The Fuchsia Breeders Initiative

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These are rapidly changing times …

Contents of this issue:

Contributions for the next issue, which is scheduled for the end of December 2016, should be in the editor's possession ultimately on 10 December 2016.

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

Photograph on front page:

F. 'Frans Boers' (De Cooker, 2015)

These are rapidly changing times, that call for a different approach to all kinds of subjects, including *Fuchsia* hybridization.

It's now 30 years ago that a young scientist named Richard Jorgensen, in 1986, failed in his attempt to produce intensely purple petunias and instead ignited a revolution in the world of genetics. Unwittingly, his experiment had demonstrated RNA interference (RNAi). This fundamental cellular mechanism regulates which of our genes are switched on or off, therefore controlling when and where proteins are produced. The discovery of RNAi ranks amongst the greatest scientific breakthroughs since the structure of DNA was revealed 60 years ago. As we know now, RNAi is a powerful mechanism in gene silencing, which could be an explanation for the results found in experiments on producing mini-triphyllas as described in this issue of The Fuchsia Breeders Initiative.

Another subject receiving much attention in the last decades is Climate Change. As the saying goes, "*It never rains but it pours.*" Let's hope this does not apply to the period following last month's weather conditions. In the South of The Netherlands, in the first three weeks of June about 250 mm rain has fallen, which is about one third of the average yearly amount. Together with alternately cold and hot weather conditions, this has clearly affected growth and appearance of several of my fuchsias. It could of course be

Editor of The Fuchsia Breeders Initiative

Mario de Cooker

a coincidence, but I have never before experienced so many 5 petal/5 sepal blooms in my seedlings. Apparently, it's a trait in the genes that can be switched on and off. According to Mr. Edwin Goulding:
" … *Several cultivars exhibit this feature sometimes, or frequently. 'Phyllis', 'Checkerboard' and its resultant offspring 'Twinkling Stars' are the most obvious. F. fulgens seems to be mildly associated with the background to its presence. F. splendens and several of its (early stage) crosses also display the irregularity. […] An increase of numerical changes in flower parts can occur among the early flowers but does not then persist. Because I was growing standard whips throughout the Winter months from Autumn cuttings (at 13°C) such changes usually presented around early June and lasted for about three weeks. It seems to be associated in these cases with strongly vertical growth spurts; early removal of side shoots can enhance the effect somewhat. […] Many do not become permanent features after propagation. Many also appear on only one or few branches of a plant."*

Permanent features or not, I'm looking forward to many new and exciting observations during the rest of the season.

Mario de Cooker

Innovation pays off: Fuchsia 'Frans Boers' makes life easy

By Mario de Cooker

Photographs: Mario de Cooker

In todays fast moving world, innovation is of utmost importance. Innovation is the process by which new businesses, processes and products are created to improve performance or replace the existing ones for satisfying the needs of ever-demanding customers.

Also we, as *Fuchsia* lovers, are ever more demanding customers, eagerly looking forward to new and better varieties. And moreover, *Fuchsia* of course faces severe competition from all kinds of other container plants. And these are also continuously renewed and improved over the years.

Potential fields of innovation in *Fuchsia* hybridization are numerous. Think, just to name a few, about the development of new types of blooms, about creating *Fuchsia* varieties having better heat and disease resistant properties or better hardiness, about growing fuchsias because of their ornamental foliage instead of their blooms and about developing new cultivars for in-house cultivation.

Each year still a large number of new varieties are introduced. Most of these originate from applying an alternative mix of the genetic material of rewarding existing cultivars. By crossing two beautiful, fertile *Fuchsia* cultivars, we can be pretty sure that several strong, beautiful seedlings will be obtained. However, chances that something really new will be created are relatively small. Still, many new fuchsias are bred this way, and indeed, several beautiful new varieties still arise each year. But also many look-alikes show up, and as hybridists we should be critical, and try to avoid this.

A large number of the many thousands of existing *Fuchsia* cultivars originates from a limited number of species, amongst which *F.magellanica* plays an important role. It seems therefore highly challenging and rewarding exploring the potential of seldom or non-used *Fuchsia* species for introducing new properties. Besides great advantages, such approach has however also serious drawbacks. Failures will often occur, but that's all part of the game, and such failures are vital for new ideas to see the light of day.

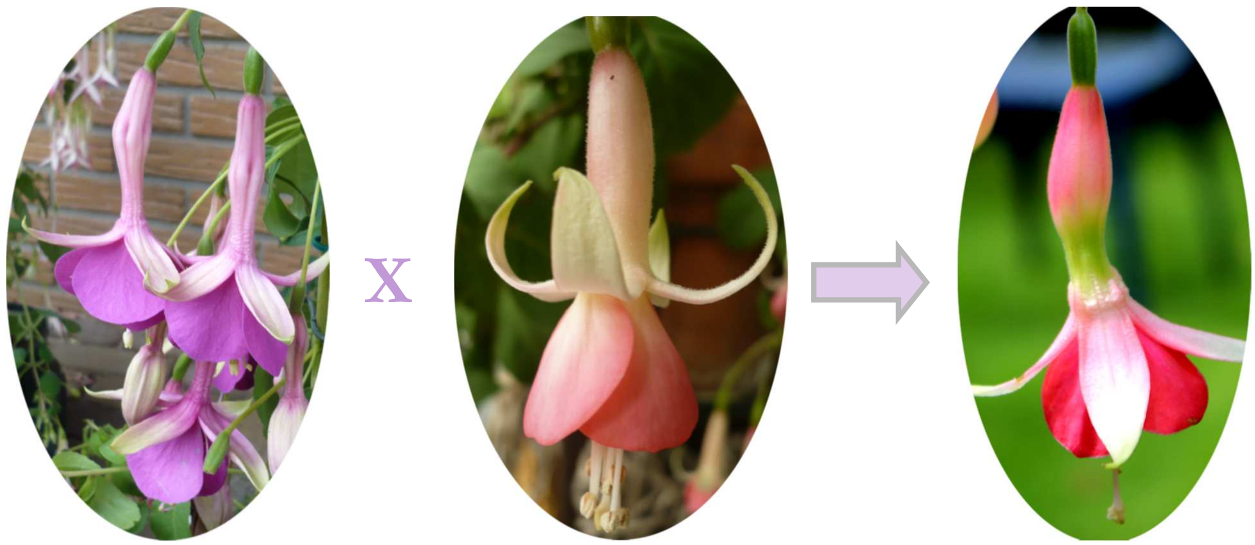
By applying seldom used species in *Fuchsia* crossings, genomes of different specimens are combined. Frequently, these genomes don't really fit, causing all kinds of aberrations to occur as well as low or even full absence of fertility. A serious friction might even occur between the genomes, bringing about all kinds of unexpected and unpredictable events. Especially in polyploid crossings this may lead to a clash of the genomes, resulting in deletion or duplication of part of the ge-

N 99-18 = 'Winter Charm'

X

N 91-39 = 'Playboy' x ?

N 07-20



N 07-20 N 93-08 = ('Checkerboard'x 'Machu Picchu') x ('Checkerboard' x 'Machu Picchu') N 09-07 = *F.* 'Frans Boers'

nome, change of gene expression or even gene silencing. Such events are highly unpredictable.

An example of making crossings using seldom used genetic material is the development of *Fuchsia* 'Frans Boers' (De Cooker, 2015). This cultivar originates from the crossing {'Winter Charm' x ('Playboy' x ?)} x {('Checkerboard' x 'Machu Picchu') x ('Checkerboard' x 'Machu Picchu')}. It has large blooms with a dark rosy red corolla and a marked green belt on its tube.

One of its parents: *F.* 'Winter Charm' is a species crossing (*F.inflata* x *F.juntasensis*) x *F. magdalenae*, dating from 1998. Its genome has been extensively discussed in the July 2015 issue of the Fuchsia Breeders Initiative (p. 18-19). It has moderate fertility.

Both *F.inflata* and *F.juntasensis* from the Hemsleyella section have not been extensively used in *Fuchsia* hybridization. Their rather awkward growth properties, e.g. making long branches, make them unattractive genetic partners for the majority of *Fuchsia* hybridists. However, blooms are very attractive both as regards shape and colour.

By using *F.inflata* and *F.juntasensis* in the hybridization program, both attractive and rather unattractive or undesirable traits will be passed over to the progeny. Inevitably we have to deal with this, and by making next generation seedlings we might be able to improve the expression of attractive traits while simultaneously getting rid of unattractive properties. This is quite a challenge, and it might take several generations before real successes are achieved.

F. 'Winter Charm' has over the years, as the female parent, produced several seedlings, amongst which *F.* N 07-20 (see the photograph). This floriferous seedling has an attractive bloom, however poor growth properties. After its first exuberant flowering period it more or less collapses completely. Furthermore, the look of the bloom suggests that the genomes don't really fit. The tube has a clear distortion, and sometimes several stamens are produced halfway from the petals instead of one stamen following the normal growth pattern.

Nevertheless, using N 07-20 a number of seedlings has been produced. Most of these have been disposed of because they were poor growers or had unattractive appearance. One seedling however has been preserved: N 09-07. This seedling, after having been tested in several situations, was introduced in 2015 as *Fuchsia* 'Frans Boers'.

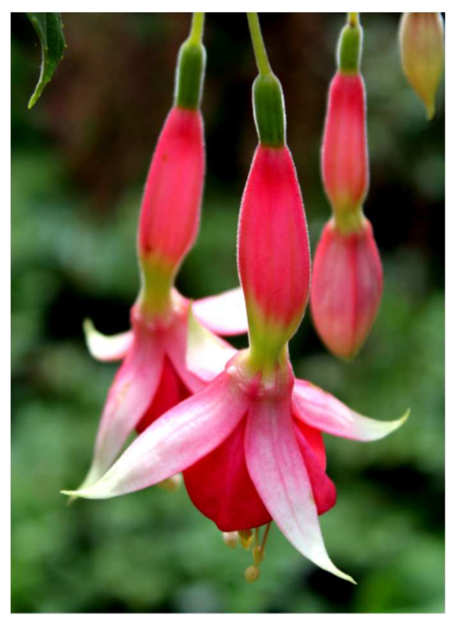
Fuchsia 'Frans Boers' is a floriferous, extremely vigorous grower. It has long internodes, which makes a proper shaping rather difficult. It is self cleaning, tolerates sun and is hardly affected by rain or botrytis because of its open structure. Contrary to normal practice of growing *Fuchsias*, best way of growing seems to just let nature take its course. On the photograph at the right *F.* Frans Bours' is shown, grown in a relatively small 22 cm pot from autumn cuttings (one mid section and two top section cuttings) without doing any pinching. From early to mid June onwards, a sea of flowers is produced for a period of 6-8 weeks. The flowering period can be optimized by adding a couple of late-winter cuttings and/or carrying out some side shoot pinching.

F. 'Frans Boers' can also be grown as a semi trailing plant. Growing it as a standard has still to be explored, but first results look promising. *F.* 'Frans Boers' can of course also be grown from late-winter instead of autumn cutting; however first blooms will then appear somewhat later in the season.

Whatever approach is chosen for, the result will always be a rewarding display of many colorful blooms on a huge plant. But to be honest, referring to the latter: the cultivar will by its size not really fit easily into the smaller garden. Raising *F.* 'Frans Boers' from unpinched autumn cuttings is easy and straightforward. Cuttings will grow during the winter season without any problem in the cold greenhouse at some 5 ºC. Then from early to mid June onwards, a massive and impressive show will be obtained, without having to do hardly any work.

Looking at the result, starting from only three cuttings without pinching as shown on the photograph, imagine what the result might be when starting from 5 - 7 autumn cuttings in a bigger pot. This undeniably justifies the conclusion that growing *F.* 'Frans Boers' makes life easy. Anyway for us as busy Fuchsia growers.

***Fuchsia* 'Frans Boers' grown in a 22 cm pot without doing any pinching (7 July; height = 1.6 m).**



***Fuchsia* 'Frans Boers'**

Bright colours for a flamboyant display.

Photographs on this page by Frans Boers

"It ain't necessarily so"

Photographs: Edwin Goulding

By Edwin Goulding

1. Introduction – Copernicus

"It ain't necessarily so"

This sentiment, expressed so eloquently in Gershwin's "Porgy and Bess", has been proved correct throughout history. Take Copernicus, who worked out that our planet Earth was not the centre of the universe, rather, it revolved around the Sun. This went against everything that was accepted as "truth" at that time. Even though true, progress towards change was slow and tortuous. In this article we will consider some of the fallacies surrounding Fuchsia hybridising. Be prepared for a bumpy ride. We are about to challenge accepted practice and theory.

2. Mendel & classical theory

Most people have heard about Gregor Mendel, who lived from 1822 until 1884. He was an Augustinian Friar and a scientist. His work on the genetics of peas established many of the rules of heredity. Mendelian inheritance provided the concept of dominant and recessive traits. These may be invisible in one generation but become evident in subsequent ones.

Fallacy: It is often assumed that "Like must pair with like" is part of this theory. Wrong. This, like many half-truths, depends upon the matters under discussion and the interpretation of relevant and proven facts. How, otherwise could we explain sexually transmitted diseases like Gonorrhoea and Syphilis, which are themselves sexless; multiplication by division is common in organisms such as bacteria. No one system fits all. This is as true of Fuchsia as it is of the rest of creation.

3. However – Darwinian theory

Charles Darwin lived from 1809 until 1882. He established the theory of natural selection. All species evolved from common ancestors and developed under the influence of their environments. In the struggle for existence this has a similar effect to that of artificial selection as practiced in selective plant breeding. In modern terms this unifying theory is the basis of life sciences and explains the diversity of life.

Fallacy: Species are not necessarily the same across the whole of their geographical range. They are not clones of each other but rather genetic swarms that can vary from virtually identical specimens to quite widely differing ones. In earlier times identification was made visually and by modern methodology, crudely. Techniques, such as Flowcytometry and Chromosome analysis are recent innovations. Their application to the study of Fuchsia has been severely limited by a lack of willpower and of funds. Variation is the norm.

4. Rigid interpretations & conflict theory

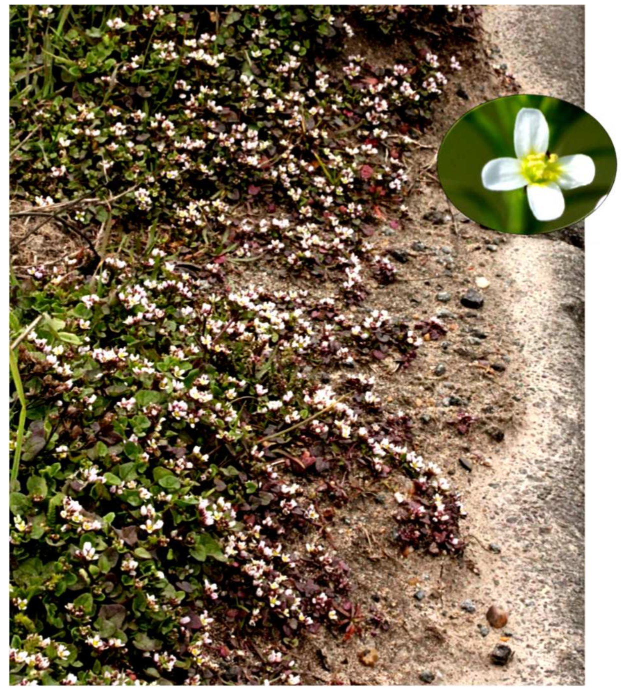
In the natural environment resources fluctuate and are finite. This leads to conflict between species themselves, both animal and plant, and between individuals within these species. Alan Sears, in his book "A Good Book, in Theory: A Guide to Theoretical Thinking", (2008), says "Societies are defined by inequality that produces conflict, rather than which produces order and consensus. This conflict based on inequality can only be overcome through a fundamental transformation of the existing relations in the society, and is productive of new social relations." Now, while Conflict theory might have unfortunate political and social associations for some people, it also nevertheless seems to apply to botanical subjects, such as *Fuchsia*, in the wild.

Our position, as hybridists, is somewhat different. We select the stock that is used for breeding new plants. Resources are also under our control except in as far as they are limited by our finances, time and energy. The world our *Fuchsias* inhabit is an artificial one of our choosing. Conflict only exists within our minds. This means that changes can be brought about much faster than would be the case if change was left to environmental factors alone. Selection of the most appropriate stock helps in achieving specific aims. Foremost among these is the requirement for polyploids if real progress is to be obtained. In theory, the larger the chromosomal content the greater the potential for change. But, here we have a balance to strike, with greater distance (genetically) between cultivars fertility is reduced. Sometimes this is zero, both as a seed and as a pollen parent. At other times the fertility gradient can be very high.

5. Dosage sensitivity – Isabelle M. Henry et al

Genes are not like light switches, either turned on or off. The actions of chromosomes (multiplying by division) are much more subtle. To be truthful, *Fuchsia* characteristics often appear to be more like dimmer switches; again on a gradient between more or less. Isabelle M. Henry has written about the "Genetic Basis for Dosage Sensitivity in *Arabidopsis thaliana*". She and her fellow authors have found a specific locus that is responsible for such an effect and have called it an SDI (Sensitive to Dosage Imbalance).

Observations place triploids as the bridging mechanism by which material passes backwards and forwards between diploid and tetraploid members of specific populations. This allows the prevention of polyploid speciation while still allowing adequate variation in genetic material to appear so allowing, albeit slow, changes to go ahead under environmental stimuli to the benefit of the species' future (See note 1.)



Arabidopsis thaliana

6. Odd chromosome results in Fuchsia – that work

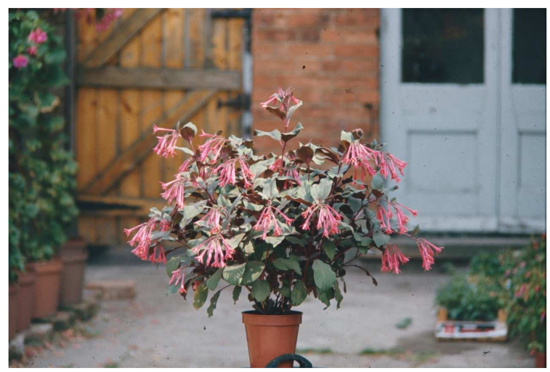
Many years ago it seemed a good idea to start breeding triphylla hybrids in order to cope with changes in the climate and with alterations to the type of house and garden coming into fashion. Since then, the digital revolution has really taken hold and global warming is now an accepted reality.

The only plant that I could find during those early years that produced pollen was continuously under dispute as to its correct name. For this reason, rather than keep changing its title, I labelled it 'Thalia'; now correctly called 'Koralle'. Subsequent experiments showed this triphylla, which had 33 chromosomes, was fertile both ways and delivered results equating with those recorded by Bonstedt; in other words, a highly fertile triploid *Fuchsia*.

Further, subsequent experiments showed many of James Lye's introductions, such as 'Lye's Unique', were also highly successful parents and often both ways. These seemed to have 55 chromosomes; odd numbers seemed to be worth hunting for. Progress was being made but unexpected problems loomed ahead.

Brain Kimberley's 'Koralle'; the centre pot, at Coventry, 2011.

'Lye's Unique', a hybrid with odd chromosome numbers.



'Gartenmeister Bonstedt' a partially sterile hybrid.

7. Fertility gradients

Principle among the developing difficulties appeared to be the almost complete sterility found among the progeny of these special cultivars with odd chromosomal complements. However, careful observation showed this sterility was not always complete; even when it appeared to be so occasional transient variations seemed to be present. It should also be mentioned that rarely would both parents chosen at that time have had the same chromosomal value; there was always an imbalance. Seedlings reflected this imbalance in parental relationship with varying degrees of sterility and fertility. Instead of information appearing in black and white terms things now appeared as shades of grey.
(See note 2.).

'Gartenmeister Bonstedt'

'Thalia', a sterile hybrid.

8. Factors affecting potential fertility

Some factors that affect fertility among our seedlings are beyond our control, but not all. Plants thrive best when they are free from pests and diseases. Regular attention to such things as feeding and watering plays a vital part, too. Fertility is nearly always best when plants are grown out of doors rather than in the hot and dry atmosphere of most summer greenhouses.

There are a few other things that are harder to prove. For example, fertility and variability appeared to rise as autumn approaches. September and October seemed to produce successful results when the same crosses, attempted earlier in the season, regularly failed. Higher relative air humidity appeared to play a part in this success as did reducing light levels. Here again gradients seemed to be present and things appeared to relate to the 'art' of plant breeding more that to its exact 'science'.

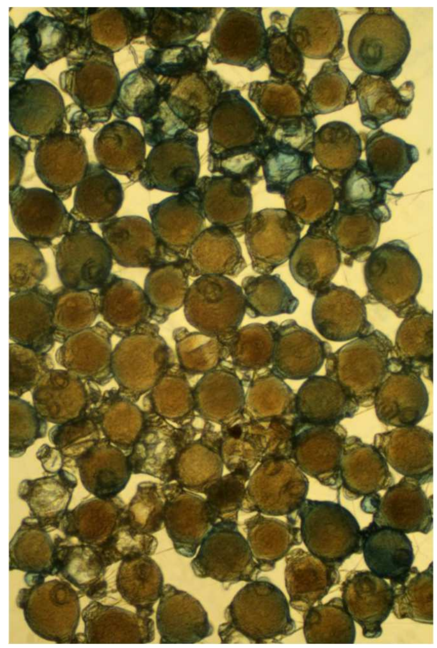
9. Back-crossing & selective outcrossing

Fertility suffers in the initial stages of such crosses. In the event of even minimal fertility being present among the progeny selective back-crossing, often for several generations, gradually restores and increases it again. This, however, also has the effect of fixing many of the characteristics that we might regard as undesirable in the progeny. Variation reduces again as fertility rises.

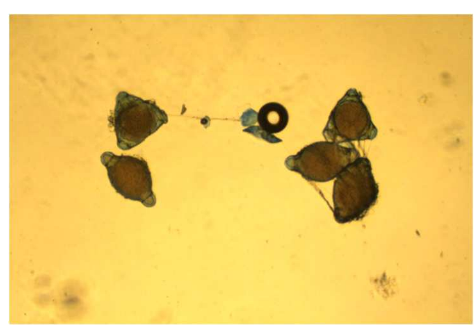
One of the ways of combatting these effects is to out-cross again. Sometimes this might require revisiting one or other of the original parents. At other times deliberate attempts can be made to use completely different parents, either as seed or as pollen partners, in order to move things in the desired direction. Perhaps, growth is too attenuated. Maybe blooms are carried too far away from the branch ends to allow them to be displayed prominently. Flowering might be brief and transient when a long floral season is called for.

10. Pollen analysis

Nowadays, the importance of pollen analysis is more easily recognised. It might not be a complete answer but it is certainly a very useful partial one. We can see, for example, that where reduced pollen fertility is present, say around 10%, it will be necessary to carry out more than one attempted cross if we are to be sure results are comparable with those where fertility is nearer to 90%. Earlier articles also offered the possibility that those specimens that contained wide variations in the numbers of apertures present among pollen grains were most likely to offer wide variations in the appearance of subsequent seedling phenotype.



'Lye's Unique'. A stained pollen sample, highly fertile each way and variable (55 Chromosomes, a pentaploid).



F. insignis **(22 chromosomes). A stained pollen sample and an unexpected result.**

11. Trial & error

This, then, is my excuse for encouraging the wider use of trial and error in our hybridising programmes. It is not to say that back-crossing and line breeding have no place in our plant breeding world. Rather, they, like many of the practices we use, are just tools of the trade. Used in the right place and proportions they have proved immensely useful; on their own, they can be extremely restrictive.

The majority of us are limited in our resources, of time, stock, money and energy. If we are wise we will consider as many options as possible before deciding which course of action appears likely to produce the best rewards in relation to this expenditure. Chromosomal analysis and Flowcytometry, like pollen analysis are valueless without carefully considering what outcomes we desire. Even then, we should be aware that amazing results can appear as if by a miracle and might require complete changes in our attitude. Being open minded allows us to learn from our experiences.

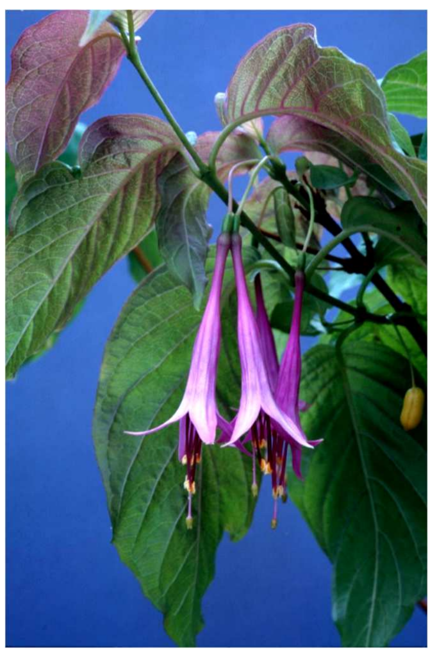
12. Summary

On page seventeen of the November's 2015 issue of "New Scientist" there is a fascinating news item. The oldest tree in the United Kingdom, the Fortingall Yew, is undergoing a sex change; not bad at five thousand years of age. It just goes to prove the point, doesn't it? Keep a sharp eye open. Science is all about provable facts, not just accepted theory and practice. The theory we have just discussed is rather like the accepted practice, in investment terms, of 'Contrarian Policy'.

Note 1: Like all excellent theories there are exceptions. All the species in Section Quelusia have been found to be polyploids.

Note 2: Pollinators with higher chromosomal values than their partners seem to be more successful than the reverse but this is not invariably the case.

'Koralle'. A triploid hybrid that is highly fertile both ways.



***F. juntasensis*, a tetraploid species.**

'Daryn John Woods', a partially fertile seedling. One of many raised from crossing the two.

New Fuchsia from Mario de Cooker

Two *F.* 'Silver Chime' plants cascading down a brick wall. The plants were grown from one year old overwintered plants without doing any pinching.

Fuchsia 'Silver Chime'

Fuchsia 'Silver Chime' (De Cooker, 2016) originates from the crossing ('Strike The Viol' x 'Delicate White') x ('Papy René' x 'Papy René'). Colour of the rather long tube and the sepals and petals is soft pink to near white, depending on growing conditions. It's a natural trailer, which apparently is a stroke of luck in making this crossing because such property does not appear in its parentage. The (near) white colour of course is no coincidence, as it is contained in all of its parents, in e.g. 'Strike The Viol' via 'Our Ted'. The name 'Silver Chime' reflects the cultivar's silvery colored wind chime appearance. It's rather late flowering, first blooms being produced at the end of June/beginning of July.

'Silver Chime' can be grown from autumn or late winter cuttings, but can also be grown successfully as an older plant. By properly shaping of the plant in the first growing season, the older plant needs no pinching because of its excellent branching properties (see the photograph).

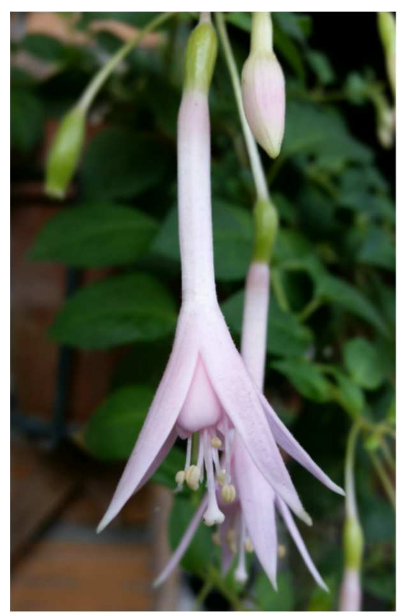
One of the parents, the seedling 'Papy René' x 'Papy René' has been produced by the Dutch hybridist Hans van Aspert. This seedling has also been used in producing *F.* 'Ícicles Chandelier' (De Cooker, 2015).

New website: Fuchsias of the World

Previously, it was always advised to use the Cultivar Inventory List on the NKvF's website for consultation and obtaining a detailed description of new and older Fuchsia cultivars.

Unfortunately, continuity of updating of this list cannot be guaranteed anymore. As an alternative, a new list is currently being prepared, which will become operational most probably at the end of 2016 at Mrs. Sigrid van Schaik's website:

www.vanschaik.nu



***F.* 'Silver Chime'**

Making mini-triphyllas

By Mario de Cooker

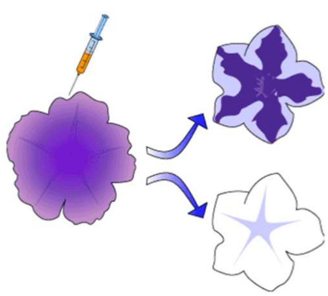
Summary

By crossing seedlings originating from 'Göttingen' x 'Our Ted' with *F. fulgens*, triphyllas can be produced having a tube length far below the expected intermediate value.

Tube length of only about 10 mm has been found, which makes this kind of seedlings real mini-triphyllas, sometimes having blooms almost as small as Encliandras.

Introduction

In 1986, plant scientist Richard Jorgensen failed in his attempt to produce intensely purple petunias and instead ignited a revolution in the world of genetics. When he tried to cultivate petunia flowers with extra purple pigment, he used a seemingly logical approach, and injected an additional pigment producing gene to the plant. To his great surprise, the resulting flowers blossomed with two-tone or totally white petals. Explanation is, that the expression of the genes coding for the dark color pigment becomes blocked. The petunia considers the extra gene as a kind of 'enemy' which should be combatted, including the original gene.



A variegated petunia. Upon injection of the gene responsible for purple colouring in petunias, the flowers became variegated or white rather than deeper purple as was expected.

Unwittingly, his experiment had demonstrated RNA interference (RNAi). This fundamental cellular mechanism regulates which of our genes are switched on or off, therefore controlling when and where proteins are produced.

Jorgensen's finding fueled interest in this area, and a few years later molecular biologists Andrew Fire, working at the Carnegie Institution in Washington and Craig Mello from the University of Massachusetts Medical School, turned their attention to this conundrum.

Fire and Mello's produced monumental results, which were published in the journal Nature in 1998. They were rewarded for their efforts with a Nobel Prize in 2006, but more significantly, their stunning discovery heralded a new era in biological research [1,5].

The discovery of RNA Interference (RNAi) ranks amongst the greatest scientific breakthroughs in genetics.

To appreciate why the discovery of RNAi ranks amongst the greatest scientific breakthroughs since the structure of DNA was revealed 60 years ago, it is necessary to understand the key pathway it acts upon. The central dogma of biology dictates that the manufacture of proteins requires the transmission of a code, which contains genetic instructions, from DNA in the cell nucleus, to an intermediary messenger RNA (mRNA) molecule.

The mRNA carries this precious code to the machinery responsible for translating the code, and the resulting protein is synthesized. RNAi challenges this dogma; rather than acting as a faithful mediator between genes and protein, RNA can be a spanner in the works by interfering with the flow of genetic information.

RNAi serves to regulate gene expression, controlling

RNA interference (RNAi) is a biological process in which RNA molecules inhibit gene expression. Historically, it was known by other names, including co-suppression, post-transcriptional gene silencing, and quelling. Only after these apparently unrelated processes were fully understood did it become clear that they all described the RNAi phenomenon. Andrew Fire and Craig C. Mello shared the 2006 Nobel Prize in Physiology or Medicine for their work on RNA interference in the nematode worm *Caenorhabditis elegans*, which they published in 1998. Since the discovery of RNAi and its regulatory potentials, it has become evident that RNAi has immense potential in suppression of desired genes. RNAi is now known as precise, efficient, stable technology for gene suppression.

Source: Wikipedia

precisely which genes are switched on or off. By unraveling the mystery of RNAi, Fire and Mello revealed one of nature's best kept genetic secrets.

Today, RNAi continues to shape research conducted in labs around the world, both as an incredibly powerful molecular tool and as a topic of interest for potential applications in medicine.

How does this all relate to Fuchsia hybridization?

In the last decades, extensive research has been performed on phenomena associated with producing polyploid plants (general information on the subject can be found in ref. 2,3,4). By combining the genomes of two different species (e.g., making a cross between *F. triphylla* and *F. fulgens*), these different genomes are brought together in one cell. These genomes may differ appreciably, having drifted apart during millions of years of evolution. As a result, cellular processes can be initiated by which expression of certain genes can be changed. New polyploid specimen (neopolyploids) appear to be particularly prone to genetic and epigenetic changes that affect gene expression. These changes would most probably result in the loss or silencing of alleles, and in combination with existing alleles, they could create new variants through reduced levels of gene expression. Gene silencing not only can act as an on/off switch for gene expression, but also can modulate gene expression by specifying the production of intermediate levels of silencing RNAs that in turn specify an intermediate level of gene expression. So the RNA not only determines what regions of the DNA are active, but also the level of activity.

In producing neopolyploid plants (as many *Fuchias* are) this kind of non-Mendelian phenomena is frequently observed. As a result, the phenotypes of the seedlings produced in the crossings may exhibit traits not being present in either one of the parents.

Experiments performed

A number of years ago, a program was initiated aiming at producing *Fuchsias* having a long tube and pastel shades, thereby using various seedlings from the 'Göttingen' x 'Our Ted' series as the female parent. Different *F. fulgens* varieties were used as the male parent. Soon after having produced the first seedlings it became however clear that frequently the outcome was not according to expectations.

In case of simple Mendelian inheritance, an intermediate expression of a trait in heterozygous individuals would be expected. Surprisingly, tube length differed substantially from this expectation, being far less than the intermediate value.

Creating mini-Triphyllas has been done before, but most probably it has never been recognized as being something special.

Also in the past mini-triphyllas have been created, but this has most probably never been recognized as being something special that should be further explored.

***F.* 'Adinda'**

***F.* 'Timothy Titus'**

Table: Crossings made

Female	Male	Code	L1 =tube length seedling	L2 = (Lm+Lf)/2= intermediate value	L1/L2*100%
N 02-16	F. fulgens var. gesneriana	N 14-16	27	50	54
N 02-16	F. fulgens var. gesneriana	N 14-18	17	50	34
N 02-16	F. fulgens var. gesneriana	N 14-20	17	50	34
N 02-16	F. fulgens var. gesneriana	N 14-21	21	50	42
N 02-16	F. fulgens var. gesneriana	---	19	50	38
N 02-16	F. fulgens var. gesneriana	N 14-23	15	50	30
N 02-16	F. fulgens var. gesneriana	N 14-24	15	50	30
N 02-16	F. fulgens var. gesneriana	N 14-37	12	50	24
N 02-16	F. fulgens var. gesneriana	N 14-38	10	50	20
N 02-16	F. fulgens var. gesneriana	N 14-39	11	50	22
N 02-16	F. fulgens var. gesneriana	---	35	50	70
N 02-16	F. fulgens var. gesneriana	---	32	50	64
N 02-16	F. fulgens var. gesneriana	---	29	50	58
N 02-16	F. fulgens var. gesneriana	N 15-13	11	50	22
N 02-16	F. fulgens var. gesneriana	---	26	50	52
N 02-16	F. fulgens var. gesneriana	N 15-23	15	50	30
N 02-16	F. fulgens var. gesneriana	N 15-24	22	50	44
N 02-16	F. fulgens var. gesneriana	---	28	50	56

Legends:

N 02-16 = 'Göttingen' x 'Our Ted'

Lm = tube length male parent = 28 mm

Lf = tube length female parent = 72 mm

'Göttingen' x *F. macropetala*

Examples are *F.* 'Adinda'(Dijkstra, 1995) = 'Göttingen' x 'Bornemanns Beste' and *F.* 'Timothy Titus' (Goulding, 1998) = 'Thalia' x 'Vuurwerk'. A more recent example is a seedling 'Göttingen' x *F. macropetala* made by hybridist Jan de Boer.

As follow-up of this initial observation, tube length of seedlings resulting from crossings N 02-16 x *F. fulgens* var. *gesneriana* has been systematically investigated (see also text box on p. 15). The results are shown in the Table above.

Most of the seedlings as mentioned in the Table have been disposed off. Several had no specific ornamental or other kind of special value. Furthermore, several seemed to have only poor viability, possibly because of aneuploidy genome composition as is expected to occur frequently in such polyploid crossings.

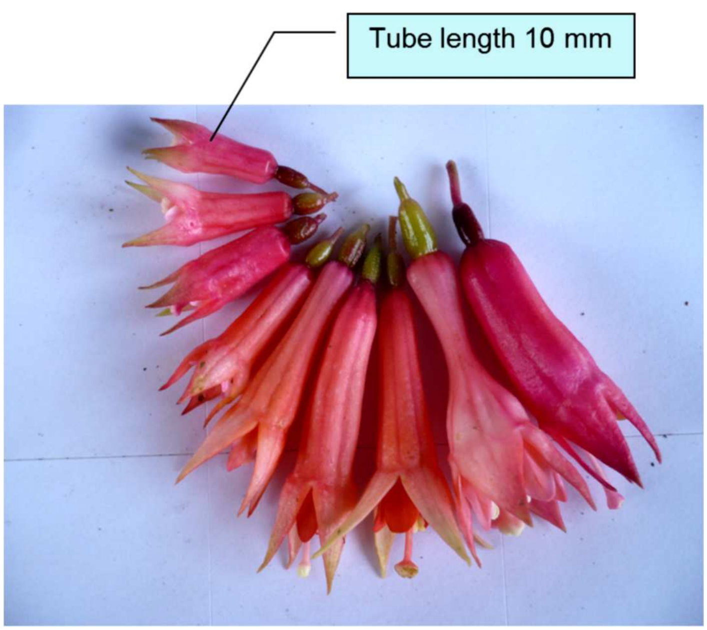
Besides the crossings mentioned in the Table, a number of other crossings has been carried out. The number of these crossings does, however, not allow for carrying out a reliable analysis of one and the same crossing. In general, the majority of these crossings shows results comparable to the outcome of crossings mentioned in the Table. A small number of seedlings showed up having tube lengths of intermediate or even slightly exceeding intermediate value.

Results and discussion

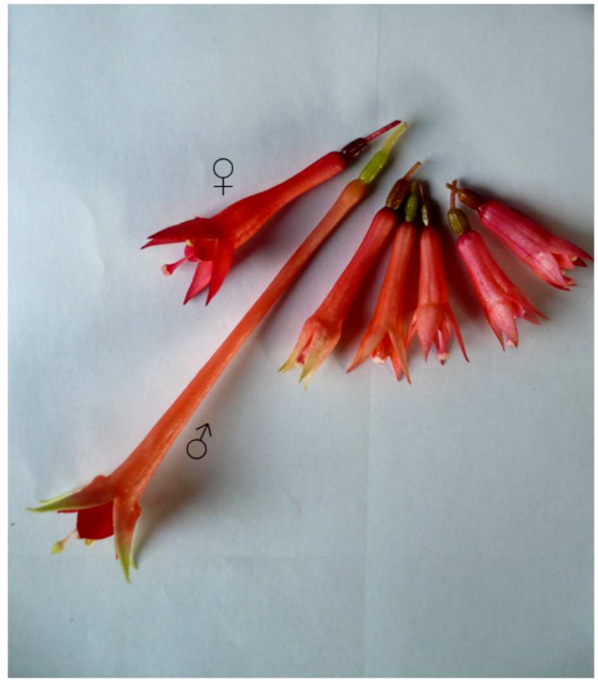
From the results in the Table it shows that tube length in these crosses is clearly not determined by intermediate expression of the tube length determining genes. On the contrary, the average value of the tube length, ranging from 10 to 35 mm, amounts to only 40% of the intermediate value.

Possible explanation is, that by combining the genome of the polyploid specimen N 02-16 with the *F. fulgens* genome, processes are initiated by which the action of the genes encoding for tube length are substantially influenced. This effect could well be brought about by gene repression or complete gene silencing, a phenomenon which is frequently observed when making neopolyploid plants [2,3,4].

Besides the numerical value of the tube length, also the



Examples of mini-triphyllas produced by crossing various ‘Göttingen’ x ‘Our Ted’ seedlings with *F. fulgens* var. *gesneriana*.



Male and female parent and crossing products.

Female parent: **N 02-16** = ‘Göttingen’ x ‘Our Ted’

Male parent: *F. fulgens* var. *gesneriana*

A large difference exists between the smallest mini-triphyllas and the male parent *F. fulgens* var. *gesneriana*.

phenotypes of the seedlings differ appreciably. The seedlings sometimes show substantial similarity with the flower shape of *F. fulgens*, while other seedlings are phenotypically more similar to N 02-16 or other triphylla *Fuchsias* with *F. triphylla* characteristics. Explanation could be, that the genome of the *F. triphylla*-like phenotypes encompasses more *F. triphylla* chromosomes than the seedlings exhibiting *F. fulgens*-like tubes. It will be investigated by Flowcytometry if any differences exists as to 2C value, which then might be correlated to genome composition.

There's still many exciting phenomena to explore also in the *Genus Fuchsia.*

So far, none of the seedlings has produced any pollen. It has furthermore not been investigated if amongst the seedlings female fertility exists. It would be worthwhile investigating this, as silencing induced by RNA can be transmitted for multiple generations without any underlying changes in the DNA sequence [1]. This interference mechanism can indeed be initiated in one generation and then transmitted in the germ line.

Seedling N 14-29 = 'Touch The Lute' x *F. fulgens* var. *gesneriana*; tube length = 28 mm.

References and notes

[1] C.C. Mello, Return to the RNAi world: rethinking gene expression and evolution. Nobel lecture, December 8, 2006.

[2] Luca Comai, The advantages and disadvantages of being polyploid; Nature, Volume , November 2005, p. 36-46.

[3] Thomas C. Osborn *et al.,* Understanding mechanisms of novel gene expression in polyploids; *Trends Genet.* 2003 March; 19(3):141-147.

[4] Comai, L., A. P. Tyagi, K. Winter, R. Holmes-Davis, S. H. Reynolds et al., 2000 Phenotypic instability and rapid gene silencing in newly formed *Arabidopsis* allotetraploids. Plant Cell 12: 1551–1568.

[5] Roundtable Review: The Nobel for RNAi: from petunias to potential cure. http://commons.wikimedia.org/wiki/File:RNAi.jpg. A substantial part of the Introduction to this article has been taken from this source.

Seedling N 14-38 = N 02-16 x *F. fulgens* var. *gesneriana*; tube length = 10 mm.

Seedling N 14-20 = N 02-16 x *F. fulgens* var. *gesneriana*; tube length = 17 mm.

Seedling **N 02-16** originates from the crossing 'Göttingen' x 'Our Ted'. Its genome composition is most probably a pentaploid TwTTFF, T and F being a set of *F. triphylla* and *F. fulgens* chromosomes, respectively. One of the sets of *F. triphylla* chromosomes presumably carries the defect for anthocyanin formation, indicated by Tw.

The 'Our Ted' genome presumably looks like TwTwTwFF, so also a pentaploid cultivar, and very similar to the N 02-16 genome, the difference being that all sets of *F. triphylla* chromosomes of 'Our Ted' carry (at least part of) the defect for anthocyanin formation.

The genome of 'Göttingen' presumably looks like the pentaploid TwTTTF. All of these genomes, derived from a combination of Flowcytometry measurements and data on phenotypes from various crossings, will be reported on separately.

In Search of White Triphyllas

Introduction

In previous issues of The Fuchsia Breeders Initiative experiments have been described on creating a white *F. triphylla*. The goal of making a perfect white *F. triphylla* has still not been fully achieved. Especially the corolla still exhibits some pale hues of pink. Nevertheless, these pale pink *F. triphyllas* prove to be very suitable for being used in hybridizing new triphyllas, e.g. orange /pink bicolor and even white varieties.

Creating white triphyllas: the recipe.

In principle, creating a white or near white triphylla should be a straightforward effort using the near white *F. triphyllas* being available now. The standard recipe looks as follows:

- crossing triphyllas or non-triphylla cultivars with pink *F. triphylla,* followed by
- F1 self fertilization, sibling crossings or crossing seedlings originating from different F1 generations.

Such route will most probably be successful within a reasonable time frame. Biggest problem will be the time, effort, space and patience needed for producing a large number of seedlings, necessary for making an optimal selection of seedlings having best colour, growth, overwintering properties etc.

Obvious starting point would be making use of fertile specimens having already some genetic traits available for making white triphyllas. Examples of these are cultivars originating from 'Göttingen' x 'Our Ted' crossings, e.g. 'Strike The Viol' and 'Touch The Lute' .

Creating white triphyllas: first results.

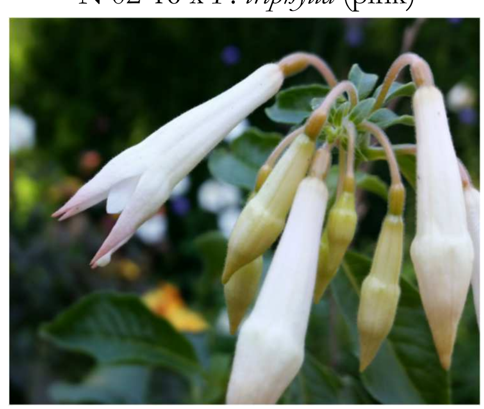
First positive results have been achieved by making crossings N 02-16 x pink *F. triphylla* (for information on N 02-16 see the previous article). As can be deduced also from the photographs, the white of the blooms is nearly excellent, especially the white of the corolla, ranging from very pale pink to pure white. Note also the different shapes of the seedlings originating from the same crossing, presumably induced by N 02-16 gametes having different contribution of *F. triphylla* and *F. fulgens* chromosomes.

Main conclusion from these first results is, that apparently producing a white triphylla, and more specifically a triphylla having a white corolla, is feasible by mere *F. triphylla* and *F. fulgens* input without having the need for introducing magellanica-genes. This is, of course, a great advantage, as it appreciably reduces the risk of the progeny drifting away too far from the real triphyllas and triphylla hybrids.

Unfortunately, these first seedlings prove to be poor growers, and will therefore never be introduced as named cultivars. They could however be valuable for making follow-up crossings.

Triphylla hybrid seedling N 15-22

N 02-16 x *F. triphylla* (pink)



Triphylla hybrid seedling N 15-26

N 02-16 x *F. triphylla* (pink)

A double F. fulgens: could it be used in creating Double Triphyllas?

By Mario de Cooker

Since a couple of years a double *F. fulgens* var. *miniata* is part of my Fuchsia collection. To my knowledge it's the only *F. fulgens* in the world having a double corolla, which makes it a precious asset.

It's quite mysterious how it has originated. According to my memory, the specimen was given to me as a single *F. fulgens* var. *miniata* by my Fuchsia friend/hybridist Mr. Jan de Boer. However, Jan has not the slightest remembrance having ever created a double and/or given to me such single or double specimen. Of course, a sport may have arisen in my own garden, but this seems highly unlikely. As Jan has experimented in the past on making double Fuchsias by colchicine treatment it has all the same most probably originated in his garden.

In principle, the plant could also be a (species) crossing as the imperfect connection between corolla and tube might suggest. Flowcytometry measurements however reveal a 2C value matching a doubled *F. fulgens*, so a genome being composed of 4 sets of *F. fulgens* chromosomes. The plant produces fertile pollen, of which a substantial number has four germination pores.

Don't expect a high ornamental value, it's not the best looking fuchsia cultivar in my collection. In fact, the 4 to about 12 petals sometimes make a rather messy corolla. It's tube length however is impressive, ranging from about 80 to a spectacular 105 mm.

As yet it's still unknown if it could be applied successfully in making double triphyllas; its hybridisation potential has still to be explored. From exploratory crossings it has proven to have, besides fertile pollen, also some modest female fertility. This year, a program has been started to further explore its male and female application in triphylla crossings.

F. fulgens* var. *miniata
(tetraploid with double corolla)

Many *F. triphylla* (pink) seedlings have excellent flowering properties. A large variability is found as to flower shape and growth properties. An example is shown on the photograph: a third generation seedling *F. triphylla* TriMC F3-5A (mid July, 2016). It has still to be investigated which seedlings have the best overwintering properties.

Contents of the next issue

The next issue is scheduled for the end of December 2016.

A brief Resumé of Time

(by Edwin Goulding)

.As hybridists, we ordinarily concentrate on the three dimensions of space because space is of vital importance if we are to care for large numbers of seedlings across several years. In this article he author explores the fourth dimension, time, and its influence upon *Fuchsia.*

Fuchsia 'Sparkling Whisper' has many faces.

(By Mario de Cooker)

F. 'Sparkling Whisper' has been used a number of times in *Fuchsia* hybridization. It has sported, as well at a nursery as in the hybridist's own garden. Especially the sport shows large seasonal plasticity.

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 should be made available at the latest on 10 December 2016.

The Fuchsia Breeders Initiative

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