistication as he becomes established. *The Daylily Journal* offers the widest readership in the field, although ads are usually more costly than newsletter ads. Good color catalogues and ads are very effective but also expensive, and the cost should be weighed carefully before taking the plunge.

In introducing new cultivars, the hybridizer can elect to do it either on his own or affiliate with an established grower. If he joins a grower for this purpose, a written agreement will avoid

future conflicts and possibly save an existing friendship. If he tries it alone, then he must create the necessary descriptions and prices for his advertisement.

- *DESCRIPTIONS.* Describing your baby is an essential part in selling what you believe to be a contribution. An accurate description coupled with a sharp color picture is the ultimate persuasion. It could have more impact than the real thing since repeated viewing is more convenient. Unfortunately, most of us cannot go this far with each of our introductions, and we must compromise with descriptions plus black and white pictures or solely with descriptions.

Photographic equipment and printing techniques improve every year, but pictures alone would be inadequate for communicating a complete understanding of the introduction. The statistics, habits, and range of performance are difficult or impossible to convey with a picture. Statistics are cold facts (size, height, season, color and foliage habit) while plant habits and performance are like topping on a dessert; they are related more from feelings than from measured data.

Putting together the statistics is the easiest part, but the data should be gathered from established plants receiving ordinary culture, and, if possible, taken from more than just a local garden.

Most narratives are more "flowery" than the actual object of description, and a few are as cold as specifications for a jail house. There is no doubt that enthusiastic, colorful descriptions are most effective; but refrain from stretching the truth, using false standards, and bombarding the reader with superlatives. Good characteristics should be emphasized, average ones may or may not be mentioned, and bad ones should have already aborted the introduction.

- *PRICING.* There has been so much controversy about today's introductory prices that it must be confusing for the new hybridizer as to what is an appropriate price for him while at the same time a fair one to the customer. It is unfortunate that there is not a simple formula to establish a

price, but if we study and become aware of some factors that affect prices, perhaps our intuition will not forsake us.

Take note and compare the quality of your own introduction with other recent introductions that seem successful. (Success in marketing is indicated by demand and rising (or holding) prices.)

After you have set a few prices, you can place them in three categories which will help in determining future pricing.

—*Underpriced*. A complete and rapid sell-out followed by continued demand.

—*Adequately priced*. Near sellout over several seasons while keeping a fixed or slightly reduced price.

—*Overpriced*. Your stock propagation runs away from the sales, and your competitors are undercutting your price even though they have very little stock.

You must speculate on factors such as:

- (a) *Supply*. This is the quantity available at time of introduction and the rate and effect of propagation.
- (b) *Demand*. Consider popularity and exposure. Has the cultivar created favorable comments and inquiries?
- (c) *Comparison*. As previously mentioned, your pricing should keep within the bounds of that for similar material.
- (d) *Quality Inference*. High prices get attention and suggest better quality. If high pricing becomes habitual, the hybridizer is putting his selecting credibility on the line. On the other hand, a low price carries the stigma of less than average quality. (If that is a fact, perhaps it should not have been selected for introduction.)

To conclude "Promotion and Marketing," we should recall how we respond as a buyer, be sincere and honest when we ask someone to "take our word for it," and never trust a critic carrying a shovel.

CONCLUSION

"The Art of Hybridizing"...

It has been fun and enlightening to write this series of articles. I certainly became more aware of not just what I was experiencing but also what other hybridizers were doing. I had much help from other breeders, and some did not even suspect they were helping.

There were a few resolutions that I made at the outset of writing these articles which I hope were fulfilled to some extent.

- (a) Target the new hybridizers, for they are our future and have the right to past experiences.
- (b) Do not mention specific cultivars or living hybridizers. The intent is to promote hybridizing, not introductions.
- (c) Discuss all the facets of hybridizing, even touching on some esoteric and forbidden subjects for the amateur.
- (d) Never be too serious about a fun project.
- (e) Avoid direct criticism (the most difficult resolution of all for a critic like me).

There remain many untold experiences of other seasoned hybridizers that can be of great value to the novice. More important than the inheritance of good cultivars, our successors need the building blocks of methods. One can only wonder what the violins of today would be like if Antonio Stradivari had determined to reveal how he created that wonderful instrument, the Stradivarius.

Good Luck!

Oscie B. Whatley, Jr. (1923-2005) was an engineer by profession, employed by McDonnell Douglas Corp. in St. Louis, Missouri. He was born in Texas where his Aunt Mary Stevens inspired him with a love of gardening, daylilies, and hybridizing. He was a recipient of the Bertrand Farr hybridizing award.