

Reticulata Irises – Something Magical

By Alan McMurtrie¹

Reticulata Iris are changing in ways you would never have imagined possible.

Traditionally they are blues and purples, along with the lemon yellow *Iris danfordiae*. In the 1970's William van Eeden was able to produce the near-white Natascha. It's now being superseded by the beautiful White Caucasus. We also have E.B. Anderson's Katharine Hodgkin, which is a lovely sterile hybrid between Irises *histrioides* and *winogradowii*. Sheila Ann Germany and Frank Elder are "copy cat" crosses.

Coming along in the trade are a number of sports from Katharine Hodgkin et. al., a few more sports from Harmony, along with one or two interesting bicolour collected Retics, and a couple of sterile 'Cantab' x *winogradowii* hybrids.

The real wind of change however is coming from *Iris danfordiae* of all places. This is an Iris people have a love-hate relationship with. It's a lovely lemon yellow, with nice scent, but it disappears in the garden. Dig it up and all you tend to find is numerous bulblets. People speak of the original bulbs as having "shattered" – they planted nice large bulbs, and all they find in their place is lots of rice-grain size bulbs². Typically you get two years of bloom and that's it. The purchased bulbs from Holland were a nice size and gave good bloom³. They were large enough, and had sufficient energy, to regenerate two bloom-size bulbs for the following year; then typically nothing, or very little, after that. Essentially our growing conditions are not good enough to produce further bloom-size bulbs.

Note: it's the fertile diploid form of *Iris danfordiae* that's the agent of change, not the commercial triploid form from Holland, which is sterile.

Observation: a better, more robust yellow is needed (yes, there are some coming).

Numerous small bulblets are a characteristic of *Iris danfordiae*. These shouldn't be looked upon in a negative light. This is Mother Nature's way of trying to ensure *Iris danfordiae*'s survival in the wild, and allow it to keep coming back. Though that doesn't quite happen with the triploid form in our gardens.

Diploid *danfordiae* and its hybrids tend to bloom in the first half to two-thirds of the bloom season. Partly as a result of this, the flowers are typically up well before the leaves. That means you get to enjoy the flowers in all their glory. *Iris reticulata* hybrids bloom in the last two-thirds of the season and their leaves tend to be at the same level as the flowers during bloom; sometimes higher.

As you might guess, there are also a couple of other players involved in this story: the blue *Iris sopenensis* (formally *Iris histrioides* var. *sopenensis*) and an unnamed purple species from near Çat, Turkey. These also produce a lot of bulblets, and hence are a clue to them being genetically compatible (i.e. to also being $2n=18$).

The good news is many hybrids from *danfordiae* can be vigorous enough to rebloom every year. I have problems with growing bulbs intensely in the same garden beds year after year. Occasionally I clear out an area and replant it with seed. Invariably a few bulblets get left behind. After a couple of years they have become large enough to start to bloom. Since they are in with seedlings I leave them alone. They end up forming clumps exactly like we want them to. One year I had a clump of Down To Earth that had

¹ Alan was awarded the British Iris Society's Foster Memorial Plaque (2010) for his work with Reticulata Iris.

² *Histrioides*, and to a degree, it's hybrids, also produce bulblets, but they are less numerous, and tend to be slightly larger in size.

³ Generally size "5-6" bulbs will give 1 flower. Size "6 op" will usually give 2 flowers per bulb the first year. A few varieties may have smaller bulbs, while others such as Rhapsody will have one size larger.

increased to 9 flowers. I thought I'd better dig it up and replant it. Wouldn't you know it, some sort of "disease" had gotten in, and there was nothing left. Not even one bulblet!

No real problem, I had bulbs of it in other spots. But, this is why I recommend moving about ½ of your stock to another spot in the garden, and for varieties you consider particularly special, even moving some to a third spot. I recommend initially giving the bulbs a bit of space. For long term plantings, resist the urge to initially plant large bulbs close together to get an instant clumping effect.

At the moment I have a number of F1 clumps. One had 14 flowers this year. Another had a total of 17 flowers in two close clumps. This is exactly what we like to see.

[picture: clump of 14 flowers / clump of 92-sxd in bed 2]

I do have a couple of smaller F2/F3 clumps in recent seedling beds. The reason I don't have more clumps, is space is at a premium. It's always a challenge to figure out where I'm going to plant this year's seed. Plus, I've got an ever-increasing number of hybrids to look after, both for use in hybridizing, and for propagating material to send to Holland. Meaning, I tend to replant all of the areas with *Reticulatas*.

We gardeners can actually benefit from all of the bulblets. You can multiply a variety faster than it would otherwise. Simply replant them closer to the soil surface, like first year bulbs from seed (1 to 1½ cm deep). If they are left at the base of the bulb, as they would be when in a clump, not all of them will have sufficient energy to get a leaf up (in my soil mature bulbs are typically 7cm deep).

White from Yellow and Blue?

When you cross two pure species it's understandable that the first generation hybrids (F1) are all fairly uniform. It's in the second generation (F2) onwards that recessive characteristics can express themselves.

With *Iris danfordiae* and *sophenensis* the F1 hybrids are all "just blues"; a reference in part to the fact there are already a lot of blues in the market. Clearly *sophenensis'* blue is dominant to *danfordiae's* yellow. It's in the second generation that whites with blue accents are possible. This is the result of blue being turned off (two dominant genes), and yellow being turned off (a recessive gene), yielding white and revealing an underlying pattern that I refer to as "blue accents": blue ribbing on the style arms and blue markings (dotting and/or veining) on the fall blade, sometimes with yellow infusing around the fall ridge.

[picture: Starlight (94-HW-1) / 03-FO-2 / Eye Catcher (98-NP-4) / 00-KV-2 / 10-CK-3]

Occasionally the accents are green, which of course is a combination of blue anthocyanins, and yellow carotenes. Jumping ahead for a moment, you can get hybrids like 03-FQ-1, when the Çat parent is involved.

[picture: 00-FP-1 / 00-BC-1 / 03-FQ-1 / 01-BE-4]

Note: a prominent characteristic of *danfordiae* parentage is hair-like standards. *Iris danfordiae* has a short bristle as a standard. In F1 hybrids this combines with *sophenensis'* normal standards to produce standards that are 1mm or less in width (occasionally 3mm), but of normal length. A "normal" standard is 7 to 10mm in width (rarely 15mm).

As you might expect, in higher generations standards can range from being essentially nonexistent like *danfordiae*, to being indistinguishable from a normal standard. Typically of course, they are somewhere in between, in both width and length.

Let's take ourselves back for a moment to when all of this work was being done. First let's think about the timing. It takes 5 years to go from a seed to a flowering bulb. This means it took 10 years to see that first F2 white: Starlight (94-HW-1). And of course it took several more years to see additional F2 hybrids and be able to figure out what was going on. I have Frank Kalich to thank for providing me with *Iris sopenensis* in 1987. Without it, I wouldn't be where I am today. Initially I didn't know *Iris sopenensis* was $2n=18$. Originally it was thought to be $2n=16$ (re: it being classified as a variety of *Iris histrioides*), although physically it's flowers looked to be $2n=20$.

When the F1s first bloomed, the key question was what to cross them with? The pollen looked good under a microscope. If anything was going to work, the most likely was to intercross them. Which is exactly what I did. Out of the 16 F1 blooms from three crosses that first year I did also try crossing two with the Armenian Caucasus collected Retic, but I can now say, "well of course those crosses didn't work."

Remember also, that it was very uncertain what the hybrid flowers would be like. At the time three of the F1 flowers also showed a bit of yellow influence, which made their blue colouring look a touch dark. I thought perhaps the F2s might be muddy messes, and that it would take a number of generations to clean up the flower colours to something nice. You can imagine my absolute amazement, and shear joy, when the first F2 bloomed and turned out to be a lovely white (to be precise, a creamy white, which is why I chose the name Starlight).

When the F1 "just blues" first bloomed I thought something important was happening. I specifically started tracking those crosses and keeping statistics about them. The benefit of actively doing so meant I then continued to have interesting things coming along in the years following the first F2 bloom. I didn't simply wait 5 years to see the results before deciding what to do next.

As well as **blues** (light blue to dark blue, plus violet), **yellows** (*danfordiae*-like) and **whites** (typically with blue or green accents), second generation hybrids were **yellow-blues** (which includes yellow with blue spots, yellow with blue veins, as well as colours ranging from greens through browns). Backcrosses to *danfordiae* occasionally gave what I termed "**spotted light blue-green**" hybrids.

[picture: Sea Green (perhaps from RHS show) / Down To Earth / 97-AG-1 / 97-AG-6]

[picture: 96-BN-1 / 95-unknown-1 / 97-DZ-3 / 00-JB-1]

The problem with some of these hybrids from a large-scale commercial point-of-view is they are a bit on the small side due to diploid *danfordiae* being small. At least one Dutch bulb grower didn't like the fact they don't have "normal" standards. He suggested people wouldn't accept them as Reticulata Iris; ...that they needed to have proper standards. Although *danfordiae* doesn't have standards, its falls are held more upright and it has wide fall blades and style lobes, so the flowers look quite full; which means you don't notice the standards are missing.

Personally I quite like some of the dainty wispy standards.

[picture: 06-EJ-2]

Working with *Iris danfordiae* and *sopenensis* gave, in a sense, one-dimensional hybrids – hybrids with what appeared to be a certain limited range of expression (i.e. the 5 colour categories mentioned above). It was when the Çat species was added that things started to open up, and it became apparent that orange was possible! Interestingly prior to my success with *danfordiae* and *sopenensis* (sxd) I had

made a cross between the Çat species and *danfordiae* (çxd). I just didn't fully realize the significance of the Çat species and the hybrids from that one cross until a few years later. The year the F1 sxd hybrids bloomed I had 8 sxd crosses at various stages of development and only one çxd cross.

It didn't make sense to repeat the Çat x *danfordiae* cross. It seemed smarter to move forward and use all of the pollen and pod parents in F3 crosses.



Hybridizing potential of two species vs. three distinctly different species

[picture: Orange Glow (98-00-1) / 03-HW-1 / 05-GT-1 / 98-00-4]

In a sense, working with Retics is a very slow process. As mentioned, it takes 5 years to go from a seed to a flowering bulb; sometimes longer (i.e. delayed germination). Thus, each generation is 5 years. The first step of course is creating the seeds in the first place. Hybridizing rates vary from year-to-year: from 25 to 65% (this is for crosses that work⁴). Germination rates can be a net of 25% or less. Years ago when I had more time, over the course of a number of years I overall got 30 to 33% germination, with 5 to 8% losses during that period, for a net ~25% each year. These days I would say it's less. I'm trying to apply a couple of techniques to improve this, but so far haven't seen any appreciable results. This year I've used Gibberellic acid right when the seeds ripen in hopes that at that point, the seed coat is more susceptible to the benefits of Gibberellic acid. Keep in mind that I'm planting thousands of seeds from hundreds of crosses each year, so that affects what techniques I can use. It would be nice to have an infinite amount of time. However, a priority is replanting the small new stocks, so bulbs of the most interesting can be sent to Holland for trial as soon as possible [Smile: things don't magically just happen. There are a lot of details involved. One of those is the strategy of sending bulbs to Holland, while at the same time still having bloom-size bulbs in Canada for use in hybridizing].

Other things to realize are: some resulting hybrids only bloom once, then are gone! No matter how beautiful the flower was, the plant was clearly not hardy enough (where "hardy" includes numerous factors). Some of the hybrids will turn out to be poor growers, and some will be poor bloomers. It helps to keep records when you replant. Then you can look back over several years and get a clear idea of rate-of-increase, issues around production of bloom-size bulbs, etc.

The only way that working with Retics isn't slow is, assuming you've been hybridizing regularly, plus been proactive with your crosses, interesting new things will be blooming every year. However, like a captain steering a ship, if you make a course correction, it takes time for it to come into effect: in this case 5 years.

⁴ For example, crossing with $2n=20$ x $2n=16$ hybrids such as Harmony is a waste of time. They are mules. To the naked eye it seems like they produce good fluffy pollen, but if you look at it under a microscope you will clearly see the pollen grains are misshapen.

What is slow, painfully slow, is building up stock to the point where sales can begin: 12+ years. We're talking about going from one flower to tens of thousands, and after that continuing to building to hundreds of thousands as, hopefully, demand picks up. Ideally, for hybrids with *danfordiae* parentage, it could be faster if the bulblets are used effectively. The Catch-22 is, 1) not getting good information from the growers, and 2) having them willing to put the effort in. Jan Ligthart has been doing a good job.

For this to work optimally, it does require having good bulblet production in the early years. If there are only a few the first year or two, then there's a delayed start. After just a couple of years it doesn't matter if some of the bulbs only produce a few bulblets since there are so many bulbs, the average will be quite high.

I suspect the overall increase may be a bit cyclic. In Holland, the previous year's bulblets will become size 5 bulbs, with a modest number of bulblets. The following year those size 5 bulbs will become large bulbs with lots of bulblets. So one year modest, then lots the next; modest then lots, and so on.

The reason I mention this is because with with $2n=20$ hybrids you might expect a 2.1 to perhaps 2.4 times increase, but it should be fairly constant. There may be a few varieties increasing a little slower, or some a little faster, but more or less it will be consistent.

In the case of $2n=18$ hybrids, the overall increase if the bulblets are managed properly is over 3 times. Exactly what it is I'm not sure because I'm not in Holland to do an actual count. But you can clearly see this is the case in Jan Ligthart's photos.

[picture: 3 years of 05-EP-2 bulb increase

This higher rate of increase should mean less growing space is required to produce a given number of marketable bulbs, and hence yield more profit per area of land (i.e. lower growing cost per bulb). From a grower and hybridizer perspective, we want this to translate into more profit – not into lower selling prices. The amount a bulb grower gets is already quite low. Selling for less won't appreciably lower the packet cost. More likely than not, middlemen will simply pocket any savings, saying they are the ones taking the risks regarding currency fluctuations, etc. For common varieties (read large quantities), growers get 3 to 4 Euro cents per bulb and their costs are perhaps 2.5 cents, but they also face a significant risk if a portion of the bulbs goes unsold. They have already spent money to plant the bulbs prior to orders coming in. These days wholesalers and exporters are waiting as long as possible before placing orders, so they aren't the ones stuck with unsold bulbs.

For 200,000 bulbs a grower's costs are over €3,000, so he needs to sell 100,000 bulbs just to break even.

Note: the Çat species also has small flowers, contributing further to the tendency to produce hybrids smaller than commercially desirable. Fortunately *sophenensis* flowers are a nice size, so hybrids have the possibility of being a reasonable size.

	<u>Tip-to-tip (mm)</u>
Çat ANMc2175	38
<i>danfordiae</i> ANMc2325	33
<i>danfordiae</i> hort.	45
<i>sophenensis</i>	70
"Small"	40
"Good Size"	50-60
"Large"	70+

Flower Size – Measured Between Fall Tips

For alpine gardeners small isn't an issue. "Small" is relative. If anything, small flowers are cute. Yes, large flowers are more showy, but three small flowers in a clump can look just as showy as one large flower; perhaps even more so.

If you keep being told by bulb growers that their customers (exporters and wholesalers) want larger flowers, then you need to do what you can to "make it so." I may be happy with my hybrids, but one primary goal is to have other people grow and enjoy them too. If exporters and wholesalers won't sell them, then I won't achieve my goal.

Fortunately Eye Catcher for example, is a nice size, with nearly "normal" standards. It should do well commercially. Orange Glow is a lovely hybrid (in my opinion), but at 40mm tip-to-tip it's a bit small. A tetraploid version, which bloomed for the first time in 2015, is 50mm tip-to-tip. If what growers are saying is true, the tetraploid version will sell better. The Catch-22 is we won't know that for at least 10 years -- the amount of time it will take to build up stock to the point where sales can begin. Then a couple of more years will be needed to gauge public reaction – to see whether the larger flowers sell better. Of course one does need to make sure they understand all of the cause and effects to ensure the correct conclusions are being reached.

With all of the long timelines, you can't just wait for the results. You need multiple strategies, and see where they take you. I do intend to introduce the original diploid Orange Glow. Unfortunately because of problems with the original Dutch bulb grower, I'm behind where I could have been, but things are now back on track.

Tissue culturing tetraploid material can speed this up slightly, but overall it's not economic (unless you knew for certain the variety would be a big seller). And there are currently technical issues with getting the material out of the lab that need to be worked out.

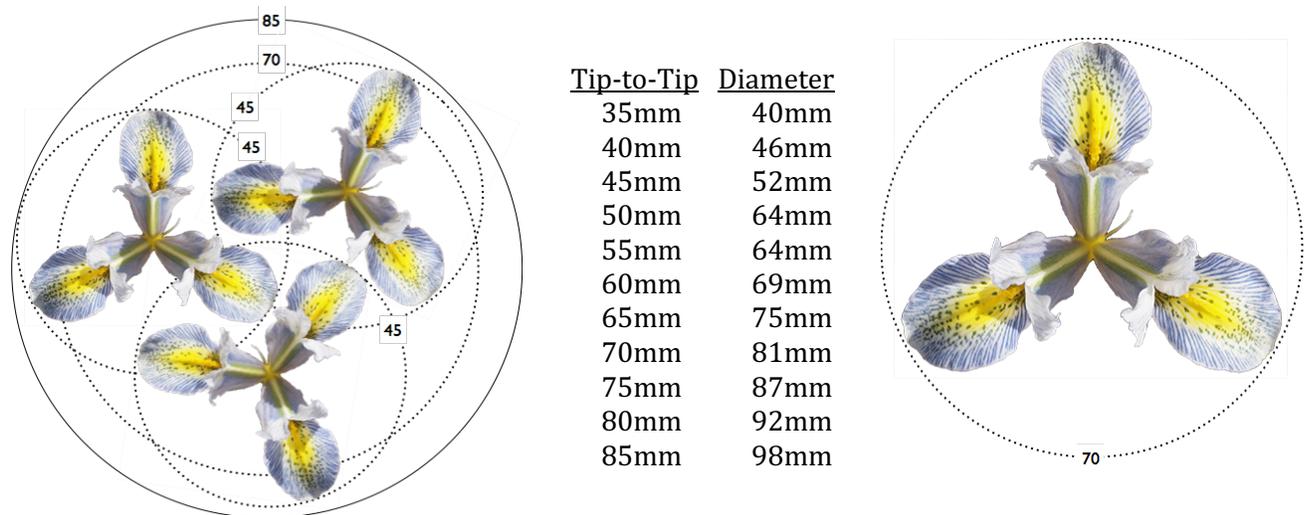


Figure x Flower-size Perspective
Three 40mm Tip-To-Tip vs One 60mm

***Iris danfordiae's* Children**

Picture for a moment a seedling patch with buds coming up; ready to bloom for the very first time. To paraphrase Dave Bowman from the movie 2010: The Year We Make Contact, "Something wonderful is going to happen." Indeed, several times each bloom season when a special hybrid opens for the first

time, it brings a very big smile to my face and I mentally utter the words "Yes!" This is what makes all of the effort worthwhile.

Let's take a look at some of Iris *danfordiae*'s current children and their colour range – **something magical has happened; a door to a whole new world has opened!**

Additional Whites

[picture 07-BQ-2 / 07-V-4 / 03-EU-1 / 00-IU-1 / ~~01-BE-4~~]

White & Blue

[picture: 05-BL-4 / 05-GS-2 / 05-FG-2 / 05-EN-1 / 01-JR-1]

Yellow

Some yellows, including a few "with proper" standards. As nice as Iris *danfordiae* is, because of problems both for consumers and bulb growers, one of these could easily replace the commercial triploid Iris *danfordiae*. The only question is, do you want a direct replacement – something that looks the same – or are you happy with it being primarily yellow.

[picture: 00-HW-1 / 97-BG-2] without "normal" standards

[picture: 07-CU-3 / 07-AG-3] with "normal" standards

[picture: 03-JE-1]

Yellow with green

[picture: 09-CW-1 / 05-EJ-1 / 05-ET-1 / 02-GH-1 / **00-KN-1**]

Yellow and black / brown

[picture: 05-GQ-4 / 09-CZ-1 / 08-EJ-1]

Yellow & Wine Red

This pattern showed up in two 2005 crosses.

[picture: 05-GQ-3, 05-EP-2, 05-EP-3]

Pale Yellow

[picture: 03-CC-3 / 08-BG-1 / 01-FS-2 / 03-DX-2]

"Orange"

[picture: 98-OO-1 / 05-HW-1 / 05-FD-1]

08-FW-2 may be purple, but its ground is orange, and it's the orangiest orange to-date. It doesn't fade in half a day; it seems to last at least 2 days. So-to-speak all we need to do now is turn off the purple.

[picture: 08-FW-2 / **08-FW-2 with colour chart**]

Blue

And yes, even some lovely blues that are worthy of note. 06-CC-1 for example is a lovely pale blue with excellent form, but it's just another blue in a sea of blues. This isn't me being negative, it's what people in the trade are saying is a reality – in part they're cautioning me not to get my hopes up too high. We could have an interesting discussion around this topic, ...but space is limited.

[picture: 11-FA-1 / 07-P-1 / 06-CC-3 / 03-CV-7 / 08-BN-1 / 98-NP-9]

00-KN-5 is a lovely blue with white style lobes and a large white patch infused with a light amount of yellow. From a distance clumps seem white

[picture: 00-KN-5 / 00-KN-5 in the field]

Purple

Unlike blues, there actually aren't many (yet). Purples tend to mixed with blue.

[picture: 03-FP-4]

Blue and Purple Mixed

[picture: 03-CV-4 / 03-AJ-2 / 06-BI-1 / 09-OT-2 / 03-sxd by path]

Plum

[picture: 03-CU-2 / Plum Cuddles (98-NP-6) / 97-BG-1]

Brown

[picture: 00-KV-3 / 05-CK-1 / 04- (like 98-PR-2) / 05-GV-1]

Green

[picture: Sea Green (97-CQ-1) / 01-JR-2 / 97-CC-2]

Black

These can be “red-black”, or “blue-black”; meaning very dark “red” (actually very dark purple, since Iris don’t have red anthocyanins as in Geraniums), and very dark blue.

[picture: 03-EK-1 / 08-BH-1 / 06-red black]

[picture: 05-HN-1]

A couple of “good doers”

I’m not sure how well these would do commercially, but in terms of producing quality good bloom-size bulbs they are excellent

[picture: 05-CP-1 / 05-BD-1]

Unusual

To me 05-HW-1 is Magical, and I was blown away when I first saw 10-BL-1

[picture: 05-HW-1 / 10-BL-1

[picture: 05-GT-1 Amazing edge pattern

[picture: 06-CT-2 / 05-EV-2

[picture: 03-AQ-1 (Orange fades)]

[picture: 03-HW-1

[picture: 02-CA-1

[picture: 07-BO-1

[picture: 06-AK-2

[picture: 05-EZ-1 (Pastel)

[picture: 10-DA-1

[picture: 03-JE-2

[picture: 03-JM-2

[picture: 03-GR-1

Other *danfordiae* Children

I have had a few successful outcrosses that yielded some interesting hybrids, but they were of course sterile and weren’t striking enough, or large enough in size, to consider introducing.

[picture: 89-A-2 / 89-A-3 / 95-D-1]

2n=20 Hybrids

Hybridizing existing varieties essentially gives more of the same. In order to break out of that mould, you need to introduce some genetic diversity – some material collected from the wild. Preferably plants showing significantly different characteristics. The Catch-22 is any hybrids you create are going to be difficult to market; especially if you are not a Dutch bulb grower. You’ll be told it’s just another blue, or

just another purple. Exporters and wholesalers only want the cheapest blue, and cheapest purple they can buy. Customers don't care how much time and effort you put into creating your prize hybrid. The markings on your hybrid may be different from all of the others, but if the overall colour is purple, then to customers it just a purple. Customers aren't going to care that it's slightly different. It needs to stand out in a major way.

[picture: Spot On (87-DQ-1) / Scent•sational (87-BB-1) / 97-EQ-2]

Something interesting has shown up with 03-AN-3. It's giving multiple flowers per bulb. In Holland the largest bulbs typically give 2 or 3 flowers per bulb. We don't often see this because we are not always being sold "top size" bulbs. What's offered to commerce are fixed-size bulbs, typically "5-6" or "6 op." "5-6" give 1 flower, while "6 op" give 2. The largest bulbs, which can be size 9, are replanted along with under-sized bulbs.

Studying photos of 03-AN-3, it appears have as many as 5 full size flowers per bulb! I wish I could see this in person, and be able to correlate bulb size to number of flowers. In one case there seemed to be more flowers, but I'm guessing there were two flower clusters in close proximity. Bulbs one size down from the largest, seemed to be giving 3 flowers per bulb. I never saw this in my garden. I only ever got 1 per bulb. Which is to say conditions in my garden are not as good as those in Holland. For example, the growing season is a lot shorter. And I don't have the luxury of doing crop rotation like the Dutch. Space is at a premium. The only time an area gets a rest is when it's been replanted with seed; typically germination is after the second Winter. On a positive note, tougher conditions should make my garden better for selecting the best hybrids.

Potentially this could be very important for pot culture.

Is it a mutation? At the time I put 03-AN-3 into the lab for conversion to polyploidy I used one of my own bulbs. I'm now wondering if I should put one of the bulbs from Holland in...

When I first started hybridizing I did get two flowers per bulb with some of my hybrids, but that was many years ago.

[picture: 03-AN-3 in Holland (initial & 7 days later)]

Occasionally Scent•sational will give 3 flowers per bulb

[picture: 87-BB-1 at 2011 Lentetuin]

White Caucasus plus some hybrids from it.

Notice Holland Glory is an amoena: white standards and styles, with a coloured fall. I haven't pursued this pattern further, but it would be worth doing so in future. At the time that it appeared, I was making more significant advancements with my $2n=18$ breeding. Now there are some other clones available that might be interesting to use with it.

[picture: White Caucasus / 99-Pale Blue / Holland Glory (98-YS-1)]

Mixed Blues and Purples

I have come up with some interesting blue and purple combinations in the same flower.

[picture: 03-CT-1 / 01-Fluorescent / 94 in 2007 / 07-AU-1 / 06-BK-1]

Turkish patterns

One of the reasons for going plant collecting in Turkey 30 years ago, beside looking for diploid *danfordiae*, was to find some new genetic material for use in $2n=20$ hybridizing. Some of the plants I found had bicolour falls

[picture: 93-BY-7 / 97-DG-4 / 03-HL-1 / 03-MW-1]

Bicolours

[picture: 00-LZ-1 / 06-IV-1]

Tricolours

In the early days, before digital photography I was getting some tricolours: standards, style arms, and fall blades all with distinctly different shadings from one and another. But they were in the realm of blues and purples. For the moment I've nicknamed 02-CA-1 Eye of the Storm, since it came from Storm and has the colouring of a violent storm

[picture: 02-CA-1 / 00-KV-7]

Winogradowii Hybrids

E.B. Anderson discovered around 1955 that *Iris winogradowii* pollen worked on *histrioides* (Katharine Hodgkin would have first bloomed about 1960). *Iris histrioides* and *winogradowii* have the same chromosome counts ($2n=16$), but they are genetically different. Hence their progeny are sterile. Both parents have large flower parts, which is good commercially. A problem is the progeny have cultivation issues in Holland (in short – they are more susceptible to disease). Unfortunately in the trade you often find virused bulbs being sold. This shows up as blue streaks on the flowers. The blue can be very bright, and if there is a lot of it, can be quite pretty. However the bulb is diseased, and weakened. It should be destroyed. If you insist on keeping it, it would be wise to quarantine it to a part of the garden well away from any other *Reticulatas*. And don't be surprised if it eventually dies out.

Note: *winogradowii* is from alpine meadows and likes a bit moisture during the Summer, otherwise it dies out.

[picture: 92-BB-1 / 92-DU-2 / 92-DU-3]

Cantab x *Iris winogradowii* works

[picture: 92-FB-1]

Colour-Fading

Normally colour-fading is not a good thing. We want colours to be nice and bright, plus sunfast. In some small number of cases having colours change can be nice. It adds a bit of variety. It all depends on how the flowers look throughout. Sea Green holds its green colour until close to the flower's finishing, then changes to a nice light blue. 05-HW-1 is quite unique, so having its colour change slightly is okay. I do quite like 98-00-1, but at this point we're looking for a good orange, so it would have been nicer if it held its initial colour; or at least held it until close to the flowers finishing. It's of course the yellow (carotene) that fades out. I wonder if at some point there will be several carotenes making up the colour we see, and only one of them will fade out (i.e. more complex fading).

It's quite amazing to see the amount of colour change in 03-AQ-1

[picture: Sea Green (97-CQ-1) initially / faded]
 [picture: 03-AQ-1 fading sequence]
 [picture: 03-HW-1 initially / faded]
 [picture: 10-EH-1 initially / faded]
 [picture: 98-OO-1 initially / faded]
 [picture: 05-HW-1 initially / faded]

Expression Variance

Interestingly a hybrid's expression can occasionally vary. I'm not sure how wide spread this is, or quite why it occurs. It's not typical. Of course fertilizers and minerals/mineral supplements can change an expression temporarily.

[picture: 03-FQ-1 in my garden vs Holland]
 title: Would You Recognize These As Being The Same?

03-FQ-1 consistently looks like this in Holland. What a difference from the original. I wouldn't blame you for thinking they were siblings. Do I mind? Of course not. I like both expressions. The only actual issue is being able to identify it. Initially that won't be an issue because it's a unique variety.

It will be interesting to see what it's like when a few bulbs are brought back to my garden.

[picture: Down To Earth (94-AT-2) original / back from Holland / 1 year later]

[picture: some F1 hybrids returned by Wim]

Mutations

i) Extra flower parts

From time to time we see flowers with an extra part, such as a style arm, or a fall in place of a standard. This tends to be a very rare occurrence.

In Eye Catcher it's quite common. This wasn't originally the case. Something happened in Holland. These mutations are not stable. They vary from year to year. A couple of years ago I marked one with a properly formed flower, to be sent to a lab for conversion to polyploidy. The handful of tetraploid blooms in 2015 were all normal. It will be interesting to see whether the tetraploid population stays that way or not.

Is this a selling feature? I wouldn't say so. Fortunately it doesn't seem to detract from the flowers.

[picture: 98-NP-4 with extra parts; 98-NP-4 multipetal]

ii) Colours

From time to time large-scale bulb growers find sports in their fields. Alida (light blue) and Pixie (violet) are sports of Harmony (blue), and there are other Harmony sports coming including a purple and a near white. Harmony has proven itself perfect for forcing, so understandably forcers like others in its extended family.

The lovely large purple George is well known for sporting blue. Years ago William van Eeden, the hybridizer, gave me some bulbs of what he called Blue George. He never registered it, but someone eventually did, so now it's known as Palm Springs. At one time there was a tremendous amount of

George being grown. Unfortunately I'm told it has a reasonable number of "blinds" – bloom-size bulbs that just produce leaves and no flowers. This "reasonable number" may in fact be only 2 or 3%, but for a bulb forcer that means a number of unsalable pots. Remember a pot has 6 or 7 bulbs in it. So statistically it could be that 10% of the pots have one bulb without flowers.

Occasionally colour streaks show up in flowers. 01-FS-2 has some yellow striations. 07-BH-1 was a nice pale yellow when it bloomed for the first time last year. This year's single flower seems to be mutating to white. Will 07-BH-1 end up as a population with some flowers being pale yellow, some white, and a percentage having streaks... time will tell.

[picture: 07-BH-1]

[picture: 07-BH-1 this year nearly white]

[picture: 01-FS-2 with yellow striations]

[picture: George mutating to "Blue George" (i.e. Palm Springs)]

What does the future hold?

The most exciting thing is polyploids: meaning tetraploids (4n), and possibly octaploids (8n). In theory flowers would be 20-30% larger, and have more substance. Meaning they should be better able to stand up to weather, and hence last longer.

Larger flower-size was why the commercial form of *Iris danfordiae* is triploid, rather than diploid. In a batch of various bulbs from the wild, the one that was selected as "superior" turned out to be triploid.

A more important benefit of polyploids is: intertype hybrids. In effect being able to cross $2n=20$ varieties with $2n=18$ hybrids and having the progeny remain fertile, and thus be able to go further. Thus $4n=40 \times 4n=36$ would give hybrids that are $4n= 9, 9, 10,10$. Since the chromosomes pair up, the plants should be fertile. As long as plants with the same genotype are intercrossed, the children will remain fertile.

What are the benefits? That's yet-to-be determined. ...part of the fun. ...an unknown mystery, with lots of potential. You could take one parent with very large flowers, another with significantly more flowers per bulb, and mix them in with a couple of parents that have interesting colours / patterns... Imagine the possibilities!

To develop a wider range of expressions (new colours and patterns), we need to work at pull out recessive characteristics. The Catch-22 is that this job becomes a lot harder with polyploids. Because I am starting my work with polyploids a lot later than I would have liked, I will continue to see interesting results from all the diploid seed I have in the ground, plus it will take a bit of time to get up-to-speed with polyploidy hybridizing. So the tendency will be to continue at the diploid level and have a lab convert the most interesting to polyploid (for breeding and/or commercial purposes). This is an expensive proposition, and I don't think there will be sufficient income to support it. I expect there will be some good things from polyploidy breeding, but overall there may be more advances due to momentum at the diploid level. Time will tell how interesting the intertype hybrids turn out to be.

	<u>Recessive Ratio</u>	<u>Percentage</u>
diploid (2n)	1 in 4	25%
tetraploid (4n)	1 in 16	6.25%
octaploid (8n)	1 in 64	1.56%

Diploid Orange Glow is 40mm tip-to-tip. The tetraploid version is 50mm.

[picture: Orange Glow (98-00-1) showing tetraploid v.s diploid]

Creating polyploids is expensive. I had hoped to be able to reinvest profits from my hybrids into polyploids, in order to “take my hybrids to the next level.” I had a lab start a bit of tissue culture work in 2002 and would have liked to have had them begin polyploidy work then. To-date I have not received any profits. Life is short. In 2011 I gave up waiting and had the lab start the polyploidy work. The first of these bloomed in Holland in 2015. There was a slight hiccup, but I’ll get some of the bulbs into Canada in 2016 and hopefully have hybrid tetraploid seed in 2017, which will potentially bloom in 2022. Assuming something worthwhile is produced it will take 10+ years to bulk up the bulbs to the point where initial sales can begin. Meaning some time after 2032. Then there will be a few more years to grow supply and build demand. Yikes!

At this point it will be a few more years before I have a number of $4n=36$ and $4n=40$ plants available to work with. That will push the timelines out even further. You might say, why not use tissue culture to make things happen faster. The simple answer is there’s no money available. Any money that’s made available needs to be put into creating the polyploids in the first place.

At the moment the lab is having significant problems getting material out of the lab and successfully growing in the field. Part of this may be due to the material being delivered too late, and thus being significantly out of sync from bulbs in the field.

One Step At A Time

Let’s take a step back for a moment, and look at the big picture:

- 1) Create something special
- 2) Build up the stock
- 3) Market it
- 4) Have people buy it

At the moment we’re at step 3. You, the readers, can’t buy these lovely hybrids if: a) you don’t know about them, and b) there’s either no, or limited, availability. The biggest hurdle is, how interested is the nursery trade in what I’ve created? Fortunately I don’t just have one hybrid available. I have several, with different price points (i.e. different quantities to sell). And, there are a number of very special ones coming. The slight catch is, what I have available first at low prices are some of my original hybrids, Spot On and Scent•sational, which are looked upon as simply purples.

70% of Reticulata sales are to the green market (to bulb forcers for pot sales), and 30% are for dry sales. Within dry sales, the market to enthusiasts is small (meaning customers looking for something different). The bigger dry market is very price sensitive. Wholesalers / exporters / retailers (such as nurseries and big bulk stores, including grocery chains), want cheap prices; otherwise they’re not going to carry them. What it comes down to is: “we want a blue, a purple, a white, a yellow, and maybe a violet – so 4 or 5 to cover the colour range.”

They’ve been selling the same purple year after year. I do understand that Pauline, Purple Gem, and J.S. Dijt are all the same shade, so yes, it comes down to pick one, any one will do. George has a different form, so it’s kind of nice to have too. If all someone wants is a blue, then any blue will do. It’s simply a case of, “we want the cheapest,” followed by, “everybody likes (insert variety here),” so let’s go with that. Retailers don’t seem to recognize that the majority of people who wanted “(insert variety here),” already have it. Customers want something different. Which takes us to the fact that the market is stagnant. There’s nothing new and exciting ...until now (cue the intro music to the movie 2001: A Space Odyssey).

At long last the excitement I’ve been feeling for the past decade, can now truly start to be shared with the rest of the world.

One way a retailer can reduce their costs is to sell size “5-6” bulbs which are about $\frac{3}{4}$ of the cost of “6 op” bulbs. These give 1 flower and two flowers per bulb respectively in the first bloom.

If I mention that we have a small quantity of bulbs available, you might think I'm talking about a hundred or two. Smile: small is 4,000 to 30,000, depending on whether you're talking about what one customer might buy of a variety, or what quantity you have available for sale.

There are issues around timing. Wholesalers need to know what you have for sale in advance of publishing their catalog. This means you need to let them know about $\frac{3}{4}$ of a year in advance of when the bulbs would be sold to the public, so they can decide which ones to offer to their customers.

The Dutch growers I'm working with are large-scale bulb growers. As such, they don't want to deal with small orders. There are middlemen who can do that. To a degree this makes sense because their focus is growing the bulbs, and they have millions of bulbs to distribute. One of the growers likes to ship in boxes of 3,000 bulbs.

As you might guess, pricing is set up to encourage large sales. Tier 1 is a price per thousand, for up to 4,000 bulbs of a variety. Tier 2 is half that, for up to 21,000. And Tier 3 is less than half that again, for over 21,000. Followed by an even lower Tier 4 price for bulb forcers, who can potentially take hundreds of thousands of bulbs.

Retailers need to buy through a wholesaler who has other customers that want the same thing. If the wholesaler has enough market power, he can buy at Tier 3 prices and pass them on to his customers, along with a markup for his services, which can include other things like packaging, looking after phytosanitary requirements, shipping, etc. It becomes a Catch-22 if a general nursery retailer wants just two thousand bulbs, and he's the only customer the wholesaler has wanting that variety. You end up hearing back, "sorry, too expensive."

This is where, if things aren't going the way you think they should be, it's a matter of "looking deep" to understand where the bottlenecks are. A fundamental issue can be getting decision makers at company to know the hybrids exist, and having them connect their wholesalers / exporters to the grower.

One issue that needs careful consideration is Plant Breeders Rights (PBR). They are expensive, over €2,000. They protect both the hybridizer and the grower from someone else simply buying up a large quantity of a variety then growing and selling it. PBR need to be applied for within 4 years of sales outside of Holland, and within 1 year of sales within Holland. PBR for Holland protect you for 30 years against someone growing the variety in Holland. If you get PBR for all of the EU, the protection is for only 25 years, but covers all EU countries.

Key is to keep tight control over supply in relation to demand, with an eye on price. Hmm, sounds like Economics 101

Hybridizing Goals

Simply stated: to continue creating new, unusual colours, and patterns. Ideally a variety should be robust, clump-forming and keep coming back year after year, while giving a modest number of blooms. Ideally we want the clump to reach an equilibrium so-to-speak; though if it did continue to expand that would be okay.

This is easier said than done, since we're only a couple of generations from the species level. In the wild you find more leaves than flowers

An original goal was to create a pale yellow. So-to-speak: to break the lemon-yellow mould of *Iris danfordiae*. I was able to do that a number of years ago, and in particular with the lovely 01-FS-2, and 03-CC-3.

In the back of my mind I was hoping that orange would be possible, and perhaps even a true pink, just like hybridizers of Tall Bearded Iris have been able to create. In 2003, when Orange Glow (98-00-1) and others from 1998 bloomed for the first time, it was clear that one day we will indeed have an orange Reticulata. At the moment the problem is two fold, we need a stronger, more intense orange, and it needs to be sunfast (i.e. not fade). This year's 08-FW-2 showed a big step in that direction. Now, it's a matter of getting that orange ground onto a large flower with nice form, and further improving the sun fastness.

Some things I'm aiming for are:

Orange – a bright, non-fading, orange.

White with dark cherry-red accents

An elusive goal is to create a pink – a true pink, just as we now have with Tall Bearded Iris

To be clear those are “nice to have;” something to strive for. To me, I'm meeting my goal if each year I get something special; something I never imagined possible.

Cultivation Recommendations

These hybrids have been raised under reasonably harsh conditions in Toronto, Canada so they are fairly robust (vs. being bred under ideal conditions in Holland). Keep in mind though that they are just a couple of generations from the wild where you find flowers sporadically amongst lots of leaves.

I highly recommend replanting your Reticulata Iris every two or three years if you have the bulbs planted close together. Ideally we want bulbs to form clumps, and bloom year after year. Give the bulbs a reasonable amount of space. It's actually a good idea to plant some in another part of the garden. That way if something happens to one patch, such as a critter digging it up, you'll always have the other(s). And if you plant some in a sunny location and some in a shady location, you can extend the growing season. It's also a good idea to plant some early varieties and some later ones.

If you happen to plant seeds, be sure to cover them each winter with a mulch of leaves, or better yet, straw (leaves have a tendency to blow off). This isn't to protect them from freezing. It's actually to protect against sudden cold snaps. If there's a warm spell for several days or a week, the seeds/seedlings might think it's time to start growing. Their cell sap starts to flow. If you then have a sudden deep cold snap, the cells don't have the same antifreeze capability. All that the leaves and straw do is act as a buffer to keep the soil surface frozen. Once the snow has melted you can remove most of the straw. Note: a light covering can help prevent the ground from drying as soon as might, thus allowing the bulbs to continue to grow a little longer, and get a little bigger than they otherwise would. This same thing applies to bulblets that you've replanted close to the soil surface. They are in effect acting like first year seedlings.

By the time Reticulata leaves die down in late June, they have grown to between 45 and 60 cm in length. Keep in mind that a bulb is forming at the base of each leaf. So if you damage the leaves, you are directly damaging next year's bloom.

If you are having problems, try digging the bulbs just as the leaves are dying down, and storing them over the Summer in mesh bags hanging in a cool dry location.

I have found for unknown reasons, if you dig bulbs at the end of Summer / early Fall and leave them unplanted for a couple of weeks, they can go soft. Yet bulbs dug in early Summer and properly dried are fine in storage. There's no problem if you dig the bulbs in the Fall and store them for a day or two, then plant them – just don't get involved in something else and leave them too long.

Why go Dutch?

They have the perfect growing conditions, plus an excellent distribution network.

At some point an original dream was to one day be able to go into a local garden centre and see my hybrids being sold. It's amazing to think this is getting very close to being a reality.

Back in 1997 a Dutch bulb grower and his wife stopped off in Toronto in early April, and got to see firsthand the Reticulata hybrids I had at that point in time (this was two years prior to the first F2 sxd blooming). They were on their way out west to look for Calochortus in the wild. Later that Summer we signed a Test Agreement and I sent him 2 bulbs each of 21 hybrids. Three of those original varieties are now being sold commercially: White Caucasus, Spot On, and Scent•sational.

It's been a bumpy, uphill battle, with an unfortunate "divorce" along the way. At a point it became clear we didn't share the same vision. It also was clear, via some blatant errors, that he wasn't properly testing my hybrids. I was of course happy that he was interested in going through with several, but in the end I bought him out.

This doesn't speak for every Dutchman, but it does for a lot: they want it for free.

Sad, but true.

I had thought the Dutch were fair. What I hadn't realized is the expression "Going Dutch," came about because the Dutch aren't willing to pay. They want things for free. As a result you have to establish up front that, for example, the bill in a restaurant is going to be split.

It's funny during the "divorce" that the bulb grower insisted his half share was worth more than my half. Seems the Dutch have an understanding of mathematics that isn't shared by the rest of the world.

I tried to remind him and his son of all of the time, effort, expense, and knowledge I put into creating my hybrids that he was growing, including two three-week trips to Turkey, travelling 9,000 km each time, with extensive research beforehand to determine the best locations to look for plants I wanted to collect. The son had told me he understood, but it was clear he didn't. He only really understood / knew of the effort he put in to building the stock.

When you step back, you see he's looking at it as if he went out, bought a few bulbs for €1, then built up the stock, so he should be reaping all the rewards. He doesn't understand that the bulbs I gave him weren't simply worth €1. They were worth an unknown sum, which we were to each share the rewards 50/50.

What's strange is they know full well of the extensive efforts Dutch hybridizers put into creating new Daffodil, Lily, Tulip, etc.

Enough said.

The good news is I have managed to save Orange Glow, and intend on introducing it to the large-scale market. And I now have a few bulbs of some of my other hybrids like 00-FP-1, and 00-KV-1 back in Holland.

Three separate large-scale growers have rejected both Storm and Sea Green. John Amand rescued them, and we are working together to introduce them; likely just to the specialist market, but ...we'll see.

Sea Green is a very unique, unusual colour. It's not necessarily for everyone. It's amazing to hear people raving over Green Jay Tulips (fringed green & yellow), yet I had tremendous difficulty getting anyone interested in Sea Green – a Reticulata like no other.

I quite like how, right as the flowers are finishing, the yellow fades out, leaving light grey-blue.

Some things have been lost like my Cantab x winogradowii hybrid 92-FB-1. As I mentioned at the opening, another grower is now coming out with at least two Cantab x winogradowii hybrids. What makes me sad is we could have already started selling 92-FB-1. Instead I have nothing.

I have persevered through all of this, and put my Engineering skills to good use. Things are looking up.

There may be things that the original grower was correct about, like the fact “Alan, you have too many.”

However, he would say, we only want one white with blue accents – the best one. Pick one and that’s it.

Yet look at Eye Catcher, 03-FO-2, 00-KV-2, 07-BQ-2, 10-CK-3, etc.

Do you think only one should be introduced?

If you’re like me, you’ll have trouble just picking three.

Why Reticulata Iris?

Reticulata Iris start blooming right as the snow disappears. Which makes them the perfect plant to have to help shake off the winter blahs. After a long winter, you can imagine what a delight it is to see these first signs of spring. Typically that’s right at the end of March / start of April here in Toronto, Canada. Lately there’s been a few winters when the start has been early or mid March due to the warmer weather we’ve been getting. This can be a good thing, because cool temperatures tend to return and the net result is a much longer bloom season. In 2013, bloom started towards the middle of March and the quite warm weather meant it was great for being in the garden, but it continued and incredibly, bloom finished right at the point it would have normally have started. Overall bloom lasted only 2½ weeks rather than the normal 3+ weeks.

Occasionally Reticulatas seem to pop through the last bit of icy snow (snow turned icy by the melted moisture trickling through the snow).

Their ~square leaves are quite interesting. By the time they die down in June they’ve grown between 45 and 60 cm in length.

It’s fascinating, even incredible, how precise Reticulata veining and dotting are.

It would be nice if the flowers and bloom season lasted longer. Reality is they are from a bulb, so they need to flower, get pollinated and produce seed before having to go dormant in order to survive the dry conditions in which they evolved.

Terminology

Reticulata capitalized, refers to the group as a whole (or Retic for short). It is a much more accepted name than Hermodactaloydes. Although “Reticulata” is a touch confusing, because there is the species “*reticulata*” with a lower case “r”, and italicized. Iris *reticulata* is a variable species, and I don’t think it should be broken into a number of additional species. Specific forms that are endemic to a given region should given varietal names, such as Iris *reticulata* var. Thalish, for the lovely blue form from the Thalish mountains.

While we are talking about terminology, I want to point out it is a “sin” to speak about the hybrid George as Iris *histrionides* George. It is not a form of *histrionides*. *Histrionides* simply happens to be one of its

parents. J.S. Dijt is the other. It should be referred to as *Iris Reticulata* George, where *reticulata* is capitalized. It would be incorrect to use a lower case “r”, because it not 100% *Iris reticulata*. You could say *Iris reticulata* Gordon or *Iris reticulata* Natascha, but both are hybrids so it would be better, as well as help to eliminate confusion to say *Iris Reticulata* Gordon and *Iris Reticulata* Natascha.

Using the word *Reticulata* first followed by *Iris*, would actually be best (i.e. *Reticulata Iris* Gordon), but there are many situation where the plant genus needs to be mentioned first.

You should NOT refer to Orange Glow, as *Iris danfordiae* Orange Glow, or Eye Catcher as *Iris danfordiae* Eye Catcher. They are hybrids involving several species, and as such should clearly be referred to as *Iris Reticulata* Orange Glow, or *Reticulata Iris* Eye Catcher.

Summary

"It's a matter of luck, understanding science, a bit of intuition... plus lots of patience!"

I've come a long way from my plant collecting in Turkey 30 years ago, which gave me the foundation for the work I'm doing today.

Every year it's amazing to see new things blooming for the very first time. Looking around the garden each day to see buds coming through the ground, then watching as the first colour appears. Some buds that look very interesting, like they are going to produce something amazing, turn out to give just something ordinary. Then every so often you get something amazing. Like seeing the first yellow and dark red (purple) combination (05-EP-2) in 2011, followed in 2012 by the even more exquisite 05-GQ-3.

Having seen what I have accomplished I am certain you'd understand if I were to say, "I'm not sure why people are so infatuated with Snowdrops. *Reticulata Iris* are much more interesting – Smile."
(I do of course grow a number of Snowdrops)

Hope I can successfully get these into the market so you can enjoy them – stocks are being built up in Holland. One trick is to figure out what colours /patterns the general public's attracted to.

I hope people like what I've accomplished. Hopefully they will want to try a few more varieties every year. I don't believe they want to buy the same thing year after year.

Variety is the spice of life.

What we are seeing at the moment is only the tip of the iceberg.

The future looks extremely exciting!

For more photos, etc. visit www.Reticulatas.com

Possible Additional Pictures

[picture: main bulbs plus bulblets]

[picture: of seeds]

[picture: *Reticulatas* covered in snow]

[picture: *Retics* coming through icy snow]