

The Fuchsia Breeders Initiative

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Fuchsias help like never before

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Contributions for the next issue, which is scheduled for the end of July 2021, should be in the editor's possession ultimately on 15 July 2021.

Please send your contribution in Word, with the photographs attached separately. Large contributions can be transferred by uploading the file with, for example, WeTransfer.

Any new Fuchsia cultivars being released? Please provide a photograph and some descriptive information, and it will be seen and get attention all over the world!

Photograph on front page:
Fuchsia 'Fancy Dress'
(De Cooker, 2020)

"Gardening helps like never before", this is what Chris Young, Editor of The Garden states in the December 2020 issue. I could not agree more, not forgetting of course that for many of us it's the fuchsias that play a dominant role. Working on our fuchsias helps us coping with these difficult times. The Covid-19 virus is still wandering around, and times are still turbulent, although great strides are being made with corona vaccines developed through breakthrough technologies.

And speaking of breakthrough technologies: a breakthrough CRISPR-Cas9 has also been achieved in the field of genome editing just a few years ago. This genome editing technique was invented by Emmanuelle Charpentier and Jennifer Doudna, and awarded the Nobel Prize in Chemistry in 2020. However, we as fuchsia hybridists will for the time being have to do with our old-fashioned approach of bringing stigma and pollen together, thereby hoping for 'breakthrough' developments by letting nature do its work. But also here we make progress in understanding the genetics of fuchsia hybridisation by applying technologies such as flow cytometry which are also affordable to the amateur hybridist.

In his article Sporting Types, Mr. Edwin Goulding takes us on a journey to the spontaneous non-Mendelian changes that can happen in fuchsia flowers. And Mr. Doug Clark gives us with his advanced technologies a glimpse into the wonderful world of the stomata, the tiny pores through which plants breathe.



Editor of 'The Fuchsia Breeders Initiative'

Mario de Cooker

Finally, in the second part of the article 'Making bi-colour triphylla fuchsias' I will lead you through the numerous opportunities that exist for making such triphylla fuchsias. For a large part it's still 'work in progress'. But I thought I should share this with you because also this is an exciting world of highly non-Mendelian processes in a polyploid environment. Mendel would have gone mad if he had used polyploid fuchsias for his ground-breaking experiments.



And in the meantime we keep communicating also by using advanced technologies like Zoom.

Wishing you, your family and friends a restful Christmas and many fuchsia successes in 2021.

Mario de Cooker

SPORTING TYPES

Being on changes that occur in flowers.

By Edwin Goulding

Introduction

In our last article we examined some of the processes involved in creating variegated foliage. We saw how yellow, bronzed and chlorotic leaves might appear and how they could affect plant growth. We briefly considered mitochondrial DNA and its implications for hybridists; a complex subject.

In this article we will discuss spontaneous changes that can happen in flowers. A brief diversion will look at organelles and the part they play in each plant's life. In all, we consider something that most commonly happens without our assistance or interference. Yet, we are sometimes able to see patterns of behaviour that are somewhat predictable and to consider ways of taking advantage of the likelihood of change. Here we deal with sporting as it affects flowers and ourselves as hybridists.

Preamble

Our main theme has to do with inheritance. During the 1980's one of my friends, David Burns, lived at Bungay on the Suffolk and Norfolk border. I used to visit him once a year to see the photographs he had taken of his new seedlings. His principle interest was in producing sturdy garden plants that could also be used for club competitions. Perhaps the most successful of his introductions then was *Fuchsia* 'Waveney Gem' (Burns, 1985), which was described in the previous article, together with the two foliage sports that arose from it. His introduction *F.* 'Waveney Walz' (Burns 1982), when used as a seed parent, produced the strikingly attractive foliage we see on *F.* 'Waveney Sunrise' (Burns, 1986).



F. 'Waveney Gem' (Burns, 1985)



F. 'Waveney Sunrise' (Burns, 1985)

Mitochondrial inheritance

David pointed out that some very odd effects seemed to be transmitted only through seed parents. These effects were not produced if the same cultivars were used as pollen parents instead. This was demonstrated best in foliage variations but could also be seen in the flowers of progeny derived from e.g. *F.* 'Fort Bragg' (Walz, 1957). This introduction was the result of a sport that had occurred on *F.* 'Enchanted' (Tiret, 1957) and was a sister seedling to *F.* 'Swingtime' (Tiret, 1950); these two were from a cross between *F.* 'Titanic' (Reiter, 1946) and *F.* 'Yuletide' (Tiret, 1948). *Fuchsia* 'Lustre' (Bull, 1868) also appears to have a similar tendency.

For many years there was no obvious explanation for such anomalies and it is only recently that light has been shed on these happenings that occur reasonably frequently throughout the plant (and animal) kingdom. Mapping the *Arabidopsis thaliana*¹ genome and the human genome has led to great strides in our understanding of the many complex mechanisms operating within reproductive systems. One of these is Mitochondrial, or non-Mendelian, influence especially as it relates to inheritable diseases.

We have previously mentioned how an early theory that placed the earth at the centre of our universe was proved to be wrong. Facts won. Evolution gradually prevailed over creationism because it more closely fitted the provable information. However, Mendel's theory about genetics has not been proved to be incorrect but rather incomplete. An expanded version is needed to fit all the known facts. Our theory needs updating so that some otherwise unexplainable phenotypic changes can be understood. Sporting does not rely on dominant or recessive genes, chimeric changes even less so.

Two basic cell types

Let us consider a few features of cells in general. Prokaryotes are single celled organisms that have no specialised parts within their enclosing membrane. Eukaryotes contain nuclei in which their chromosomes and their DNA are stored. The two major kingdoms comprising plants and animals are comprised of collections of Eukaryotic cells. In these, multiplication progresses by division of the chromosomes followed by the re-combination of each haploid portion with another half contributed by a partner of the opposite sex. This process restores the normal numerical balance for each species. We have seen in recent



F. 'Lustre' (Bull, 1868)



F. 'Lustre Improved'
(Carter Page, 1870)

times how the content of cells can be measured by processes such as flowcytometry. The emphasis so far has been on nuclear content and has taken little account of the influence of other organelles. These are assuming an ever greater importance as our knowledge increases.

Organelles

The nucleus is the largest organelle inside a cell but it is not alone. In plants containing green pigmentation another well-known example is the chloroplast. There are frequently many different organelles within each cell and these are distributed apparently randomly through the cytoplasm and enclosed within the outer membrane. There are a number of differences between the largest organelle and all the others. Principle among these is that nuclei contain vast amounts of DNA containing most of the cells' genetic library. Organelles other than the nucleus are of



F. 'Snowfire' (Stubbs, 1978)

special importance in particular ways. First, they contain a much smaller quantity of DNA than is held within the nucleus but they also contain RNA, a feature peculiar to them. They are capable of reproducing their genetic material by fission not fusion as is the case in nuclei. They are able to replicate, transcribe and translate the information contained within their own DNA.

Sex discrimination

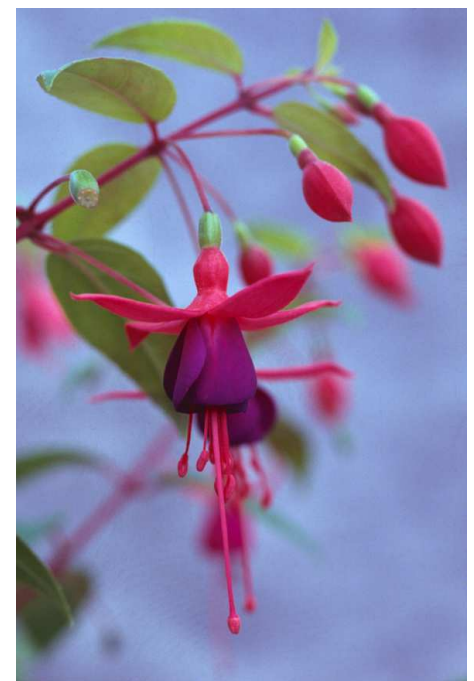
All of this might appear of little importance until we realise that male cells, such as pollen, contain just the bare minimum of DNA information held within their nucleus.² Female egg cells contain both nuclear and non-nuclear organelle contributions; in other words they can also contribute a small but significant amount of extra DNA from within their cytoplasmic organelles in order to exert a predominant influence upon their offspring.

Flowers

Some features seem to be particularly associated with seed parents like those of *F. 'Fort Bragg'*, which was mentioned earlier. Progeny seem apt to produce further variations in later generations. Another flower of interest is *F. 'Checkerboard'* (Walker & Jones, 1948) which sometimes carries blooms with more than four sepals; it gave rise to *F. 'Twinkling Stars'* (Handley, 1976). This introduction almost invariably has around five or six sepals on every flower. Marbled petals too frequently appear to be transmitted by mother plants and are usually unrelated to pollen parents. Early experiments using *F. 'Snowfire'* (Stubbs, 1978) both ways proved that this was not always the case.³ Here the genetic effects appear to have come entirely from within the nucleus.



F. 'Checkerboard'



F. 'Graf Witte'
(Lemoine, 1899)

Sequential change

As among other genera, changes seem to happen in sequence, as stepped changes, so that a whole family can result from one original plant. Chrysanthemums were the first

competition plants in which I saw examples of this. These changes do not happen through cross fertilisation but spontaneously on the part of a plant already in existence.

One Fuchsia example that comes to mind is *F.* 'Graf Witte' (Lemoine, 1899; p.4), which had single red and violet flowers. Its sport, *F.* 'Pixie' (Russell, 1960) had pink petals, with red tubes and sepals like its forbear.

Fuchsia 'White Pixie' (various, 1968) produced white petals with unchanged colour elsewhere on the flowers but it did have much yellower leaves and a reduced vigour that resulted in plants being about two thirds the size of those it was descended from. This pattern of change appears to be the most common one among Fuchsia sports. Flower changes come most often among plants of *F. magellanica* descent and general appearance. They seem to follow the sequence of dark to light hues in the petals. Foliage changes, as in *F.* 'Piquant Pixie', usually but not invariably occur after blooms



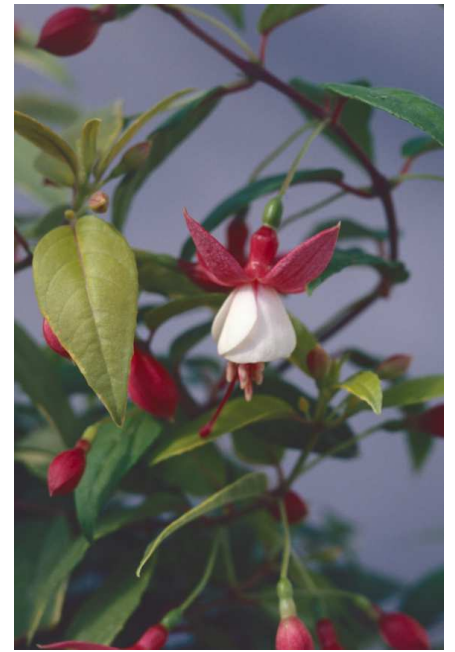
***F.* 'Pixie'**
(Russell, 1960)



***F.* 'White Pixie'**
(Wagtails Nursery, 1966)



***F.* 'Tom Knights'**
(Gouldings Fuchsias, 1983)



***F.* 'Piquant Pixie'**
(Whiting, 1989)



***F.* 'Sportsknight'**
(Newstead, 1987)

have altered and as the sequence develops more fully. A further example is *F.* 'Tom Knights' (Gouldings Fuchsias, 1983). This produced a flower sport that was introduced as *F.* 'Sportsknight' (Newstead, 1987; p. 6). *Fuchsia* 'Knight Errant' (Gubler, 1990; p. 6) finally appeared with its foliage changes.

These changes are so common that we are apt to think of them as simple and ordinary. This is far from the case when it comes to offering an explanation for their occurrence. Changes don't stop there; they can even happen to portions of the colour especially as markings on individual flower petals. These alterations are frequently unpredictable in their appearance and scope. *Fuchsia* 'Supersport' (Klein, 1990) which looks rather like *F.* 'Swingtime' (Tiret, 1950) carries double flowers with red tubes and sepals, and white petals. However, the latter appear randomly splashed with red blotches upon a white background. *Fuchsia* 'Satellite' (Kennett, 1965) has more obvious bi-colour marbling on its single corollas. A very early example with even more regular marbling is *F.* 'Bland's New Striped' (Bland, 1872).

Variation in petal colour is probably at its most common among the large double Fuchsias. *Fuchsia* 'Orange King' (Wright, 1975) is one of the best oranges to date. Some have subtle gradations whilst others have more pronounced differences. These are often most common among those with pastel shades; pink through and into the blue hues. Red or pink are often juxtaposed against a white ground or, as with *F.* 'Flying Scotsman' (Gouldings Fuchsias, 1985; p.7), white against a red background. In the majority of cases these colours blend into each other rather than forming clearly differentiated zones on each petal.

Lastly, and in contrast with many other flowers such as pansies, central zonal separation is almost non-existent among fuchsias. The clearest separation into an outer and an inner band of disparate colours within the corollas is probably *F.* 'Look East' (Heavens, 1987; p.7). *Fuchsia* 'Martin's Double Delicate' (Beije, 1999; p.7) is a rarity in that it appears to have petals edged with darker blue.



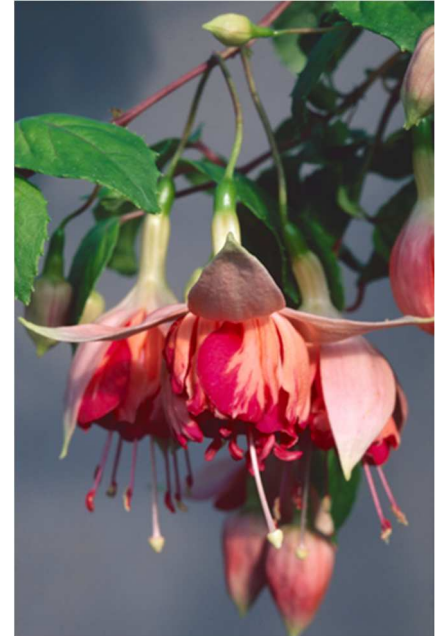
***F.* 'Knight Errant'**
(Gubler, 1990)



***F.* 'Satellite'**
(Kennett, 1965)



***F.* 'Bland's New Striped'**
(Bland, 1872)



***F.* 'Orange King'**
(Wright, 1975)

Lace edging, like other forms of zonal separation, is still very uncommon among Fuchsia blooms. Perhaps this is a further goal worth pursuing?

We have already mentioned organelles, which contain extra-nuclear genetic material. This may be of the conventional DNA type but can also be of RNA. (For many readers the latter will now seem very familiar because of the current covid-19 pandemic.)



F. 'Flying Scotsman' (Gouldings Fuchsias, 1985)

Organelles appear to answer some of the otherwise unexplainable changes that occur as Fuchsias sports. A second element, called a Transposon, can more easily show us how chimeric or non-fixed changes can occur. Transposons may be contained within nucleic organelles, hence our earlier discussion on organelles, but sometimes they are held outside nuclei. Let us expand on this a little.

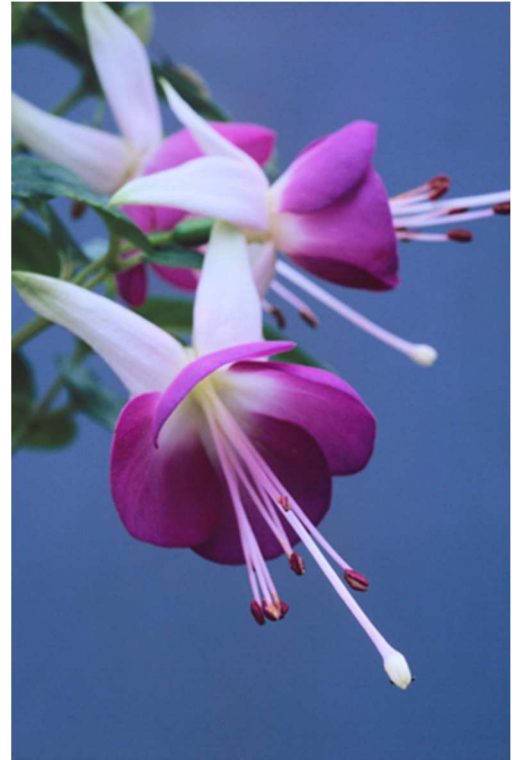
Model-dependent reality

Stephen Hawking and Leonard Mlodinow, in chapter four of their book entitled *The Grand Design*, describe how perspectives change according to our observational positions. This, they say, allows each of us to create a Model-dependent reality from our experiences; these are working hypotheses that allow us to make sense of incoming information. In this article and its forerunner we have explained some of the things that happen without our interference and they have sought to provide information that can make sense of these by creating a model of reality; a working hypothesis.

Transposons

These are mobile elements that can alter the appearance of a plant. They may be independent of other elements or dependent upon others and act as groups of closely inter-related units such as we see in *F. 'Sophie's Surprise'* and *F. 'Supersport'*. These may be nuclear in origin or extra-nuclear, being contributed by non-nuclear organelles.

Although the nucleus itself is an organelle, mitochondrial material is only transmitted by non-nuclear organelles. In plants these are of two



F. 'Look East' (Heavens, 1987)



F. 'Martin's Double Delicate'
(Beije, 1999)

types, those that contain chloroplasts and those that don't. Chloroplasts transmit the information they contain within themselves. In other words green organelles provide identical information, those that lack chlorophyll give only white or chlorotic foliage, whilst variegated leaves can give all three types of progeny in varying proportions.

The theory behind these occurrences is fascinating. We have seen how in most subjects maternal cytoplasm is capable of transmitting a small amount of extra-nuclear material. This same characteristic is not usually present in pollen and is unlikely to be so in that of *Fuchsia*. Chimeric changes would appear to be entirely at the whim of these transposons or jumping genes.

Conclusion

In summarising the information that has been discussed within these last two articles it is possible to see that some regular patterns exist that, at the moment, are beyond our complete understanding and control. Genes are often thought of as beads upon strings. Sometimes, in our model-dependent reality, they can seem to act individually but at other times as a group of them acting as a single unit and independent of all the other genes on the same string. Most of these occurrences are outside our control when combining two different *Fuchsia* genotypes when we practise hybridisation.

Floral changes:

1. Spontaneous changes often occur first in the petals. In this way plants like *F.* 'Graf Witte' sport to create *F.* 'Pixie'. Usually colours become paler with each modification.
2. Changes happening to the tubes almost invariably occur in the sepals also; they behave as a single unit. An example is *F. boliviana* var. *luxurians* 'Alba'.⁴
3. Such changes are not necessarily transferable through plant breeding. This is one of the strengths (and weaknesses) of *Fuchsias*. To maximise visible benefits vegetative propagation might have to be used instead.
4. Dominance is very evident in some colours like aubergine. Changes, when they occur, may be passed on via the seed bearing parent as nuclear or extra-nuclear features. Nuclear changes alone can be passed on by the pollinator.

We live in an expanding not a fixed universe in which it was possible to imagine ourselves at the centre of things. An expanded evolutionary synthesis helps us to make sense of each part of Darwin's theory. Lastly, by expanding Mendel's analysis of basic genetics we can increase our understanding of some things in our botanical experience that would otherwise make no sense at all.

ORGANELLE:

One of the various structures contained within the cytoplasm of a cell or unicellular organism. Somewhat like the organs within multicellular organisms.

TRANSPOSON:

A transposable chromosomal element. A portion of DNA that can be translocated as a whole unit and in the absence of a complementary sequence in its host.

Notes

- ¹ Arabidopsis illustration in TFBI, Issue 7, July 2016, p.6.
- ² As with so many things in nature exceptions can be found. One example is the *Sequoia sempervirens* or California redwood.
- ³ Goulding, E., 2001, *Fuchsias The Complete Guide*, London: B.T.Batsford. p.166. ISBN 0-7134-8664-3.
- ⁴ TFBI issue 11, July 2018, pp. 2-4.

Further Reading

HAWKING, S., & MLODINOW, L., 2010, *The Grand Design*, London-Bantam Press. ISBN 9780593058299.

MORLEY, S.A., & NIELSEN, B.L., *Plant Mitochondrial DNA*, in *Frontiers of Bioscience, Landmark*, 22, pp.1023-1032, January 2017.

NEALE, D.B., et al., *Chloroplast and mitochondrial DNA are paternally inherited in Sequoia sempervirens* D. Don Endl., *Proc. Natl. Acad. Sci. USA*, Vol.86, pp.9347-9349, December 1989, Evolution.

Footnote

Fuchsia 'Supersport', like *F.* 'Sophie's Surprise' featured in our article of July 2020 on foliage alterations, is an example of spontaneous chimeric change. In spite of sourcing material from several places in 2019 the special features had been propagated out of all the stock; there were no arbitrary red blotches on the petals. The whole point of its introduction has thus been lost.



***F.* 'Supersport'
(Klein, 1990)**

Photographs in this article courtesy Mr. Edwin Goulding

Making bi-colour triphyllas (Part II)

By Mario de Cooker

Introduction

In part I of the article 'Making bi-colour triphyllas' (The Fuchsia Breeders Initiative, Issue 15, July 2020) we have seen that the current range of real bi-colour triphyllas is still very limited. However, in recent years several new pale pink triphyllas, still having the *F. triphylla* species genome, as well as purple triphyllas containing the *F. juntasensis* genome were developed, which offers potential for creating new bi-colour triphyllas having different shapes and colour combinations.

In the first and second generations of *F. triphylla* 'HvdP' x *F. triphylla* PB7760 # 6 and #7 selfings and sibling crossings it became clear that bi-colour orange/pink and white/pink combinations are clearly part of the *F. triphylla* genetic capabilities [1]. By using triphylla cultivar *F. 'Pangea'* as the crossing partner, other interesting pink/orange bi-colour triphylla progeny can be obtained. *Fuchsia* 'Fancy Dress' is an example of such colour combination. We have also in short touched upon several potentially promising opportunities for creating other bi-colour triphyllas by using cultivars having a more or less white tube as the crossing parent. This will be further explored in this Part II of the article. It will be shown that some particular colour combinations are rather easy to produce, several others might be

more difficult. All in all there seems to be still huge potential for creating all kinds of new bi-colour triphylla combinations, all the more so as new exciting developments are emerging just around the corner.

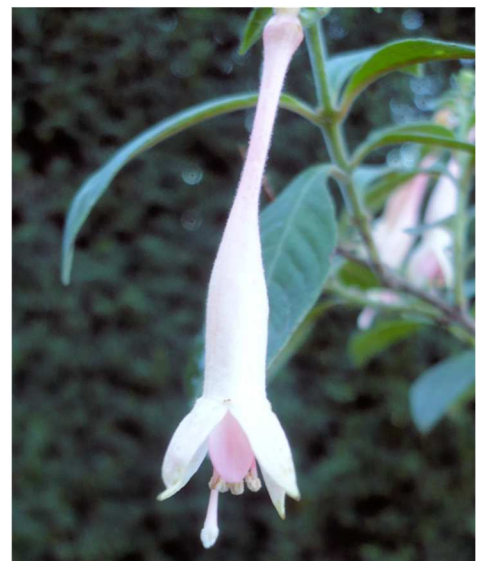
Triphylla white/pink combination

Bi-colour white/pink *F. triphylla forma alba*

Making near-white (the tube)/pink (the corolla) bi-colour combinations of triphyllas still having the *F. triphylla* genome (so actually alba forms of *Fuchsia triphylla*) is a rather straightforward exercise. Such seedlings are easily produced because such combination is part of the genome of the original parents *F. triphylla* 'HvdP' and *F. triphylla* 'PB7760 # 6 and #7', and shows up in second+ generations of selfings and sibling crossings. Third generation seedling *Fuchsia* F3-10A is a typical example. So far two seedlings of the alba series have been introduced as *F. 'Purcellian Elegancy'* and *F. 'Purcellian Grace'*, respectively. Many seedlings of this series of progeny have excellent fertility and can be used for making more cultivars having similar looks, but having the advantage of somewhat better overwintering properties.



White/pink bi-colour *F. triphylla* seedlings



Bi-colour *F. triphylla* seedling F3-10A

White/pink bi-colour triphyllas starting from *Fuchsia* ‘Our Ted’

Fuchsia ‘Our Ted’ originates from a selfing of *F.* ‘Koralle’ and has a white tube and a pale pink corolla. Triphylla Fuchsia cultivars ‘Koralle’ as well as ‘Göttingen’ and ‘Thalia’ have all originated from the crossing *F. triphylla* x *F. fulgens* or vice versa. These cultivars have a pentaploid genome, resulting from the combination of an unreduced *F. triphylla* gamete and a regular *F. fulgens* gamete [2]. Evidently, the defect for making anthocyanins is also part of the *F. triphylla* chromosomes contained in the *F.* ‘Koralle’ genome, by which the near white seedling ‘Our Ted’ could originate from a ‘Koralle’ selfing.

From crossings ‘Göttingen’ x ‘Our Ted’ several orange seedlings have originated, amongst which N 02-16 and N 03-01 [3]. Crossing N 02-16 x N 03-01 has produced seedling N 05-31, an orange triphylla cultivar having a clear combination of *F. triphylla* and *F. fulgens* properties (a.o., rather large leaves inherited from *F. fulgens*).

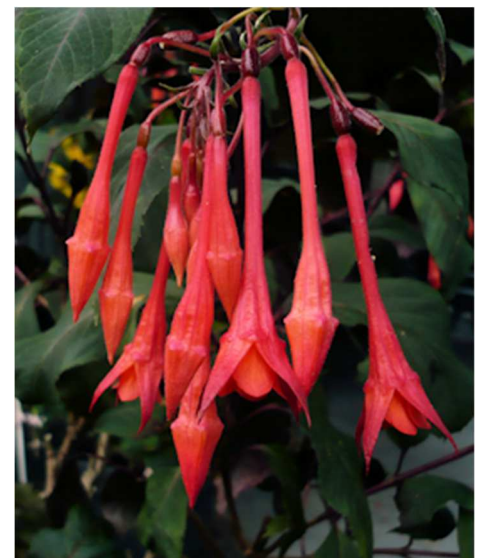
From flowcytometry measurements it follows that all seedlings mentioned in the above paragraph have (at least) a pentaploid genome. Making a reliable estimate of their genomes, which is a combination of sets of *F. triphylla* and *F. fulgens* chromosomes, is not possible. They have all a moderate to fair fertility.

By crossing N 05-31 x ‘Purcellian Elegancy’, seedling N 16-54 was made, which is a clear bi-colour triphylla. The similarity as regards flower shapes of N 16-54 and female parent N 05-31 is striking.

Seedling N 16-54 can be used for creating next generations white/bi-colour triphylla progeny, dwarf seedling N 19-27 being an example.



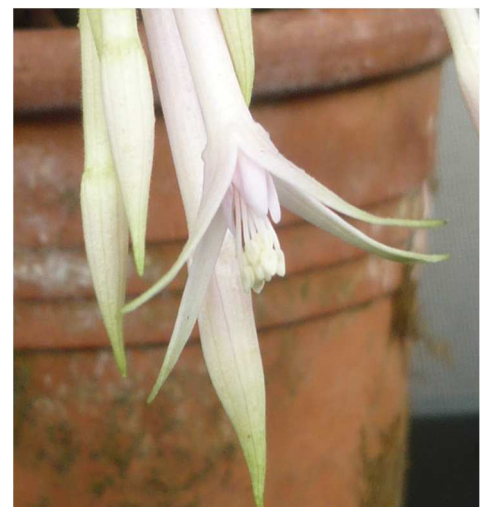
***F.* ‘Our Ted’
(Gouldings Fuchsias, 1987)**



Triphylla seedling N 05-31



Triphylla seedling N 16-54



Triphylla seedling N 19-27

White/pink bi-colour triphyllas starting from *Fuchsia* ‘Jaspers Indestructible’

Fuchsia ‘Jaspers Indestructible’ proves to be an attractive hybridisation parent for making white/ pink triphyllas. It has originated from the crossing ‘Papy René’ x ‘Papy René’ and was introduced as a new cultivar by Dutch hybridist Hans van Aspert in 2019. However, it was kindly made available to me already in 2013 for being used in my hybridisation programmes.

Over the years the cultivar has proven its value as a hybridisation parent by producing the triphylla-like (but non-triphylla) cultivars ‘Icicles Chandelier’ (De Cooker, 2015) and ‘Silver Chime’ (De Cooker, 2016).

So far, two white/pink bi-colour triphylla seedlings originating from *F.* ‘Jaspers Indestructible’ are worthwhile mentioning: viz. seedlings N 18-13 and N 19-11, originating from seedlings N 05-31 and 16-54, respectively (see also p. 10).

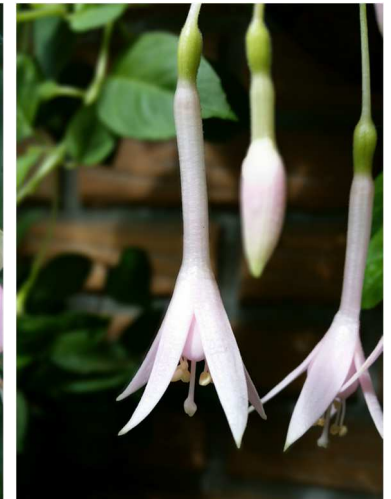
N 18-13 = N 05-31 x *F.* ‘Jaspers Indestructible’.

N 19-11 = N 16-54 x *F.* ‘Jaspers Indestructible’.

Seedling N 18-13 will not make it to introduction; it has been disposed off because of its unsatisfactory growth properties. Seedling N 19-11, a semi-trailing triphylla, is still being tested and could be introduced in 2022 if it keeps performing according to the satisfying early test results.



***F.* ‘Jaspers Indestructible’ (Van Aspert, 2019)**



***F.* ‘Silver Chime (De Cooker, 2016)**



Bi-colour triphylla seedling N 18-13



***F.* ‘Icicles Chandelier’ (De Cooker, 2015)**



Bi-colour triphylla seedling N 19-11



Apparently, *F.* ‘Jaspers Indestructible’ is highly capable of transferring its white/ pink colour combination to its progeny (which could, of course, in some occasions also be a disadvantage because it restricts variation).

As shown on p.13 it has however other additional hybridisation potential.

Bicolour triphylla pale-pink/pink combination

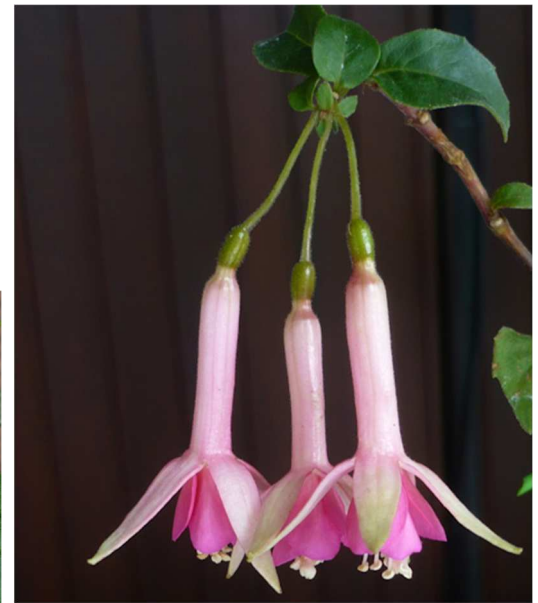
Obtaining pure white triphyllas is difficult. Often the triphylla phenotype shows pink colour hues. The best white triphylla seedlings so far have been obtained via routes in which ‘Göttingen’ x ‘Our Ted’ crossings were involved. *Fuchsia* ‘White Twinkle’ = (‘Göttingen’ x ‘Our Ted’) x ‘Purcellian Grace’ serves as an example.

Pinkish colour hues are part of the genetic make-up of the *F. triphylla* f. *alba* series. Tube colour of these specimens ranges from near white to soft pink. The colour of the corolla ranges from very pale to darker pink colour hues. Many of these are therefore actually pale-pink/pink bi-colour triphyllas. The *F. triphylla* f. *alba* series has been discussed on p. 9 of this article.

Examples of triphylla pale-pink/pink combinations are seedlings N 19-15, N 19-22 and N 19-24. Seedling N 19-15 has originated from *F.* ‘Lord Lonsdale’ as the male crossing parent. Both seedlings N 19-22 and N 19-24 have originated from *F.* ‘Spray’ (De Boer, 2017) as the male crossing parent. Attractive genetic trait of *F.* ‘Spray’ is the ability of producing multi-flowering progeny (see also p.15 of this article).



F. ‘White Twinkle’ (De Cooker, 2019)



Triphylla seedling N 19-22



Triphylla seedling N 19-24



Triphylla seedling
N 19-15



F. ‘Spray’ (De Boer, 2017)

Bi-colour triphylla white/red combination

In recent years, focus of the author's hybridisation programme has been predominantly on making purple and bi-colour white/pink triphyllas, as well as on performing background research on the genetics of pentaploid fuchsias.

Making white (the tube)/red (the corolla) triphylla fuchsias has therefore not yet resulted in any substantial progress. A couple of potential (non-limiting) routes leading to the desired combination will be discussed below.

An example of a white /red bi-colour triphylla is seedling N 18-30, which has originated from the crossing N 06-20 x *F. triphylla* PB 7760 #7.

Female parent N 06-20 has a quite complex origin ((‘Winter Charm’ x (‘Stanley Cash’ x ‘Delicate White’)) x (‘Göttingen’ x ‘Our Ted’), with ‘Winter Charm’ = *F. juntasensis* x *F. inflata*) x *F. magdalanae*.

Seedling N18-30 bears a great resemblance to *F.* ‘Michael Wallis’. It has however rather poor growth and flowering properties and, has, moreover, not shown any fertility. It has therefore been disposed off. As also the seed parent N 06-20 has poor fertility it's not clear whether this route provides a real realistic opportunity. It would require at least substantial effort.

Possible more promising route is via *F.* ‘Jaspers Indestructible’ because this cultivar has the potential of turning purple/purple combinations into white/reds as can be seen in non-triphylla seedlings N 16-28 and N 17-10.

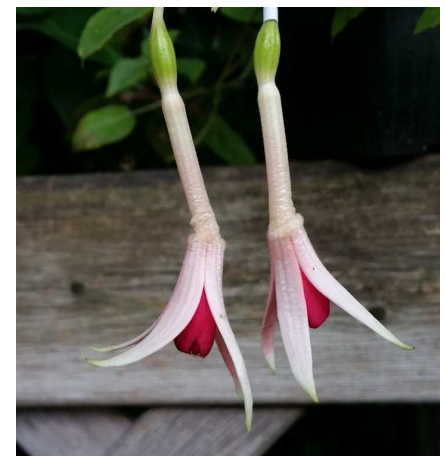
N 16-28 = ‘Remembering Claire’ x ‘Jaspers Indestructible’

N 17-10 = ((*F. juntasensis* x *F. inflata*) x *F. magdalanae*.) x N 93-08) x ‘Jaspers Indestructible’.

This route will be further explored, as well as routes via the *F. triphylla* forma *alba* seedlings.



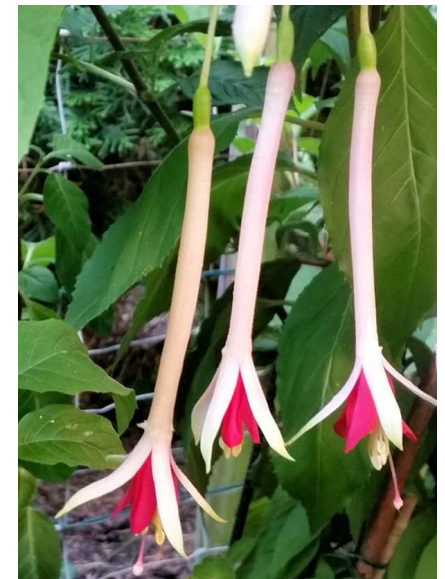
Triphylla seedling N 18-30



Non-triphylla seedling N 16-28



Non-triphylla seedling N 06-20



Non-triphylla seedling N 17-10

Bi-colour triphylla white/purple combination

Creating white (the tube)/purple (the corolla) triphylla fuchsias looks more promising on the short term than making white/red combinations, but also this could require some laborious work.

Logical inroad for making white/purple combinations seems starting from the purple triphyllas which have been created by using hexaploid seedling N16-20 as the initial crossing parent. As the N 16-20 genome can be represented by TTTTJJ (T = set of *F. triphylla* chromosomes, J = set of *F. juntasensis* chromosomes), all seedlings derived from N 16-20 will contain a package of TTJ chromosomes in their genome. This TTJ package of chromosomes invariably creates purple progeny because of its dominant *F. juntasensis* colour genes. This could therefore well be a hurdle for turning (part of) the flower into a lighter colour.

A first step in changing the purple tube into (near) white hues, while preserving the purple corolla has been demonstrated before by using 'Remembering Claire' for making 'All Summer Beauty'.

'Remembering Claire' has been derived by a series of crossings in which *F. juntasensis* has been involved, thus inducing 'Remembering Claire' 's purple colour.

'All Summer Beauty' in its turn has been derived from the crossing 'Remembering Claire' x ('Checkerboard' x 'Machu Picchu'), in which the female parent has shown, in other crossings, the ability for creating lighter colours. This crossing has induced a split of colours of tube plus sepals and corolla. And as there does not seem to be any reason to believe that a comparable sep-



**'Remembering Claire' (De Cooker, 2009)
at the left vs
'All Summer Beauty' (De Cooker, 2014)
clearly showing the separation of colours
of tube and corolla.**



***F. 'Lye's Unique'* (James Lye)**



Seedling N 93-08

aration of colours would not also be possible when using purple triphyllas as a crossing parent, this route is also being explored for making white/purple triphyllas.

Candidates for being used as a crossing parent are fuchsias having a more or less white tube. Examples are *F. 'Lye's Unique'* and seedling N 93-08; both have proven their ability for transferring the white tube to their progeny. Naturally, others could be used as well in first trials for exploring their potential.

Parentage of 'Lye's Unique' as well as year of introduction have been lost in the depths of time.

Parentage of seedling N 93-08 is ('Checkerboard' x 'Machu Picchu') x ('Checkerboard' x 'Machu Picchu').

Making bi-colour triphylla white/purple combinations starting from seedling N 16-47

Purple triphylla seedling N 16-47 is a pentaploid seedling having presumably the genome TTFJJ (T = set of *F. triphylla* chromosomes, F = set of *F. fulgens* chromosomes, J = set of *F. juntasensis* chromosomes). It has fair fertility. Crossings N 16-47 x ‘Lye’s Unique’ have been made, which has produced seedlings N 20-03 and 20-05. These fuchsias are clearly bi-colour triphyllas, however without having yet the light coloured tube which is the goal of these crossings. For achieving this, at least a second generation of progeny should be produced, if fertility allows.

Making bi-colour triphylla white/purple combinations starting from seedling N 16-20

Seedling N 16-20 (see also p.14) has excellent fertility and has already produced many offspring. Crossings have been made N 16-20 x ‘F. Lye’s Unique’, producing several seedlings having colour hues similar to N 20-03 and N 20-05. Which is, of course, still far off the desired white/purple combination. Promising exception is seedling N 20-06 with its light purple tube and dark purple corolla. Again: if fertility allows, it could possibly be used for producing a satisfying second generation of white/purple triphylla or triphylla-like seedlings. Also quite interesting is multi-flowering seedling N 20-10 = N 16-20 x *F.* ‘Spray’. All in all a quite satisfying start for making white/purple triphyllas.



Triphylla seedling N 16-20



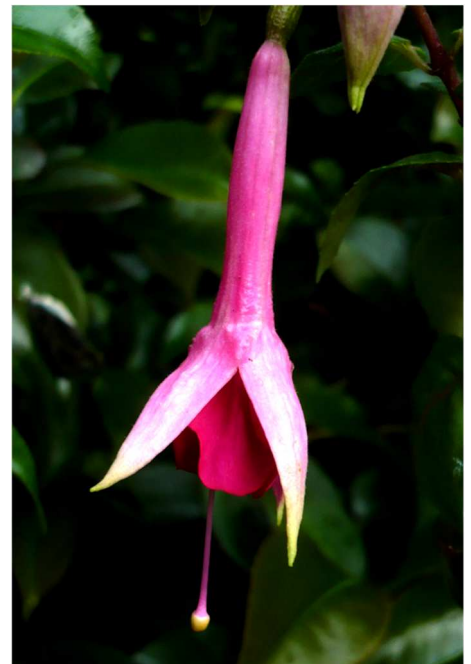
Triphylla seedling N 20-06



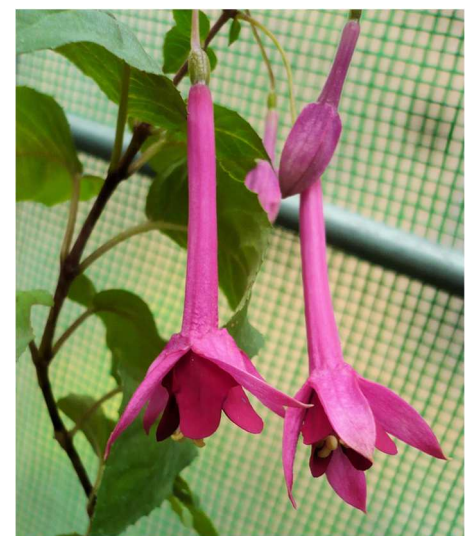
Triphylla seedling N 20-10



Triphylla seedling N 16-47



Triphylla seedling N 20-03



Triphylla seedling N 20-05

Making bi-colour triphyllas starting from *Fuchsia paniculata*

Species *Fuchsia paniculata* has interesting multi-flowering properties. Starting from this species, a large number of progeny has been produced by Dutch hybridists, amongst which Herman de Graaff, Henk Waldenmaier and Arie Smits to name some. *Fuchsia paniculata* has proven being able to offer good opportunities for making bi-colour triphyllas.

One of the earlier introductions: *Fuchsia* ‘Gerharda’s Panache’ (De Graaff, 2003) has over the years become one of the most frequently used parents for making new paniculate fuchsias. It originates from the crossing ‘Small Pipes’ x ‘Pan’ = (*F. paniculata* x *F. triphylla*) x ((*F. paniculata* x *F. triphylla*) x *F. magdalенаe*)).

From crossing ‘Herps Parachute’ x *F. paniculata* (tetraploid) = ‘Gerharda’s Panache’ x ((‘Gerharda’s Panache’ x ‘Gerharda’s Panache’) x *F. paniculata* (tetraploid)), *Fuchsia* ‘Herps Riksja’ (Waldenmaier, 2011) has originated.

Subsequently, from crossing ‘Herps Riksja’ x ‘Purcellian Grace’, triphylla seedling N 16-23 was obtained. Like many other descendants of *F. ‘Gerharda’s Panache’*, flower colour and shape contain many traits of this paniculate parent. Seedling N 16-23 has rather poor fertility.



Triphylla seedling N 16-23



Seedling N 16-23 (above) vs *F. ‘Gerharda’s Panache’*



Triphylla seedling N 16-23 (at the left) vs N 18-34



Triphylla seedling N 18-34

Crossing N 16-23 x 'Purcellian Elegancy' has produced in its turn bi-colour triphylla seedling N 18-34 (see p. 16). This time, the split of floral colours is the reverse of the white tube/purple corolla combination as discussed on p. 14-15, which is a very promising development. Another seedling originating from N 16-23 is seedling N 20-30, showing a similar split of flower colours. Unfortunately N 20-30's male parent is unknown.

A comparable split of flower colours is also found in other *F. paniculata* progeny. Examples are triphylla fuchsias *F. Poetry*' (De Graaff, 2004) = 'Gerharda's Panache' x 'Göttingen' and *F. 'Herps Tripan Tetra'* (Waldenmaier, 2017) = *F. paniculata* (tetraploid) x *F. triphylla* PB7760#7.

Conclusions on making bi-colour triphyllas

Potential pathways for creating new bi-coloured triphylla fuchsias are numerous. Several (non-limiting) potential pathways have been pointed out in part I and part II of this article.

Some specific pathways, such as routes towards bi-colour white-pink triphylla cultivars, have been explored already for several years and have proven their capabilities. Several other routes such as the creation of white/purple bi-colour triphyllas and triphyllas having all kinds of different pink hues are still in their infancy, but first results are promising.

Recently developed new cultivars will be further tested in the coming years. First to be introduced, most probably in 2022, might be seedling N 19-11, a white/pink bi-colour semi-trailing triphylla if it keeps performing according to the satisfying early test results.

Notes and remarks

- [1] The Fuchsia Breeders Initiative, Issue 2, Dec. 2013, p. 12-13; issue 3, July 2014, p.12-14; Issue 4, Dec. 2014, p.11-15; Issue 5, July 2015, p.2-6.
- [2] The Fuchsia Breeders Initiative, Issue 10, December 2017, p.14-15.
- [3] Both N 02-16 and N 03-01 originate from the same crossing. N 03-10 has been lost over the years; it had larger bloom and leaves as compared to other seedlings from the crossing.

Please update your e-mail address!

It happens rather frequently that subscribers to The Fuchsia Breeders Initiative change their e-mail address. However, if this has not been communicated to the editor, it's not possible providing you with the most recent issue at the moment it is sent around. And you might be wondering why you are not on the subscribers list anymore.

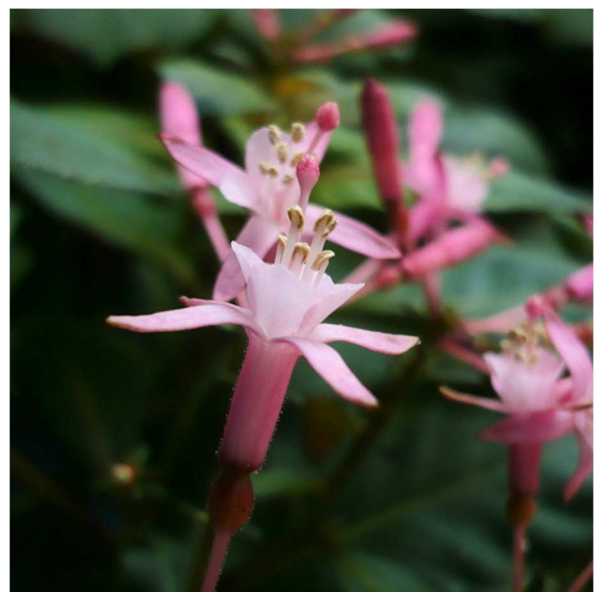
So if you want to stay connected, please communicate any changes to fuchsia@decooker.nl and you will receive your copy at the appropriate moment.



Triphylla seedling N 20-30



***F. 'Poetry'* (De Graaff, 2004)**



***F. 'Herps Tripan Tetra'*
(Waldenmaier, 2017)**

Little things that matter

A dive into the micro world of San Francisco by Doug Clark

By Mario de Cooker

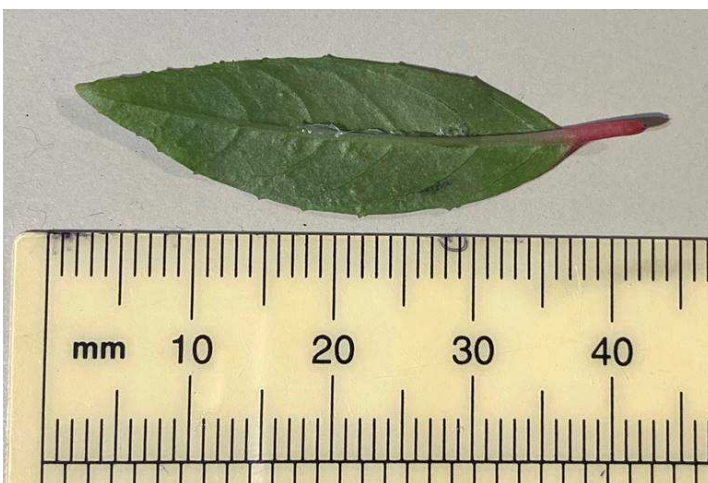
Most of the time, many of us will not be aware of the micro world that surrounds us, filled with trillions of microorganisms. This world of microorganisms, some of which being related to animals, others to plants was observed for the first time in the 1670s by Antoni van Leeuwenhoek. Since then, the development of microscopic techniques has made great strides. It now allows us to look in great detail at a world that is not visible to the naked eye, including all kinds of fascinating plant structures.

Let's take a short dive into a specific part of this micro world: the stomata of plants. Stomata are tiny pores through which plants breathe. They are found on the upper and lower sides of leaves, on flower petals, on stems, and on roots. Stomata of various plants may be examined in detail by light microscopy. Dr. Douglas Clark is one of the enthusiast diving into this micro world already for many years. You might remember Doug from his fascinating pictures and video on the Fuchsia Gall Mite (see The Fuchsia Breeders Initiative, Issue 2, December 2013, p.6). Recently he has provided us with some enthralling material on stomata, such as a view at the stomata of hardy and Gall Mite resistant *Fuchsia* 'Reyna Del Campo'.

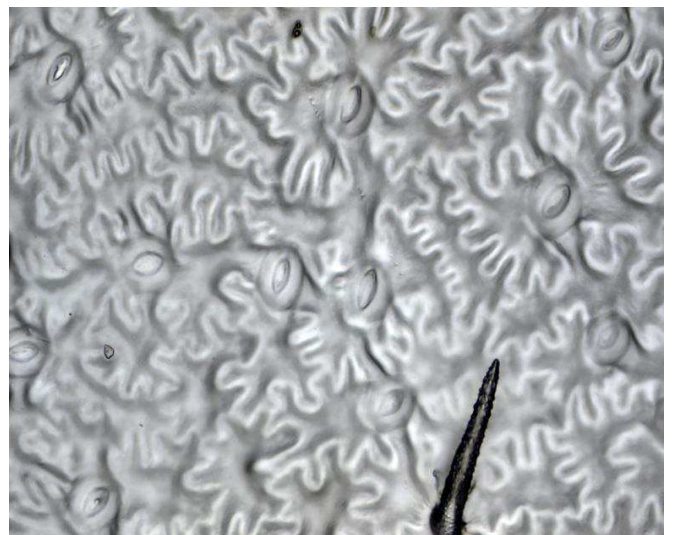
Dr. Douglas Clark is an engineer with an interest in technologies for printing and imaging. He lives and works in San Francisco, California. Over the last 40 years, he has used x-rays, ultrasound, microscopy, and photography to study all kinds of things: animal, mineral, and vegetable. He has patented much of the equipment designed for this purpose, and is CEO of Paedia Corporation, which he founded in 1985. Paedia Corporation provides consulting, research, and design services in the areas of engineering, physics, science, computer hardware and software, forensic and legal discovery, and expert services.



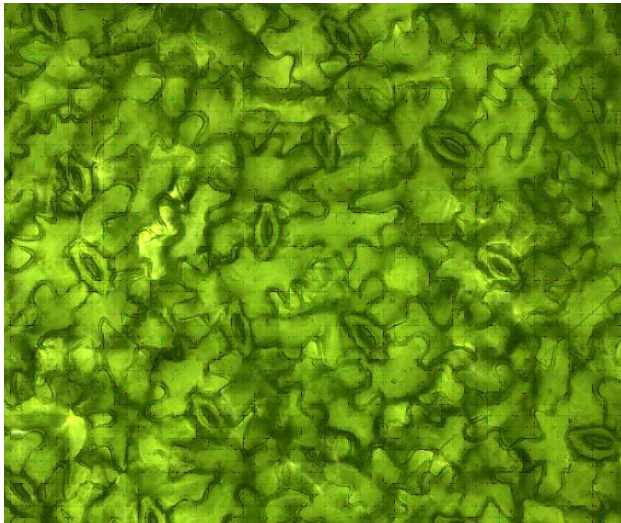
***F.* 'Reyna Del Campo'**



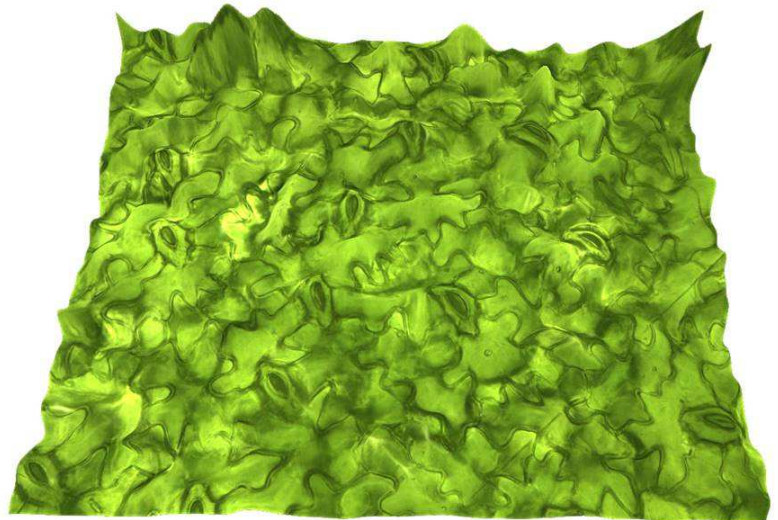
***F.* 'Reyna Del Campo'** leaf underside after casting.



***F.* 'Reyna Del Campo'** Leaf underside cast. 260 micron width. The pointed object is a trichome that extends about 20-25 microns above the leaf surface.



***F. 'Reyna Del Campo'*, leaf underside.**
Image width = 260 micron



F. 'Reyna Del Campo'
Oblique view of the same leaf section. The height of the lips is about 4-5 micron above the base of the stomata.

San Francisco is also the city of the **Golden Gate Park**. With 24 million visitors annually (Doug being one of these), Golden Gate is the third most-visited city park in the United States. A diverse collection of plants, from all over the world, can be found in the park, including fuchsias. But maybe for fuchsias we could better say: "could be found". The park used to have a very beautiful fuchsia collection. *Aculops fuchsiae*, the Fuchsia Gall Mite, changed all that. Most fuchsias are gone now, and the former fuchsia garden is now a children's playground and lecture centre.

Until recently several fuchsias having reasonable resistance to Fuchsia Gall Mite could be found in the park. Amongst these are *F. boliviana* 'Alba' and *F. 'Ruddy Rodney'*. Unfortunately, however, the park management has now taken out almost all of the remaining fuchsias in order to install a new fence. Indeed, *The Times They Are a-Changin'*.



***F. boliviana* 'Alba'**



***F. 'Ruddy Rodney'* (Peter Baye)**



Fuchsia, 10 kV

Further Reading and Information

Douglas Clark, Stimulation and Observation of Leaf Stomata Using a Light Microscope; *Microscopy Today*, July 2019, p. 12-16

Stomata videos can be found on websites www.paedia.com/Stomata.html. and <https://www.nikonsmallworld.com/galleries/2020-small-world-in-motion-competition/herb-leaf-stoma-breathing-pore>

Photographs in this article courtesy Mr. Doug Clark

New pentaploid triphylla fuchsias

The range of pentaploid triphylla fuchsias, the 'Power Machines' for triphylla fuchsia hybridists, has been further extended. Examples of older pentaploid specimens are cultivars like 'Göttingen', 'Thalia' and 'Koralle', and the proprietary seedling B 83-05 from Henk Waldenmaier. These older pentaploids have good fertility and have produced many offspring, frequently by non-Mendelian inheritance patterns.

Recently, a series of new purple triphylla pentaploids (seedling P18-F8 being an example) has been developed having the genome TTTTJ (T = set of *F. triphylla* chromosomes, J = set of *F. jantasensis* chromosomes). First progeny (see the photographs, these are not pentaploids)



Triphylla seedling P18-F8

show a large variation of colour hues, some of which having not been found previously in triphyllas. More research needs to be carried out for elucidating these pentaploid's properties and their non-Mendelian inheritance pathways.



Triphylla seedling N 20-18



Triphylla seedling N 20-26

Contents of the next issue

The next issue is scheduled for the end of July 2021.

Longevity

(by Edwin Goulding)

Longevity is just one aspect of time, a subject we have considered before. Its wider impact on marketing, and competitiveness in relation to other available genera is of vital importance; hybridists should remember this.

Fuchsia inflata: a diploid or tetraploid species?

(by Mario de Cooker).

No unanimous opinion exists on the ploidy of *F. inflata*. In literature both diploid and tetraploid chromosome counts are mentioned. A combination of flow cytometry and phenotypic data of crossings suggest that *F. inflata* could very well be a tetraploid species.

Want to learn more about all this? Then stay connected!

Your contribution to the **The Fuchsia Breeders Initiative** is highly appreciated.

Contributions for the next issue must be available by July 15, 2021.

The Fuchsia Breeders Initiative

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