"THE NEWSLETTER OF THE ONTARIO REGIONAL LILY SOCIETY"

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* ANNUAL MEETING OF THE *
* ONTARIO REGIONAL LILY SOCIETY *
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SUNDAY, APRIL 21, 1974

2 P. M.

Headquarters Building of the
Royal Botanical Gardens -
Plains Road - Burlington, Ont.

Another fine programme has been planned for this year's annual meeting. Jim Taylor will lead a discussion on the growing of lilies from stem bulbils and small bulblets. We hope this will lead into many questions, and an exchange of ideas that will further your enjoyment with lilies.

Photographers and gardeners alike, bring along some of your best slides to share with us. Fred Hayes, who looks after our slide collection, will co-ordinate the showing of members' slides. You will see some pictures taken from past shows and who knows what else might come from this feature!

There will be a draw for a gift certificate on bulbs for fall planting. To be eligible, you must have paid your 1974 membership dues by April 21st. Ifyou haven't paid your dues yet there is still time to send them to Miss Watson. All members can take part in this, whether at the meeting or not.

There will be refreshments following the Annual Meeting.

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NOTICE OF MOTION TO AMEND THE CONSTITUTION

The Board of Directors, at their meeting March 13th, passed a motion to present before the Annual Meeting on April 21, 1974 whereas the directors of the O. R. L. S. be increased from six members to eight members. The present term of office for Director is two years. Three directors are elected each year. In effect the new motion, if approved by the membership would increase this to four directors elected each year.

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MEMBERSHIP DUES ARE PAYABLE AND SHOULD BE FORWARDED TO THE TREASURER

EDITOR'S NOTEBOOK

No lilies have yet dared raise their heads, although the first two weeks of March, with temperatures reaching record highs, could easily have raised false hopes of an early spring. More normal weather has since prevailed and April showers will soon be with us. An early spring feeding of a commercial fertilizer, say 5-10-10, spread over the beds before the lilies emerge, and allowed to be washed into the soil by warm spring showers, will give your bulbs a spring tonic boost. Should you have mulched for winter, that too should be removed by mid-month unless the weather stays unseasonably cold. I would certainly not recommend leaving any winter mulch on the beds after May 1st.

It may seem to be an old story, tried and true, but one worth repeating for our new members. Late frosts can do a great deal of damage to many of the trumpet lilies. Do try to cover your tender lilies during any frost threatening evenings during May. Little damage is done until the foliage begins to break out of the sheath, and even then the asiatics appear to withstand temperatures down to 26-28 degrees. But not so with the trumpet lilies. Any soil temperature below 32 can be dangerous. Using metal containers for covering can be a danger as well. It is best to use boxes, bushel baskets or similar covers, always making sure that the plant does not touch the container.

It is never pleasant to report the passing of gardening companions; Joe Tiffin who acted in the capacity of vice president of our Society, passed away in February, and a former treasurer, Mr. Gordon Utting passed away in March. Both members were active in the society until their failing health made it impossible to continue. We will always remember them for their guidance and assistance in the early years of development for the O.R.L.S. Mr. Tiffin's Josiveve has made a substantial contribution in breeding for pink and white lilies, and the vigor and colour of this lily willmake it one to stay around for many years.

Our membership is constantly growing. We can be proud of our group but letus not sit too long on our laurels. We have work to do - lilies are not making the inroads that it appeared they might once do. They have not become as popular as we once had hoped they would. Let us find new ways to bring them into the gardens of others.

Bob Barber has started the Round Robin off with flying colours. He has already sent the first letters off, so if you should be interested and have not indicated your desire to be included, do write him at 50 Market St., Georgetown, Ontario, so that your name can be included.

The treasurer reports that our financial situation looks good. A final, audited report will be presented at the annual meeting, but at March 12th 1974 our treasury contained $1043.63, and our single membership was reaching the 100 mark. Twenty-five family memberships were in addition.

Again, we want to thank Mr. Charles Robinson for his splendid article on hybridizing. So many fine compliments have been received, we feel privileged to have him write for us. If you have not tried your hand at breeding, and the "bug" has not bitten, file the Newsletters away for future reference. It <u>will</u> bite some day, and you will want to be prepared with some good background material when it does.

The Newsletter is in need of articles for future issues. Mostof us can write something of interest and of value. New members need basic information on lily growing, and the kinds to grow. Can you help them?

HYBRIDIZING - THE HYBRID AND ITS CHARACTERISTICS

* C. Robinson

No discussion about hybridizing can possibly be complete without an examination of the very heart of the subject - the chromosomes and the genes. If a cell from the somatic or body tissues of a lily is subjected to microscopic examination, it will be seen that it contains a sperical body called the cell nucleus, and the largest identifyable bodies within this nucleus are the chromosomes. Lilies normally have 24 chromosomes although it is more accurate to say that they have 12 pairs, one of each pair being contributed by the pollen or male parent, the other of the pair coming from the seed or female parent. The number, size and shape of the chromosomes are the same in all the body cells of a lily, or for that matter any living organism, and indeed with rare exceptions throughout a particular species. Every lily plant grows by the process of cell division. Between successive divisions (the resting stage) the chromosomes are not easily seen, but when cell division is about to begin they can be seen as twining bodies which are split lengthwise. Finally, these half chromosomes thus formed begin to move toward the opposite ends of the cell, as if each of these half chromosomes were strongly repulsed. When the half chromosomes are at the poles of the cell they begin to again pass into the resting stage and a cell wall is formed between these daughter nuclei, each of which contains precisely the same number of chromosomes as the original parent cell. After a suitable length of time the process is again repeated. The chromosome itself is organized into units, several or many of which are carried in linear order along its length. Each of these units is known as a gene, and genes determine the character of the lily. However, the hereditary connection between one generation and the next is by means of the chromosomes on which the genes are carried, and the transfer from one generation to the next is done by the sex cells -- the pollen and the ovules. When a lily begins to form its sex cells, a special type of cell division takes place, scientifically known as meiosis but more simply as the reduction division, in which only half the number of chromosomes, 12 instead of 12 pairs, pass into the sex cells. This haploid, or half number, is very necessary in order that when a pollen grain fertilizes an ovule the resulting embryo will have a total of 24 chromosomes (12 pair) as in every normal lily plant. These paired chromosomes are alike in purebreeding individuals such as species, but may be slightly dissimilar in other lilies within a particular group. Just how similar or dissimilar they are determines the possibility of crossing them. But not always; where a cross betweenplants (or animals) having dissimilar chromosomes has been achieved the offspring are usually sterile.

Let us assume that we have created a hybrid by the methods already discussed, just what part do the genes play in the development of the plant? It is generally believed that each gene has one major and perhaps several minor roles to play. Conversely, the expression of a character is usually dependent on the major influence of one gene with perhaps other genes playing minor roles. Generally, however, we merely recognize the major gene and ignore the others. Thus, will L. pumilum with its orange-red flowers we deal only with the two genes for red colour, stated R R, one from each parent. However, some colours or other characters may depend on more than one pair of major genes before they can express themselves. Now suppose we cross L. pumilum with its yellow variant, Yellow Bunting. The resulting seedlings will all be a shade of orange-red and there will be no yellows. Thus, the red of pumilum is said to be dominant to the yellow because it completely masks it.

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HYBRIDIZING - THE HYBRID AND ITS CHARACTERISTICS (Continued)

Geneticists indicate dominance by using the capital R for the dominant red and a small r for the recessive yellow. The colour constitution of pumilum, therefore, would be R R (one R from each parent) and Yellow Bunting r r. The hybrid between the two would obviously have the constitution R r ... the R from pumilum and the r from Yellow Bunting. But why would any breeder want to cross pumilum with Yellow Bunting? The answer, of course, is that he wishes to effect an improvement by combining the yellow colour of Yellow Bunting with the much stronger constitution of pumilum (such an attempt has been made many times). But the seedlings are all of an orange-red colour, something similar to pumilum but perhaps a little lighter. What now? As we have shown, each of these seedlings is carrying the colour genes R and r and if two such seedlings are intercrossed the Law of Segregation takes over. This law states that genes brought together in one generation will seperate when that generation reproduces and forms offspring. In this next generation will be found the plant or plants with the desired characters, and for which the cross was made. In the above example we have only dealt with a one character difference. When two or more characters are used, a much greater number of offspring will have to be raised in order to produce the plant with all the desired characters. The more characters we deal with, the greater will be the population needed for success.

We have so far dealt with genes which are either dominant or recessive. It should be said, however, that in the lily most of the visible characters are neither truly dominant or recessive. They are somewhere in between. Again using colour genes as an example, the state of dominance or recessiveness can be stated in percentages; thus, 80% dominant and 20% recessive, 60% - 40%, 75% - 25%, and so on. This state is known as incomplete dominance. Another important fact about genes is that when we describe them as being dominant or recessive they are only so in their relation with other and particular genes. A gene which is dominant in one instance could well be recessive in another. Genes for lilac colour are dominant to white, yet recessive to red.

We will now move along and study gene expression, namely the character. To lily growers colour is an excellent example for study and observation, and a close look at the variety of colour characters will help us to understand something about inheritance. The colours of asiatics (Division I of the recognized lily classification), can conveniently be divided into two groups- (1) the orange-red group, and (2) the lilac group. In group 1, and in descending order of dominance are orange-red, orange and apricot, bright yellow and pale yellow. Orange-red is the most dominant colour, bright yellow being the recessive, while pale yellow is the final recessive by virtue of the fact that it is recessive to the recessive bright yellow. But any grower who has hybridized within the group may have been perplexed by the appearance of dark reds among the seedlings. Dark red is something of a phenomenon because it is unknown in any of the species from which our present asiatics are derived. A genetic study shows us that dark red is controlled by two pairs of genes, one pair which we will call C C being carried by one parent, the other by the second parent. This latter pair we will call A A for the sake of simplicity. The C C colour genes, however, cannot produce colour by themselves, but only when A A are present. These latter are known as complementary genes and act as catalists for the C C genes. Not very much is known about the C C genes except that some plants within the L. willmottiae - L. amabile complex carry them. Some within this complex also carry the A A genes, as do some lilacs. When these dark reds first appear the colour is modified by orange-red -- the parent colour, but intercrossing and selection can produce pure-breeding dark reds.

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HYBRIDIZING - THE HYBRID AND ITS CHARACTERISTICS (Continued)

Another interesting feature is that when these dark reds are crossed with yellows the colour bronze appears, a colour not found in nature. The appearance of bronze seedlings has always interested me because of their variability; some are typically bronze with about equal dominance of the red and yellow; others have a bronze face and yellow reverse or a yellow face and bronze reverse, again equally dominant but possibly with pattern genes at work. Although dark red is known in nature it is restricted to the species L. papilliferum, whose natural habitat is extremely limited. Authorities have theorized that the colour is such that pollinating insects are not attracted to it; also, lilies with dark red flowers are known to be more susceptible to lily diseases. Group 2, the lilacs, are represented in nature by L. wardii, L. lankongense, and L. cernuum. All of our lilacs, or pinks as they are called, have been derived from cernuum and some of them carry the A A genes, and when crossed with the orange-red group we occasionally get the dark red, but this time modified by lilac. This colour is usually referred to as fuchsia and there are several named varieties which typify this colour. In this group 2 are several sub-sections namely deep lilac, medium lilac, pale lilac, rose, pink, salmon, and white. I have placed them in the approximate order of descending dominance. I say "approximate" because these days it is often difficult to determine precisely to which group a colour belongs and thereby to what degree it is dominant or recessive. White, of course, is recessive to all colours, yet white asiatics can be further divided into at least four different genetic groupings, which illustrate just how complicated our lilies are becoming. But our study does not end here because there are now many colour combinations which have resulted from our breeding efforts. As examples, there are whites modified by yellow, by pink (blush), by apricot (fawn), and also by red. This state can also be applied to most other colours within groups 1 and 2. Yet we have undoubtedly only begun to tap the resources of the asiatics. Surprises seem to occur each year in the seedling beds. To name a few; seedlings having flowers heavy with papillae (I always think that papillae adds tremendous character to L. speciosum flowers); flowers having orange or orange-yellow surrounds to each spot, and another type in which the flowers can be described in two ways -- yellow with large orange centres or orange with broadyellow petal edges. Bicolors are also making an appearance to broaden the colour spectrum. It is the first sighting of one of these newer colours that makes lily breeding so fascinating. It is in this particular area that keen observation becomes most important.

So far we have only dealt with the colours of asiatic lilies. However, those colours found within the western American and martagon sections are quite similar to the asiatics, not only in general appearance but also in the molecular structure of the colour compounds. The interactions of the genes follow quite closely those I have mentioned in the asiatics. This similarity can readily be understood if we give some thought to the evolution of the lily. Starting with the Proto (or original) Lilium from which all our lilies have descended, the evolutionary tree shows that L. hansonii is considered to be the lowest branch, followed closely, but just a little higher, by the martagons. Much about the same time the Western American group emerged. Although differing from the martagons botanically the colours were passed on with only very slight modifications. On a much higher evolutionary branch is the asiatic group, significantly different botanically, yet having much the same colours and gene interactions as the martagons and Western Americans, but once again with slight modifications which have taken place over thousands of years. This being so, the information relating to asiatic colours can also be used by breeders working with the martagons and the Americans.

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HYBRIDIZING - THE HYBRID AND ITS CHARACTERISTICS (Continued)

Apart from the normal genes which control colour there are still others that play an important part in the expression of lily colours and colour patterns. There are intensification genes which intensify colours, dilution genes which dilute, inhibiting genes which do exactly that, and collectively they are known as modifying genes because they modify the basic colours. Another and very important group, is the pattern genes which dictate just where each particular colour will be laid down on the flower tepals, or what particular pattern the spotting will be. There are many spotting patterns in the asiatics, and other groups. To understand this, breeders should examine the differing patterns of such species as L. lankongense, modadelphum and tigrinum, not only note the differences but also how a particular pattern persists throughout the species. And so it is with the hybrids; each clone will have its particular colour and spotting patterns. All these charactersare the direct results of the actions of pattern genes. Trumpet lilies are an excellent example of the operation of pattern genes. Let's take a look at say, L. regale, a white lily with a broad reddish-purple band on the exterior of each tepal, and a yellow throat. Under normal circumstances this pattern persists and is under the control of the pattern genes. When a mutation or change occurs and the colour pattern varies from normal, it is due to the pattern genes having undergone a change from dominant to a recessive state and can no longer control or dictate where a particular colour will occur. Some years ago this did happen, and still happens occasionally, and the colour of the reddish-purple band seeped or spread onto the main body of the tepals; it also passed to the inside of the flower. Then by selection, breeders finally acquired what is now known as the pink trumpet. This is just one illustration of pattern gene actions in both the dominant and recessive states. You will note that I have used the word "mutation". It denotes that a change has taken place and a new character has arisen quite suddenly. Although gene mutation is fundamental to variation and evolution, change can also occur through alteration to chromosome structure and number.

Early in this paper I made mention of the fact that lilies normally have 24 or 12 pair of chromosomes. These are known as diploids, meaning that they have two sets of chromosomes, one set or one of each pair being contributed by the male parent, the other of each pair, 12 in all, being handed down from the female parent. But abnormal types do occur either naturally or by man's design. Forms known as triploids (3 sets of 12 chromosomes) occur in the tigrinum group, notably varieties splendens and fortunei. There is a double-flowered form which I believe is also triploid. Such abnormalities originate through the failure of the cell to reduce the chromosome number from 24 to 12 at the reduction division at which the pollen or ovules are produced. If such an unreduced cell becomes, say, a pollen grain with 24 chromosomes and fertilizes a ovule with 12, the total will be 36 instead of the normal 24, thus having three sets of 12 instead of two. Hence, the use of the word triploid -- tri meaning three. Triploids are usually infertile because of chromosome complications and have had little or no impact on the production of present-day hybrids. For that matter, neither have the tetraploids (tetra meaning four) which have four sets of 12 chromosomes and which were produced by the use of the drug colchicine, derived from the colchicum or autumn crocus. There are a few tetraploid lilies around and they do produce good pollen and seeds, but only when crossed with other tetraploids. This group should contribute much more in the future.

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HYBRIDIZING - THE HYBRID AND ITS CHARACTERISTICS (Continued)

One group which has played an important part in the development of the asiatic section is the Patterson lilies which were derived on the one hand from the species L. cernuum. These varieties can be further divided into two groups (1) the diploids with 2 sets of 12 chromosomes, and the (2) aneuploid group, the varieties of which have an irregular chromosome number above 24. These aneuploids obviously arose through the crossing of a diploid with a triploid and are highly infertile, seldom producing good pollen or seeds. But this infertility is not confined to the aneuploids; it is also present among the diploids. I assume that whatever the cause this state of infertility runs through both groups but is further complicated in the aneuploid varieties by the additional chromosomes. The inevitable irregularities which occur at germ cell formation (pollen and ovules) makes matters difficult for the lily breeder interestedin the lilacs. However, many of the newer varieties derived from the normal hybrid - Edith Cecilia - are either fertile or reasonably so. Breeders should make use of these rather than the older Patterson varieties.

At the present stage of lily development I believe it best for lily breeders to select parents by visual appraisal only and avoid inbreeding, line-breeding and back-crossing unless there is a very special reason for so doing. This does assure a certain measure of heterosis or hybrid vigor which in turn will give us healthy and virile progeny. To simplify the task of designing a sound breeding program it is only necessary to use four colours--orange-red, apricot, yellow and pink. One bulb of each will suffice but make sure they are the finest varieties available. From these four colours every known colour in the asiatic group can be obtained. Be sure the lilac is free from any modifying colour as this will make the task much easier. Yet we must not forget that colouris just one character with which we have to deal, and there are many others to which we will have to pay equal attention -- characters such as height,foliage, disease resistance, flower texture, etc. Breeders cannot afford to overlook any of them.

Finally, may I say that I hope members will derive some little benefit from this paper. For those who wish to keep their breeding efforts at a simple level just learn the art of crossing two lilies, as I have described, then go ahead and enjoy yourselves. Lily breeding is a very pleasurable hobby and can be so rewarding in many, many ways.

Charles Robinson
R. R. No. 1
Erin, Ontario

Editor's Note: This is the second part of "Further Observations of a Lily Breeder" and concludes Mr. Robinson's article which first appeared in Volume 29, Jan. 1974 Newsletter. Members are invited to contribute their experiences and observations on the subject of lily breeding in future Newsletters.

SHOPPERS' CORNER

A new supply of Let's Grow Lilies" has been purchased by the Society. This new printing is priced at $2.00 per copy, and makes an ideal gift for a gardening friend. The supply is limited. The quality of the booklet speaks for itself! Write the Treasurer.

Another supply of used iron 3 ft. stakes has been purchased by the Society. These are reasonably priced at approximately 50 stakes for $1.00 but cannot be mailed because of the weight. Fred Hayes will take orders while supply lasts. Fred also has a few packets of Benlate still available for members.

AMERICA'S WEST COAST HYBRIDS

* T. Ross Martin

The rather limited popularity of the American Hybrids can quite possibly be attributed to the heavily spotted, sweeping reflexed, pendant flowers of the group. Certainly, recent hybrid vigor has made this group more dependable garden subjects.

Early breeding carried on by Dr. David Griffith of the plant station at Bellingham Washington in the mid 1920's, using L. humboldtii, L. pardalinum and L. parryi, resulted in eleven named clones being introduced. While those hybrids with L. parryi did produce yellow forms, they were more difficult to grow, and with the exception of one variety, probably have disappeared. It was the orange-yellow or orange shades of Shuksan and Cyrus Gates that provided the hybrid vigor that persisted. These hybrids came from L. humboldtii x pardalinum crosses, and displayed the heavy spotting of the parent species. Peter Puget, reported to contain L. parryi and L. pardalinum has also survived and I recently saw this variety growing in the garden of Mrs. S. D. Holmes, Orono, Ontario. Mrs. Holmes' success with the species L. parryi may well account for the fact that its child has done so well with her.

The vigor of many of the early Griffith hybrids, led others to pursue using the west coast species liliums in their breeding programmes. While many articles can be found relating to this subject, both in N. A. L. S. yearbooks and Royal Horticultural Society journals, it might be worthwhile to highlight some of the achievements which have contributed to some of the varieties now available. One such strain, the Bellingham Hybrids from the Oregon Bulb Farms is derived from the Griffith hybrids as well as the species which originally created the first group of clones. The colours in this strain are predominantly orange-yellow or orange, showing the heavy spotting typical in the parents. One named clone, Afterglow, has more crimson than found in the strain, and grows to seven feet in a peat and light loam location in our garden.

L. parryi with its lovely clear yellow flowers was a logical choice to use as a parent in attempts to produce better yellow lilies in the group. It is a rather difficult lily to grow in the eastern parts of North America, and while hybrids derived from it do show better garden qualities, even they do not persist for any length of time. A number of lily enthusiasts have developed hybrids with L. parryi parentage, but none have received wide distribution. In England, as on the west coast, lily breeders are making use of L. parryi to develop better yellow clones in the division. Whether their adaption to eastern North American conditions might be more successful, I do not know.

Two other west coast species, however, have also played a significant role to make this division more appealing. L. kelloggii, with its lovely ivory white and pale pink flowers, and L. bolanderi with brick to wine red exterior, and scarlet interior, have opened an entirely new world of colour possibilities. One might compare this development to that which took place when Dr. C. F. Patterson of the University of Saskatchewan began using the pollen of L. cernuum in his search for pink asiatics. These two species, and perhaps to a degree a third, L. pitkenense, can be given the credit for doing the same in the American Hybrids.

Some of the spade work in developing new colour breaks in the Americans can be attributed to the late Eric Mayell, who by using L. bolanderi, created the Monteray Hybrids. Bulbs of these, and others, found their way to England

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where Oliver Wyatt, too, was attempting to develop American hybrids. Using L. kelloggii, L. bolanderi, L. parryi, and the dependable L. pardalinum giganteum a group of hybrids which he named "Bullwood Hybrids" became familiar cntries in English shows. Various named varieties were introduced, but none made their way to Canada, as far as I am aware. Other growers became interested in this group and many recent clones have appeared in England. At this point it might be of interest to mention that Mr. Wyatt developed the lovely Kelmarsh, a clone originating from L. martagon album x L. kelloggii with martagon shaped flowers of whitish mauve suffused maroon. This cross indicated possibilities of crossing Martagon lilies with the American species which I am afraid has not met with much success else not publicized.

Here in North America, the commercial development remained rather bleak. Hybridizers were at work, but their work was not well distributed. Amateurs were slow to get involved because of the length of time it took to germinate the seed and get flowering size plants. That, together, with the delicate requirements of some of the species, left the work to be done by growers who could best equate their growing requirements. But in 1968 Jan De Graaff brought a display of west coast hybrids to the Philadelphia North American Lily Society Show that changed the whole concept of the rather uninteresting varieties then found in the Division IV group. It captured the imagination of gardeners who had relegated the Americans to merely a group of heavily spotted orange lilies. DeGraaff had named these new lilies, in new shades of cream, pink, old rose, blends with orange and yellow, after birds. The series contained such varieties as Magpie, Hummingbird, Bunting, Skylark, Robin, Nightingale, Grouse, Bullfinch, Falcon, and Bluebird. Indeed, they were lovely - but could they be grown by the average gardener? Their beauty made me resolve to give them a try. Nightingale was the first clone made available for distribution. Its rose flowers with whitish centres, with medium to heavy spotting proved to be a garden highlight. Together with the Oregon Bulb Farm strain, Del Norte, (L. kelloggii x L. pardalinum) in shades of pink, old rose, ruby, burgundy, and blends with orange, the American Hybrids became an important segment in the garden at Binbrook. Another strain, using L. parryi in the parentage, San Gabriel Strain, while flowering for me, did not do nearly as well as Del Norte. The yellow parryi had again shown its inability to adapt to conditions for me. Miranda, a yellow clone from the strain, did some better but as yet can not be considered a complete success.

Most of these new American hybrids bloom in late June to early July. Robin and Bunting have been more recent acquisitions and have done as well as the first purchases. Del Norte and Nightingale grow four to five feet and increase quite rapidly. Robin with vermilion and orange flowers, and Bunting, a soft creamy orange and white blend, appear to be adapting as well. New varieties recently obtained include Bluebird, Hummingbird, Bullfinch and Skylark.

While the value of the American Hybrids appears to be more aimed at garden use, there should be possibilities for their use in naturalized settings. Full sun, a moist but not wet soil, appears to be their requirement. A summer mulch should prove beneficial to protect the bulbs from our hot summer suns. While the flowers cannot compare with the exotic beauty of the orientals, the flashy and bold bloom of the asiatics, or the majestic trumpets, the classic beauty of the American hybrids should not be overlooked.

T. Ross Martin
Binbrook, Ontario