

CLIVIA



9



Photos: Tessa Nel

Clivia miniata 'Marzelle' Breeder: Chris Welgemoed Grower: Tessa Nel

Front cover: *Clivia miniata* 'Salmon Magnum', Breeder: Edgar Fevrier, Photographer: Gordon Fraser

Back cover: *Clivia miniata* 'Pat's Profusion', Grower: Pat Gore, Photographer: Gordon Fraser

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Editorial

*To own a bit of ground, to scratch it with a hoe, to plant seeds
and watch their renewal of life - this is the commonest delight of the race,
the most satisfactory thing a man can do.*

Charles Dudley Warner

We are sure that all keen clivia growers will agree with these sentiments - no wonder gardening is the most popular pastime in the world. Just communing with nature, pottering about with our plants, watching them grow and finally flower - their renewal of life - can be very satisfying.

Another of our commonest delights is to dream, and *Clivia* lovers well know that *Clivia* seeds are "dreams that come in small packets". Often what keep us going through dreary winters are sweet dreams of anticipation of flowers to come. "The future belongs to those who believe in the beauty of their dreams", as Eleanor Roosevelt once said.

"The beauty of our dreams" is reflected in CLIVIA 9 by the large number of excellent photographs of luscious *Clivia* plants and flowers that have been submitted to us from all over the world. We feature clivias in USA, England, Australia and China, in addition to many in South Africa, from whence clivia-mania has spread far and wide.

The articles in this Yearbook take us from *the past* - Linnaeus, born 300 years ago, who proposed a naming system for all living things that is now universally accepted; four early clivia explorers of the 19th century; the unlocking of the secrets of DNA accumulated over millions of years to interpret relationships between some well-known modern clivia cultivars, to *the present* - reports by delegates

to the 2006 International Clivia Conference on their impressions of the various post-conference tours and of their visits to clivias in the wild through to *the future* - articles on breeding the clivias of our dreams.

Visits with fellow clivia enthusiasts to see the different clivia species in their natural habitat are experiences to be treasured. We trust that the articles in CLIVIA 9 describing such visits will entice many more readers to make similar "pilgrimages" in future. Also, to be able to see clivias growing where they appear to be most suited is a large help when it comes to cultivation.



Clivia miniata in Habitat

Photo: Gideon Schreppers

Once again, we have an international spread of authors – from Australia, China, New Zealand, South Africa, United Kingdom and USA. We thank them, and those who sent us photographs, for their contributions. You have helped to make the Clivia Society's Yearbooks into highly regarded and sought after publications.

Four of the articles are transcripts of talks given at the 2006 International Clivia Conference held in Pretoria last September, including the talk 'Green Gold' by Xueguan Song, leader of an official delegation of Chinese *Clivia* growers from Changchun. This was the very first contact at this level with Chinese clivia growers. One of our South African authors, Hein Grebe, is a regular visitor to China and this Yearbook contains three articles by him which we are sure will generate even more interest in Chinese clivias amongst clivia lovers in the rest of the world.



Photo: Hein Grebe

Clivia miniata at a Chinese flower market

Our contact with the Orient is further developed by Helen Marriott who has drawn on her links with Japanese clivia breeders to tell us how they, and others with their material, are using *C. caulescens* to produce some extremely beautiful hybrids.

Cynthia Giddy's name is mentioned several times in this Yearbook. She was a cycad expert of world renown, the author of *Cycads of South Africa*, an accomplished photographer and a much sought-after national and international speaker, not only on cycads, but on many other plants, including *Clivia*. A founder member of the old Clivia Club, she had a very good *Clivia* collection and used to export offshoots of her plants all over the world. She had about 300 top quality plants from Mr Nakamura, with whom she had been corresponding for a long time and with whom she had exchanged many plants and seeds over the years. She and her husband both died as a result of a motor accident in mid-1998. Yellow clivias which originated from her have been used in breeding programs in many countries – an excellent topic for a future Yearbook article?

At the time of writing this Editorial interspecifics are in flower in Cape Town, attracting iridescent sunbirds that are a joy to watch, chattering away as they flit from plant to plant, looking for nectar, doing their cross-pollinating job in the process. As we look at our own *Clivia*, and at the many very beautiful blooms pictured in CLIVIA 9, it is hard to believe that flowers, with their stunning array of colours and shapes – and sometimes perfumes – were not created especially for us to enjoy. We may have selectively bred a few new varieties of flowers, but the humbling fact remains that plants put on their show, not for us, but for their pollinators...

The Photographic Competition has drawn 155 entries from a paltry 12 entrants. While the best photos are of a high standard the most notable factor is the lack of participation by photographers who nevertheless place excellent pictures on the internet.

The Clivia Yearbook editorial team bids farewell to John van der Linde and welcomes Roger Fisher as incoming lead editor. The Clivia Society has also had a change of leadership, with Prof. Johan Spies taking over as Chairman from Chris Vlok. Johan, who has recently been President of the South African Genetics Society, is both a keen *Clivia* grower and a geneticist – what a happy combination. He leads a team at the University of the Free State that is doing research on various aspects of the genus *Clivia* and has written several articles for recent Clivia Yearbooks. This year he and his team have given us 'DNA fingerprinting

of *Clivia*'. We look forward to further reports on the results of their research.

A complicating factor in their research has been: which source and its associated DNA-profile should be linked to a particular name? Two plants collected from *exactly* the same locality ('Greykloof', to coin a hypothetical name) may superficially look like each other. Offsets from those plants may have been distributed and, in all good faith, have been labelled 'Greykloof Yellow' by their recipients. Yet, when those plants are DNA fingerprinted, they show up as genetically different. Which is then the 'official' 'Greykloof Yellow'? Consequently the authors emphasize that this article is a report on work in progress, and that a fuller picture will only emerge once the test results have been extended to include more orange-flowering *C. miniata*. After all, yellows are not a totally distinct group but mutations from orange.



'Paradise Gracious Goodness' A pastel bred by Felicity Weeden. Peach pollen on a 'Ghost type' *miniata*

Photo: Claude Felbert

The Naming of *Clivia* Plants

Roger Fisher, South Africa

Carl Linné, alias Carl von Linné, alias Carolus Linnaeus

Ossa Caroli a Linne – the bones of Carl von Linné – inscribes a stone slab above the type specimen of *Homo sapiens* – that is if one accepts that the entombed corpse of Linnaeus in Uppsala Cathedral is indeed that of the specimen Linnaeus chose to name our species!

He was born 300 years ago on the 23 May 1707 in Råshult, Sweden 'at one o'clock in the morning, between the month of growing and the month of flowering, when the cuckoo was announcing the imminence of summer, when the trees were in leaf but before the season of blossom', as Carolus Linnaeus himself later recorded. Why all the Latin and his Latinised name? And why does Linnaeus record his birth as part of the natural order of things?

Well, if it had not been that Linnaeus was born three hundred years ago there might not have been a natural order, or at least not an orderly system for classifying the natural order. As Linnaeus himself claimed 'God created, Linnaeus ordered', although he did this in Latin and not English, as if Latin, too, was the language of heaven. The binomial system – that is the giving of two names to signify an individual – is not unique. We all have it, for example, 'Roger Fisher'.

Before Linnaeus the living world was described in lengthy Latin texts alluding to all sorts of characteristics. Like Newton, Linnaeus believed that God-given laws governed the natural order, and he believed two of these were pre-ordained:



Carl Linné

(1) the genus, or a broad grouping of living organisms with shared characteristics – in the plant kingdom sexual characteristics, and

(2) species, the unique characteristics, again in plants – sexual – that a member of that genus displays.

These were the natural characteristics expressive of God's plan as manifest in His Creation.

Over and above this were Artificial Classifications – we use them whenever we resort to field guides – How big is that bird?

What is the colour of that flower? Is that a buck or a goat? Artificial systems rely on categorisation by traits which do not reflect in the natural order of the living thing, such as the ancient Chinese system, where, for example a class of animals might be 'All those belonging to the Emperor', or, as in field guides, 'All large goat-like mammals' or 'All yellow flowers'.

For the description of the unique natural characteristics Linnaeus developed the protologue, or manner in which living things are described, and for this he devised a unique style of Latin, avoiding verbs as far as possible. Here follows an example for *Clivia robusta*, the most recently described of the *Clivia* species, published in the *Botanical Journal of the Linnaean Society* (2004, Vol 146: pp. 369-374):

Clivia robusta B. G. Murray, Ran, de Lange, Hammett, Truter & Swaneveldt sp. nov.

Diagnosis: *Clivia gardenii* Hook, affinis sed qua habitu robustiore majoribus, apicibus foliorum apiculatis, staminibus et pistillis inclusis, habitatione silva palustri anteferenti, et ab omnibus aliis speciebus generis *Clivia* karyotipo chromosomatum et ordinationibus DNA indicibus differi.

Translated as:

Clivia robusta determined by BG Murray, Ran etc. new species.

Description: Related to Major Garden's *Clivia*, but in condition more robust, with leaves pointed at the end, with the stamens and pistils enclosed, preferring marshy woods for habitat and differs from all other species of the *Clivia* varieties in respect of chromosomes and DNA.

Because of Linnaeus's focus on the sexual characteristics of plants we have introduced into botanical nomenclature terms as he used them,

relating in particular to the flower of the plant, for example *anthera*, *corolla*, *petalum*, *pistillum* (in its declination *pistillis*), and *stamen* (in its declination *staminibus*). Had Linnaeus not resorted to Latin as a *lingua franca* or universal language and stuck to his Swedish, his system of classification would not have travelled! Yet travel was what his system of classification required.

While he was comfortably ensconced in his chair as Professor of Medicine at the University of Uppsala (1740 until his death in 1778), he had his 'apostles' scour the new world for plants. There was neither always an easy nor a happy lot, as Linnaeus observes:

Good God! When I observe the fate of botanists, upon my word I doubt whether to call them sane or mad in their devotion to plants.

A choice comment for one who had enjoined that one of his apostles, Osbeck:

... take heed not to return without the choicest spoils, or we shall invoke Neptune to hurl you and all your company into the depths of Taenarum.

We in South Africa are indebted to at least two of these travelling apostles, the one Anders Sparrman, the other Linnaeus's successor to his post as professor at Uppsala University, Carl Thunberg. Hence many Cape plants were named and described by Linnaeus; for instance, more than a quarter of the species in the Cape Peninsula were originally named by him. Governor Ryk Tulbagh sent plants that J. Auzé collected at the Cape directly to Linnaeus for study, and N. L. Burman took the important herbarium of Cape plants belonging to his father, Johannes Burman, from Amsterdam to Linnaeus at Uppsala for examination. Linnaeus and C. H. Wernman, one of his students, wrote the first



The first *Flora Capensis*

Flora Capensis (1759). With J. Printz, another of his students, Linnaeus wrote *Plantae rarioris Africae* (1760). Through this work and the writings of Thunberg and Petrus Bergius, who were also his students, he laid the foundations for the scientific nomenclature and taxonomy of South African plants.

(For the celebrations surrounding the 300th anniversary of the birth of Linnaeus see <http://www.linnaeus2007.se>)

Linnaeus's legacy – botanical nomenclature and taxonomy

Botanical nomenclature is the formal scientific naming of plants. It has a long history, going back even as far as Theophrastus (b. 370 BC, pupil of Plato) who authored *Historia Plantarum* in which he is the first to distinguish between mono- and dicotyledons. Plant descriptions flourished through the Middle Ages when Latin was the scientific language

throughout Europe, and the apothecaries yard was the laboratory. The keystone event was Linnaeus's adoption of binomial or two-part names for plant species in his *Species Plantarum* (1753). This gave every plant species a name that remained the same no matter what other species was placed in the genus, and thus separated taxonomy – classification – from nomenclature.

In the nineteenth century it became increasingly clear that there was a need for rules to govern scientific nomenclature and initiatives were taken to formulate a body of laws. These were published in successively more sophisticated editions. For plants the key dates are 1867 (Louis de Candolle), 1906 (International Rules of Botanical Nomenclature, 'Vienna Rules') and 1952 (International Code of Botanical Nomenclature, 'Stockholm Code'). The International Code of Botanical Nomenclature (ICBN) currently governs the formal naming of plants.

Plant taxonomy is an empirical science, a science that determines what constitutes a particular taxon (taxonomic grouping, plural: taxa); for example 'What plants belong to this species?' and 'What species belong to this genus?' A botanical name is a phrase of one to three words, for example *Clivia* (genus), *Clivia miniata* (species) and *Clivia miniata* var. *citrina* (variety). The first part of the name is termed by taxonomists as the 'generic name', the second part the 'specific epithet'. A plant derives its name from the first of its kind to be formally described, termed the type or leptotype. The type is either a preserved specimen or an illustration. A specimen is a real plant, or one or more parts of a plant or a lot of small plants, dead and dried, kept safe, and curated in a herbarium.

The oldest surviving representative material of the genus *Clivia* is that lodged by Burchell's sister, Anna, with the rest of his botanical collection that is now conserved at the herbarium of the Royal Botanical Gardens, Kew.



Herbarium specimen - *C. nobilis*

Burchell's writings record that he collected his first specimen on 28 September 1813, southwest of the mouth of the Great Fish River. The Kew record states that the preserved herbarium example was collected between Riet Footein and the source of the Kasouga River Bathurst Division Oct 25 1813; obviously an additional specimen that he collected. It appears that Burchell wished to name this plant *Cyrtanthus sylvatica*, or the forest cyrtanthus. Had this been done the genus name would of necessity later have been changed, since it is not

a *Cyrtanthus*. But perhaps the specific epithet might have remained and what was subsequently named *Clivia nobilis* might have been anything from *Imantophyllum sylvatica* (Burchell), through the originally published spelling error without the 'n' *Imatophyllum attonii* (Hooker) to *Clivia nobilis* (Lindley). It also means that the type specimen for the genus and species is neither the collected specimen of Burchell, nor the plant that Lindley depicted that he saw at Syon House, but the rendered depiction by Lindley published in the Botanical Register, and not that of Hooker's of the same plant published simultaneously in the Botanical Magazine. Such are the niceties of botanical taxonomy. Hence, this is a notable case of where an illustration serves as a type. One must further add that it is the original depiction and not the reproduction that is the type.



A botanical artist's sketch of *C. nobilis*



Carl Peter Thunberg spent three years at the Cape

How do we know a plant is a species?

The concept of species is probably one of the most controversial in science. By definition, a species is the fundamental category of biological classification. A species in terms of morphology is defined as the smallest group of distinguishable organisms having constant morphological characteristics. However, natural variation may also cause morphological differences. What if we use compatibility during hybridisation (a concept of a biological species) to distinguish between species? The biological concept of a species defines a species as a group of individuals that produce fertile offspring when crossed, while remaining genetically isolated. Every *Clivia* species can be crossed, each with the other, and their progeny remain fertile.

Plant species are usually defined based on evidence that supports two or more concepts: Morphological difference – for instance the trumpet flowers of *Clivia miniata* in contrast to the tubular pendulous flower forms of all other *Clivia* species. Were this the only criteria there would only be two species of *Clivia*.

Infertility if cross-pollinated – if this were the determinant for *Clivia* there would only be one species in the genus.

Distinct difference between habitats – while all *Clivia* are shade loving, the shade afforded is in a variety of habitats – from the desiccated environment of Oorlogskloof to the perennial swamps of Pondoland. This has allowed for the relegation of the representative populations of distinctly differing habitats to separate species within the genus *Clivia*.

Genetic distinction – the analysis of DNA is playing an ever-greater role in determining the taxonomic place of plants

There is thus still debate as to the status as species of certain *Clivia*, for example that of *C. robusta*. Part of this concerns the type specimen for *Clivia gardenii*. Hooker did not record where Major Garden had collected the plant, although he is known to have campaigned with the military in the Pondoland area. It is thus possible that the type specimen for *C. gardenii* may in fact be what is now termed *C. robusta*. Only DNA analysis of the type specimen will settle the matter.

Should taxonomists differ in opinion then more than one name may be in use for one and the same plant. Within any taxonomic viewpoint only one name can be correct, but others holding a different view may be committed to different taxonomic

nomenclature, since for them, too, only one name can apply. For example, in the case of *C. robusta* there are others who may take a broader view of species and who may accept more variation within what they recognise as a species, and who may prefer to call it the 'robust' or the 'swamp' form of *C. gardenii*. There are *Clivia* enthusiasts who do not wish to have the giant form known as 'Maxima' relegated to the species of *C. robusta*, but would rather have that form designated as its own species.

If confusion has to do with the name, for example if an older name is rediscovered, which thus has priority and so displaces a well-known name, as for example should it be discovered that Burchell had indeed prepared and published a third volume of his travels, and named the plant he had preserved *Cyrtanthus sylvestris*, then the older name would prevail. The Code offers the only means to set a standard.

If confusion is taxonomic (in other words, if taxonomists differ in opinion on the circumscription or the relationships of taxa), then only more scientific research can settle this. However, the ongoing debate as to the status of *Clivia robusta* - accepted by taxonomists as a perfectly valid name - does not solve the problem of how the plant itself is classified. It is we laymen who are looking for certainty; the professional taxonomists seem prepared to live with what we may consider as ambiguity.

Some *Clivia* etymology

Let us start with the generic name, *Clivia*, which is, as is known, the Latinisation of the surname 'Clive'. The surname itself is a derivative of 'cliff', which is a word come to English out of Old German, transliterated

from the Latin *glabere*, meaning 'to peel'. Perhaps it is appropriate that the genus name is associated with cliffs, since the genus finds itself in the relictual forests that follow the scarp down from the high Drakensberg at Mariepskop in the far north, till where they peter out as dune forests at Alexandria. The pockets of the Oorlogskloof, habitat to the oldest of the species, is an exception, but still relictual of forests that once covered the continent before their recession as the grassland, and later still desert, encroached.

Then let us look at the specific epithets in the Genus in alphabetical order:

Caulescens - having a stem showing above the ground [Latin *caulis*, stem], which relates it to cauliflower, the flowering stem, and through its Indo-European root *kaul-* to all coles (Afr. *kool*), i.e. cole slaw, kohlrabi.

Gardenii - after Major Garden. 'Garden' derives from the full vulgar Latin phrase *hortus gardinus* meaning an enclosed garden, which relates it, through its Indo-European root *gher-*, to yard, girth, girdle and orchard.

Miniata - derives from the Latin "minium" through Spanish, for cinnabar, a naturally occurring mercuric sulphide, which was once adulterated with red lead oxide, now applied exclusively to that compound.

Mirabilis - meaning miraculous, derives from the Latin root *mirari*, to wonder at, from its Indo-European root *smel-*, allying it with words such as smirk or smile, as well as mirage, mirror and admire.

Nobilis - which means noble, derives from the Indo-European *gnō-* meaning know or known,

which relates it to such words as, for example, gnome and prognosis.

Robusta – robust, derives from the Latin root *robur*, an oak and by analogy *robis*, the strength [of an oak]. Its Indo-European root *reudh-* means ruddy or red and relates it to words such as ruby and rubric, that being the title or initial letter of a manuscript, usually decorative and coloured red. Which neatly returns us to *minium*, the pigment used for painting these letters, from which then also the term 'miniature', the form of *Clivia* the Chinese seem to admire.

References:

In the writing of this article the following have served as source material and for quotes in text:

for biographical information on Linnaeus – Wilfrid Blunt (1971) *The Compleat naturalist. The life of Linnaeus*

(Collins); and on botanical nomenclature William T. Stearn's appended essay 'Linnaean classification, nomenclature and method'

for the South African connection, M. P. de Vos (1971/2) entry on Linnaeus in SESA Vol. 6 (Nasou);

for plant nomenclature and taxonomy,

http://en.wikipedia.org/wiki/Biological_type and

http://en.wikipedia.org/wiki/Botanical_nomenclature

for etymological information *The American Dictionary of the English Language* (1969).

Readers are referred to the article "What's in a name?" by Johan Spies in CLIVIA 7 for more on the different approaches adopted by taxonomists in the classification of plants. (Eds.)



A fine example of *C. nobilis*. Photo courtesy of the late Mike Christie.

DNA Fingerprinting of Clivia

Johan Spies, Anthia Gagiano and Liezel Herselman,
South Africa

We often hear about forensic discoveries made possible by DNA fingerprinting. These methods enabled the identification of the remains of the Tsar and his family in Russia more than 70 years after their deaths, proved beyond doubt the innocence of death row inmates in the United States (Marvin Anderson, Ray Krone, Earl Washington, etc.) and became a major theme in many TV programmes, eg. "CSI", "Cold Squad", "Medical Detectives", etc. Can this tool be used to enhance our understanding of *Clivia*?

There are different DNA fingerprinting methods available today. These methods are usually known by their acronyms such as RFLPs (Restriction Fragment Length Polymorphisms), RAPDs (Random Amplified Polymorphic DNA), AFLPs (Amplified Fragment Length Polymorphisms), SSRs (Simple Sequence Repeats), STRs (Short Tandem Repeats), etc. We use the AFLP method because it is a very reliable method and presents a high level of variation between different specimens.

For the scientifically minded a diagrammatic presentation of this process is given in Figure 1. The question arises how can this highly technical process help me as a *Clivia* breeder? The following applications of this technique will be discussed:

- *The identity of a plant can be determined*
- *Most likely parenthood of a plant can be determined.*
- *The validity of anecdotes on the origin of a specific cultivar can be evaluated.*
- *The evolutionary development of different cultivars can be determined.*

Figure 1: Validation of cultivar origin

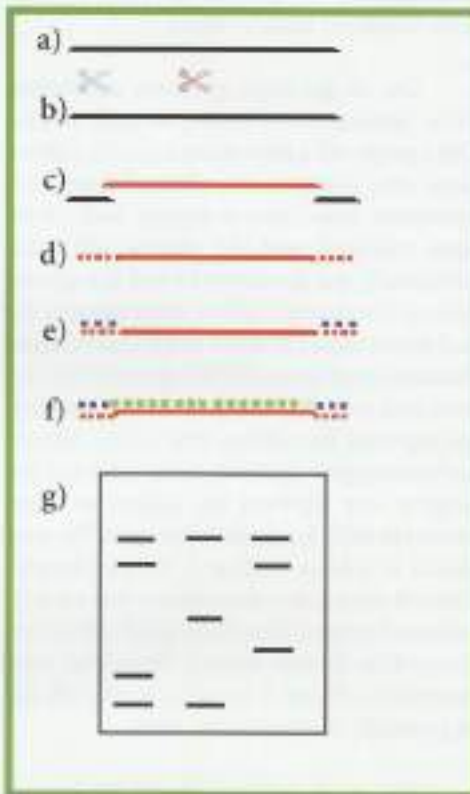


Figure 1. Schematic representation of the procedures used during an AFLP analysis. The process consists of digesting DNA with two different restriction enzymes (a-c). The DNA fragments (red solid line) are then linked to the adapters (red dotted lines) (d). New DNA (green) is then generated (e & f) between specific primers (blue). These newly formed DNA fragments are visualized on a gel (g) and a comparison between the fragments of different lengths will indicate whether corresponding fragments occur in different plants.

Identity

The AFLP method can be used to identify a specific plant. Applications of this in forensic investigations are obvious for cases varying from misplaced labels to fraud.

One of the major problems confronting *Clivia* breeders is the validity of given names. Often people sell a plant under a specific cultivar name even though it was obtained from seed, sometimes even open-pollinated seed. With open pollinated seed the progeny will differ substantially and should not be sold as a specific cultivar. The identity (cultivar/strain name) of the pod-parent should be stated and it must be made clear that the offspring will differ morphologically. Even with self-pollinated seed the progeny may not represent the cultivar. Most *Clivia* cultivars are heterozygotic (split) for many traits and the progeny may represent the cultivar to some extent but differ for several other traits. The seed should be sold as 'Cultivar A' F₁, for example. This will make it clear to everybody that it is self-pollinated progeny from the original cultivar but it may differ in some respects. Remember, even two plants collected at the same locality will not be genetically identical (Spies, 2005).

The word cultivar should be limited to the original plant and clones of that plant (offshoots). Where a plant is propagated by seed and the progeny resemble the parent, the term strain should be used. We should limit the terms used in *Clivia* breeding to cultivar (meaning clone) and strain. The use of more terms confuses many people leading to the incorrect use of terms. We suggest that cultivar or strain registration should be accompanied by a standardised DNA fingerprint (a DNA fingerprint that is done with a specific protocol; using similar chemicals [enzymes, primers,

adapters, etc] and procedures). This will ensure that it is really a new cultivar or strain that is registered and plants sold under registered names can be tested to determine whether they really represent that specific taxon.

Another problem is that someone may tell you that your plant looks like a specific named taxon and you start using that name as the name of your plant, although it may only represent a superficial morphological resemblance and not a real genetic similarity. Or even worse: an unscrupulous breeder may use a well-known cultivar name to obtain better prices for his/her own inferior stock.

Let us get practical and look at these implications. We used two 'Chubb Peach' plants from different sources during this study. The two plants differed morphologically and provided totally different DNA profiles (Figure 2). We doubt that 'Chubb Peach' 2 was related to 'Chubb Peach' 1 (the original cultivar obtained from Sean Chubb himself) in any way. This is a case where 'Chubb Peach' 2 was probably not even an open pollinated progeny of the original 'Chubb Peach'. Somewhere somebody exploited the name 'Chubb Peach'?

A few years ago the senior author obtained approximately 20 seedlings of 'Kirstenbosch Yellow' origin from Kirstenbosch Botanical Garden. Even without any DNA evidence it is evident that these plants differ greatly. The majority of these now mature plants have narrow tepals with approximately eight flowers per inflorescence (first flowering). One plant started its flowering life with more than double that number of flowers on the inflorescence. Three plants had very broad tepals and one represented the opposite spectrum with needle-like tepals. This clearly demonstrates the effect (variation) of using progeny (from

seed) from a cultivar. One of these 20 plants was used during this study and the variation between these individual plants may lead to a misinterpretation of the DNA data.

If we use another example: 'Vico Yellow' is one of the best known yellow cultivars in *Clivia*. The travels of this plant from South Africa to Kew Gardens to Switzerland to Japan are described in detail by Roger Dixon (2005). We obtained specimens of 'Vico Gold' (from Nakamura), 'Vico Gold' (from Smithers), 'Vico Yellow' (from Nakamura) and two different 'Vico Yellow - meristem' specimens. With the good breeding practices expected from these doyens in the *Clivia* world we would anticipate the two 'Vico Gold' specimens to cluster together whereas the three 'Vico Yellow' specimens should cluster together. AFLP analyses indicated that the specimens obtained from Mr Nakamura were genetically similar (Figure 2) and also corresponded to some extent to the specimen from Sir Peter Smithers, regardless of the Yellow or Gold in the name. These data suggested that 'Vico Gold' and 'Vico Yellow' may represent the same cultivar. In contrast the two 'Vico Yellow' meristem specimens deviate significantly from the "true cultivar". The 'Vico meristem' specimens were genetically different. These differences suggest that the original plants used for producing the meristem cultures were not 'Vico Yellow' and that the two plants used for these cultures are also not related to one another. However, more studies are necessary to determine the natural variation in a cultivar. An alternative explanation is of course that these two plants of non-Vico origin were simply labelled incorrectly, for whatever reason.

A last example is 'Floradale Yellow' obtained from two different sources. Once again the two plants do not represent the same

cultivar. Both sources obtained their plants from the Floradale Nursery and subsequently named their plants after the nursery and the flower colour. These results clearly indicated that the nursery propagated plants from different sources. It was consequently incorrect of the buyers to name the plant after the nursery and the flower colour. The nursery did not provide the name, nor did they suggest that all yellow flowering plants in the nursery represent the same cultivar.

These case studies clearly indicated the necessity for a central DNA fingerprint database that should be linked to cultivar registration. This will safeguard the *Clivia* fraternity in the long run from innocent mistakes as well as from abuse by unethical sellers.

Parenthood

Clivia plants or seeds are often sold at very high prices. The price is often linked to the 'pedigree' of the parents. This AFLP DNA fingerprinting technique can determine which cultivars were probably used as parents for a specific plant. This will also help to determine if pollen from your plant was stolen and used by someone else.

We used three sets of parents with their known offspring in this preliminary study. The first case involved an interspecific hybrid between *C. caulescens* and *C. mirabilis*. The hybrid clearly displayed a combination of the parental fingerprints. The second set was 'Floradale Apricot' crossed with 'Umtamvuna', both *C. miniata* plants. In each set of results the two parents shared many similar fragments and the hybrids showed a mixture of these fragments. To test the effect of maternal influence a reciprocal cross between 'De Villiers Variegated Peach' and a yellow *Clivia* was used. Both the yellow (yellow x 'De Villiers

Figure 2.
Consensus
 cladogram of
 the different plants
 used during this
 study. Blue represents
 Group 1 yellows, red
 Group 2, orange Peach
 and black unknown or
 other groupings. (See
 text for detail.)



Variegated Peach') and peach ('De Villiers Variegated Peach' x yellow) offspring produced fingerprints showing a combination of both parents. A section of the DNA fragment indicating the combined effect in the hybrids is shown in Table 1.

In order to do parenthood testing a young leaf of the hybrid and both parents should be provided. As the fingerprint database grows, leaf material of only the

and the plant she got from Cynthia Giddy flourished. On two separate occasions Mrs Höll sold plants to Fred Gibello. Mrs Höll had a son-in-law, Nico Frick. He eventually inherited her collection. After his death in a car accident, Fred van Niekerk bought the collection.

Thus the 'Natal Yellow' sold to Anna Höll became known as 'Giddy Yellow', 'Höll's Yellow', 'Swellendam Yellow', 'Fred Gibello Yellow', 'Frick Yellow', 'Jardine Yellow', 'Stella

C. caulescens	10110111111111010001110000111100110110111100001001110011101001
C. mirabilis	11110010111111110011111011000001011101101110011000010010011100000
hybrid	1011001111111100111110101111110110110111001100000010011101001
Floradale Apricot	1011011111101111011111101111011111101101110011010000011111100011
Umtamvuna	10110111111111011001111101111011111110110111001101000001111110011
hybrid	101101111110111101111110111111101101110011010000011111100011
De Villiers Var. Peach	10111011111111111101100000101011111111101110111010000011111100011
Yellow	1010101111111111001111000101011111111101100111010000011111100011
Yellow Offspring	1010101111111111001111000101011111111101100111010000011111100011
Peach Offspring	101110111111111101100000101011111111101110111010000011111100011

Table 1: Characters (AFLP fragment present or absent) shown in a binary state. Blue indicates that the character was inherited from the pod-parent, red from the pollen-parent and black could be inherited from either parent.

hybrid will be needed eventually.

Validation of cultivar origin

Many *Clivia* discussions are based on the origin of certain cultivars. The history of 'Natal Yellow' was conveyed to us by Fred van Niekerk in the following way: Cynthia Giddy collected plants in nature. She found only one yellow *Clivia* in nature and named it 'Natal Yellow'. She sold one of her 'Natal Yellow' plants to Mrs Anna Höll. Mrs Höll resided in Swellendam

Parish Yellow', etc. The only yellow *Clivia* produced through line-breeding by Cynthia Giddy was 'Cynthia's Best' (Van Niekerk, personal communication). All these plants, with the exception of 'Cynthia's Best', should consequently be identical. The other exception may have been Fred Gibello's plants, since it is not known whether he used these plants in any hybridisation process or just propagated them.

Unfortunately we did not have material bearing all these names, and we obtained material from different collectors. However, this study indicated that the two specimens labelled 'Natal Yellow' showed many similarities at DNA level with plants named 'Giddy Yellow', 'Höll/Frick' and 'Cynthia's Best' 1 (Figure 2). This may support the anecdote of the origin of this group to some extent. However, another 'Cynthia's Best', plant 2, was genetically different from this group. Once again the validity of the cultivar name 'Cynthia's Best' is questioned. Furthermore, some morphological differences occurred in this group; leaf tip die-back was observed in the 'Natal Yellow' specimens but not in the other specimens. The two 'Cynthia's Best' specimens differed in leaf morphology; 'Cynthia's Best' 2 shows the "wavy leaf margin" associated with this cultivar whereas leaves of 'Cynthia's Best' 1 exhibited normal straight leaves. Our conclusions are that 'Cynthia's Best'

1 is actually a 'Natal Yellow' specimen; Mrs Höll got a 'Natal Yellow' from Cynthia Giddy and these plants differed from 'Cynthia's Best' with respect to leaf tip die-back and some differences at DNA level. It is known that plants produced from seed of 'Natal Yellow' may produce normal leaf tips. It is consequently possible that 'Cynthia's Best' represents linebred F_1 's or F_2 's of 'Natal Yellow'. This will also provide a reason for the small differences at DNA level between these plants.

More specimens of each "cultivar", including 'Cynthia's Dream' (a new cultivar developed by Fred van Niekerk), should be studied to get an unequivocal answer to this anecdotal history. Once again the validity of the names of the plants we used in this study may be questioned.

Evolutionary development

The last application of AFLP fingerprinting used in this study is the evolutionary relationships in a certain group. Evolutionary studies usually involve DNA sequences but we wanted to test the ability of the AFLP technique in this regard.

An interesting feature of the cladogram (Figure 2) is that Group 1 yellows frequently clustered together, as did Group 2 yellows (Van Niekerk, 2005). However, the clades containing Group 1 plants were spread throughout the cladogram as were Group 2 clades. This suggests that the mutations causing Group 1 or 2 yellows occurred several times in the history of *Clivia*. These findings should, however, be confirmed through DNA sequencing of several DNA-regions.

One of the most interesting clades was the 'Peach' clade, containing Chubb, Bonnie, Gill Hornby and Gail's Peach. The draw-back of our study was the fact that we received the leaves of many of the plants but no further information regarding the plants. Our initial



Photo: Mick Dower

Floradale Apricot — a plant that produces interesting breeding results.

thought was that these peaches might have the same origin. However, information provided by Sean Chubb indicated that these four cultivars differed significantly on morphological level and originated from different geographical areas. So, in spite of clustering together, these peaches do not appear to have a common ancestor in the near past, as the cladogram suggested. Another peach, Myuma Peach, was excluded from this clade, suggesting that the colour peach did not develop only once. It would consequently be wrong to give taxonomic status to the peach forms of *Clivia*.

Another limitation of this study was the exclusion of orange forms of *Clivia*. By including orange plants the validity of a monophyletic (a single forefather) clade for yellows (var. *citrina*) could have been tested. The inclusion of more specimens could also have improved the resolution of the cladogram.

Conclusions

This study clearly indicated that AFLPs can be used to determine the identity of a specific plant and can be used for this purpose in forensic studies. Most importantly, it can distinguish between different cultivars. It further proved that the same procedure might determine the parenthood of a hybrid and it can be used to test the validity of anecdotes on the origin of a specific cultivar. Although the technique has also been used to determine the evolutionary development of different cultivars, more studies involving DNA sequencing are needed to test the validity of the assumptions made during this study.

The most important contribution of this study is the recommendation that all new cultivar/strain registrations should be accompanied by a DNA profile. This is the only way in which we can ensure that newly registered cultivars/strains are "really new novelties" and that people do not misuse "high profile" cultivar names.

Acknowledgements

We would like to thank Sean Chubb, Mick Dower, Fred van Niekerk and John Winter for providing material used during this study. The knowledge shared by them is also gratefully acknowledged. Financial support by the University of the Free State is greatly acknowledged.

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Chubb 'Pretty Pink Mistress'

Photo: Sean Chubb

Four 19th Century *Clivia* Explorers

John van der Linde, South Africa

Southern Africa has been blessed by nature in many ways. We enjoy magnificent scenery, wildlife and flora. From very early on, visitors from Europe collected plants and seeds to be taken back to the Northern Hemisphere, where they were described and named by the leading taxonomists of the day. For example, the 'King Protea', *Protea cynaroides*, which today is South Africa's national flower, was being grown in London over three centuries ago (1698).

Four of those visitors from Europe are amongst those relevant to *Clivia* history; two of them civilians with botanical training, and two of them army officers who were also off-duty plant collectors. We have a likeness of

Coucal, and you may recognize two of the plants named for him, *Androcymbium burchelli* and *Burchellia bubulina*, but few people know about him and his *Clivia*.



Preparations for the Journey

Burchell's wagon



William Burchell at age 73 in 1854

He was born in Fulham, London, in 1781, the son of a prosperous nurseryman. Having worked for a time at Kew, he was employed on the island of St Helena as a 'schoolmaster and acting botanist'. His fiancée sailed from England to marry him there but went off with the ship's captain instead. After that experience Burchell never married. He left for Cape Town in 1810. There he had a wagon specially built for him, and in June 1811 he trekked off into the interior, accompanied only by six 'Hottentot' [Khoekhoen] men and his span of oxen, on a journey that was to last four years. He recorded part of the journey in his two volume book "Travels in the interior of Southern Africa". Some of his rarely-seen paintings and etchings have been used to illustrate this article.

only one of them, and know the most about him: William John Burchell. You may know of Burchell's Zebra, and the bird, Burchell's

They set out from Cape Town accompanying a group of missionaries traveling inland, away from the beauties of the Cape

Floral Kingdom. They crossed the Berg River and rumbled inland towards the Roggeveld, literally at the pace of an ox, most suitable for viewing plants along the way. After the mountains came the endless open vistas of the arid semi-desert of the Great Karoo. Before this trip Burchell had never in his life eaten food cooked over an open campfire, let alone spent a night out in the open. He was a small, gentle man who hated to kill even a bird, so one of his men would go out and shoot for the pot.

Burchell and his team got their wagon across the great Gariep or Orange River to Griquatown and Kuruman in the north, where he collected the type specimen of the White Rhinoceros. They climbed over the Sneeuberge (Snow Mountains) and got as far south-east as Graaff-Reinet, and then Grahamstown. Their long journey took them as far as the mouth of the Great Fish River, and finally CLIVIAS!



Original drawing made by Burchell in 1811 when crossing the great Gariep river.

The earliest scientific record we have is that of a *Clivia nobilis* that Burchell collected on 28th September 1813, south-west of the mouth of the Great Fish River. The habitat photo below was taken in the area. It appears that Burchell may have intended to publish his specimen as *Cyrtanthus sylvatica*, i.e. the forest cyrtanthus, but he never got around to



C. nobilis, at first glance not unlike a forest cyrtanthus

Aurifol Batters



Cyrtanthus obliquus

Aurifol Batters

doing so. This would have preceded Lindley's description of *Clivia nobilis*, which was written a full 15 years later. Note the resemblance

between the flowers of *Cyrtanthus obliquus*, which Burchell collected in the mountains in the Somerset East district, and those of *Clivia nobilis*, both illustrated by Auriol Batten.

Around the time he collected the *Clivia nobilis* Burchell decided to head back towards Cape Town, stopping along the way at Port Elizabeth and at coastal villages en route. They eventually reached Cape Town in mid-April 1815, 4 years - and 7200kms - after setting out on their journey. Burchell had collected over 40 000 specimens.



Burchell's round trip took over 4 years

The next person to collect *Clivia nobilis* and send plants back to Britain was almost certainly an army officer serving in the Eastern Cape, asked to find plants by someone who had seen Burchell's specimens back in Fulham and who had found out from him where they had been collected. It was one of these plants that flowered at Syon House that the botanist Lindley saw and named for Lady Clive in 1828. It would appear that no record of this person's name exists today.

Meanwhile, back at Kew Gardens ... another *Clivia nobilis* had flowered, this time one of several collected for Kew by James Bowie, probably in 1822, and described as growing "on shaded spots, near Quagga flats, and more common in the Albany tracts, near the great Fish River". In the records, it is Bowie's name that has ever since been associated with *Clivia nobilis*.

James Bowie was born in London around 1790, the son of a seed merchant. He joined the staff of the Royal Botanic Gardens, Kew. After a period of training he was sent to Brazil in 1814 to collect seeds and plants for Kew. He arrived at the Cape from Brazil in November 1816, still only about 26 years old, as a professional plant collector. For the next 6 years Bowie sent many bulbous plants, succulents and seeds back to Kew, collected on his expeditions to the southern and eastern Cape, where he collected the *Clivia nobilis* that were taken back to Kew and also northwards to the Orange River. He was recalled to London in 1823.

Bowie found it hard to settle down in London, and he returned independently to the Cape in 1827, the year before *C. nobilis* was described. He worked as a professional plant collector and gardener until he died in Wynberg in 1869, when he must have been close to 80. He never married. His name is commemorated in the genus *Bowiea*.

James Bowie might have ranked among the great botanical collectors of the Cape, but he often gave wrong localities in the labels attached to his plants. This has made his collections of little use to botanists. He was possibly simply trying to put his competitors off

the scent. In fact, Bowie complained in writing about an army officer who sent 40 soldiers at a time out collecting for him. Competition among collectors is fierce, even to this day.

Throughout the period about which I am writing it was common for army personnel to make extra money by collecting and selling specimens from places where their army activities took them. As well as plants, they collected rocks, birds' eggs, seashells, snake skins, butterflies, seaweeds and small mammals and reptiles.

This neatly brings me to **Robert Jones Garden**, one of many plant-collecting soldiers who served in South Africa in the 19th century. He fought in the Frontier Wars in the Eastern Cape and from 1848 was based in Pietermaritzburg, Natal. He collected plants and other specimens, to be sent to England. *Clivia gardenii* was named for this many-sided man: professional soldier, a gifted and observant journal writer, a prickly personality; a talented amateur geologist, artist and plant collector of note. He is also something of a mystery, as is his *C. gardenii* ...

I say this because there is no trace of him or of his parents in the birth records of England, Scotland or Wales; nor a record of where and when he died. As for his *Clivia*, all



C. robusta growing on the bank of a stream

Photo: Ian Coates

that we know is that it was found somewhere in Natal. Annoyingly, he did not record where he found it. We know from army records that he served for a short time in Pondoland, which is swampy *Clivia robusta* country. Who knows, maybe the plant he found and took to London was a *C. robusta* and not a *C. gardenii*!

Garden's name is commemorated in *Clivia gardenii*, *Albuca gardenii*, and *Streptocarpus gardenii*.

Perhaps the romance of those early days has gone, but *Clivia* exploration continues in the 21st century, across rivers and in difficult country. Plant collectors still go out looking for special plants in the wild, hoping to find *Clivia* as unique as 'Appleblossom' and 'Andrew Gibson'.



C. nobilis

Photo: Ken Smith



The unusual colour distribution of 'Andrew Gibson'

Photo: Sean Chubb

A Visit to the Home of *Clivia mirabilis* Jim Shields, USA

Rashid Qureshi and I toured South Africa with our wives in September 2006. Near the end of our tour, we had the opportunity to go on one of Hein Grebe's famed Mirabilis Tours. We stayed up in the Bokkeveld, in Nieuwoudtville. We awoke early on the morning of Monday, 25 September 2006, to rain, where the rain is supposed to be only ca. 30 cm per year at this altitude (ca. 600 metres above sea level). Admittedly, rain falls here mainly in the winter, but this was spring... Our wives decided to stay behind at the guest house, so our guide Beate drove Rashid and me down to the meeting point in Vanrhynsdorp, some 50 km to the south-west of Nieuwoudtville, for the *Clivia mirabilis* habitat tour. We assembled at the guest house where most of the other tour members were staying. Down in Vanrhynsdorp, at an altitude of about 330 metres above sea level, it was sprinkling rain intermittently. We debated what to do.

We went. We boarded three vehicles and headed out to the farm where the clivia plants are growing in the wild. There were 10 of us, including Beate; since our wives did not come, she had the chance to join the tour. Beate isn't really a clivia person, but she is pretty game, and in better condition to climb around a rocky cliff than most of us! We drove for about an hour on asphalt and then dirt roads, under overcast skies and through more occasional rain showers, climbing into the mountains of the escarpment.

The two ordinary cars were then parked at the point where the dirt track started to climb sharply. The third vehicle, a 4-wheel drive that could comfortably carry 4 passengers, was used to shuttle us higher up into the mountains to

the farm, situated in a secluded valley. At the farm house, we disembarked and found two ladies, Betsy and Erika, putting together the makings of a "braai," or cookout. We looked around while the 4x4 returned for two more loads of visitors.



The road to Mias's Farm

Photo: Claude Felbert

The farm is diversified. They run about 40 head of the native Nguni cattle as well as some sheep, and plant such things as rooibos, the small bush that is the source of Rooibos tea. "Rooibos" just means "red bush," and the bushes turned out to be very bright green, with scattered tiny yellow flowers. The very narrow leaves are pointed toward the tip of the shoot and pressed closely to the stem. At a distance, they looked almost like evergreen shrubs such as juniper or *arbor vitae*. The shoots are picked by hand and then dried. In the drying process, the red colour develops. It appears that the

green shoots are loaded with anthocyanins. Since it contains no caffeine at all, Rooibos tea becomes a natural caffeine-free beverage. On my visits to South Africa, I've learned to love Rooibos tea.

We then debated whether to go on to the *Clivia* site. The road from there was even narrower and steeper, and in worse condition. On top of that, it was wet and muddy and therefore slippery. Finally our host Mias, the farmer who owns this land, drove on in the 4x4 to try it out. He returned satisfied that he could get us there and back again safely.



Photo: Tony Barnes

A view of the terrain where *C. mirabilis* is found

Once at the habitat site, we climbed out of the 4x4 and Mias pointed out where the *Clivia mirabilis* were growing. They were on a west-facing slope almost filled with blocks of sandstone and granite rock that had fallen from higher up on the cliff walls over the centuries. There was an open thicket of small trees and bushes growing in the crevices between the rocks, and under them a sparse mixture of *Zantedeschia olerata* (what we Americans commonly call "Calla Lily" and in South African is commonly refer to as "Arum Lily") and, of course, the mature *Clivia* plants that we had come all this way to see. The blocks of stone were two to three feet on a side. We had to get down over the jumble of large rocks

to see the *Clivia*. Climbing up and down over them was a bit of a challenge.

The *Clivia mirabilis* were large plants. Although some scapes were showing, we did not find any *Clivia* in bloom. The plants themselves were growing from cracks and crevices between the large blocks of stone. The leaves were erect and quite stiff. They seemed to be mainly narrow, though there were some broader ones to be seen. Those plants we saw that were exposed to a lot of sun were not in nearly as good condition as the vast majority of the plants, which were growing in shade – they were surviving, rather than thriving. I was told by someone who visited the site the next day that two of them had managed to lift a slab of rock next to a smallish plant, to see thick roots, much thicker than those of any other of the *Clivia* species, creeping below the rock.

We photographed the plants, and then clambered out of the rocky gully to the track that the 4x4 uses. On the other side of the 4x4 track, uphill from the *Clivia*, I could see very large, healthy-looking plants of *Haemanthus coccineus* as well as some more of the *Zantedeschia*. The *Haemanthus* appeared to be growing in better soil than the *Clivia*, with very few of the large blocks of stone seen where the *Clivia* are growing. Mias told us that the *C.*



Typical *C. mirabilis* habitat

Photo: Tony Barnes

mirabilis were confined to a strip of the hillside, from quite high up, down to the small stream at the bottom of the slope. They did not grow on either side of that strip, which he said overlay underground water seeping from a source near the top of the hillside. So it would appear that, despite the apparently harsh environment, the *C. mirabilis* and their companion plants obtained enough water for their needs.

After an excellent lunch back at the farm, a subset of the group, including Rashid and me, were taken out to a site at a lower elevation where some unusual small bulbs were seen. One of these was a pink flowered *Lachenalia* with a single leaf wrapped around the base of the flower stalk; I hope it doesn't turn out to be plain old *L. mutabilis*. Some others were a couple species of terrestrial orchids in the genus *Satyrium*, both *S. erection* and the dwarf *S. pumilum*. Finally there was a small orchid that must be a *Disa*, but perhaps a new species. Specimens of the *Disa* were taken, with the

farmer's permission, to send to the appropriate taxonomist at Kirstenbosch. I urged them to send specimens of the *Lachenalia* to Graham Duncan at Kirstenbosch as well.

This was a memorable outing, especially as having recently done the other habitat tours we were able to contrast the growing conditions of *C. mirabilis* with those of the other species. What an interesting genus we are dealing with! The trip was made even more memorable for all of us by our farmer host and his family who were so welcoming. A visit to the farm is an experience in itself. I would recommend this outing to anyone. These dates were the only time we had at the end of our South African visit to fit in this trip, but we saw the promise of what was to come. Two or three weeks later many of the *C. mirabilis* would have been in full and glorious flower. We nevertheless felt privileged to be able to visit these particular plants in their natural habitat, surviving so well in their specialised environmental niche.



Photo: Tomy Barnes

C. mirabilis flowers different stages of opening



Photo: Claude Felbert



Photo: Tomy Barnes

The rocky west facing slope where *C. mirabilis* grows

The Noble *Clivia nobilis* in Habitat

Tony Barnes, New Zealand

For some inexplicable reason I have always been drawn to *Clivia nobilis*. I don't really know why - perhaps it's because it was the first *Clivia* to be named, or maybe it's simply the name "nobilis", which all must agree has a certain classy air of distinction. Whatever the reason, after growing them from seed and waiting seven years for flowers (the first began flowering two years ago now), I was determined to see this species growing in the wild - when I visited South Africa last year for the *Clivia* 2006 conference. Fortunately the enthusiasts of the Eastern Province *Clivia* Club were willing to plan a habitat tour, so I was quick to book in.

Tight schedules didn't allow time to drive from Durban via East London down to Port Elizabeth, which was a disappointment for me, as I was keen to visit the Kei River area, north-east of East London. But after a quick flight from Durban to Port Elizabeth, our small group was warmly welcomed by local club members, bundled into a couple of cars, and headed straight off up the coast to visit nobilis at its seaside home.

I had read about *C. nobilis* habitat in Yearbooks, but was still thrilled and amazed when we stopped at the small settlement of

Kleinemonde, about an hour's drive north-east of Port Elizabeth, past Port Alfred but before the Great Fish River, and found mature flowering plants of *C. nobilis* happily growing in the natural scrub that made up the gardens of these mostly holiday houses. Only a hundred metres or so from the stunning white sand beach and rolling surf, these plants were thriving under a virtually impenetrable 2 metre high cover of wind-blasted vegetation. The plants were short and stubby, and although some on the edge of the scrub, which obviously received a considerable amount of sun, were a slightly bleached green, many were flowering wonderfully, in varying shades from pale apricot pink to mid-red, all with the characteristic green tips.

In this fragile coastal dune area it is so pleasing to find that, despite the inevitable human habitation, natural vegetation is left untouched as much as possible and precious plants such as these can continue to thrive here as they have done for thousands of years. It was an extra thrill to be close to where William Burchell must have found and collected his *nobilis* way back in 1813.

Photo: Tony Barnes



The Nobilis Coast



Typical Habitat

Photo: Tony Barnes



Charl Malan and the tour party

The next day we headed inland to Grahamstown, and after an exciting bouncy trip in the "bakkie" up to the heights of Featherstone Kloof Reserve, hiked for almost an hour to reach a remnant of bushveld wood. Here, in the cool deep shade alongside a tiny stream, we found *C. nobilis* in its woodland residence. The leaves of these plants were much longer and deeper green, many showing the distinct pale median line along the midrib, as we were to see on the *C. mirabilis* plants in habitat a week or so later. Plants tended to be single, but often in "family" groups of differing age and size.

We were all especially awed to find an enormous clump that had eleven umbels, one of them with seventy one flowers (yes, we counted!). Needless to say there were a huge number of photos taken of this beauty, despite it being in a more open situation with dappled sunlight making photography difficult. While we were groveling around on all fours under the thorny bushes trying to get close enough for that perfect shot, this granddaddy of a plant was probably laughing at the antics of these idiotic humans!

Other highlights of this *nobilis* tour for me were.....

- seeing mature 100 year old plants of *Oldenburgia arbuscula* growing on rocky bluffs at Featherstone Kloof (I planted a small one of these at home two years ago).
- staying with Wimpie Maas and his lovely wife Lydia and their family.
- Having a great braai at Charl Malan's home and viewing his superb *Clivia* collection.
- seeing Gideon and Esther Botha's wonderful garden, and especially the flowering *Cyrtanthus*.
- attending the Eastern Province *Clivia* Show.

Overall, this was an experience of which I have many wonderful warm memories and a few reasonable photos. I would recommend to anyone the thrill of viewing these noble plants. Thanks to everyone at the Eastern Province *Clivia* Club who helped make it happen.



C. nobilis in Habitat

The 2006 Kwa Zulu - Natal Clivia Tour

M. Paskert, U.S.A.

After returning from the spectacular *Caulescens* Tour only the day before, two small buses of intrepid *Clivia* addicts set out for Pietermaritzburg from Pretoria. This was to be the *C. miniata* and *C. robusta* leg of the tour in KwaZulu-Natal, a province in the mid-eastern part of South Africa. I could hardly wait! To see the plants that I collect where they evolved half way around the world was so exciting. My personal quest was to gather as much information as possible to duplicate *Clivia miniata* growing conditions at home, so interspersed in this article will be cultivation notes. Those of you who are very experienced growers may find this redundant but this was all new to me! As with the previous tour, the South African landscape was astonishingly varied and beautiful; dry brown winter plains backed by mountains, as we traveled southeast - more mountains, then rolling hills. The long drive to Pietermaritzburg provided Cultivation Note #1: *the winters in this part of the country are cool and dry.*



Photo: Ian Coates

The Tour Group

Shortly before Pietermaritzburg our bus driver Ollie stopped at Howick Falls. To see so much water in such an arid landscape was spectacular. Local women were washing

clothes at the top of the falls. Our stop here was brief but we would return here several days later. After the waterfall our group was dropped off at two different hotels only to meet again a few hours later for a fantastic braai (barbecue) at the home of Etzel and Brenda Nuss. This was one of the most outstanding meals of the entire trip! Thank you so much Etzel and Brenda for your hospitality.

Saturday, Day 2 of the tour, found us up early at the KZN Clivia Show at the agricultural showgrounds in Pietermaritzburg. To go to a *Clivia* show in South Africa is indeed heaven: so many beauties, so little time! Marie van der Merwe's green-centered peach took first place, 1st runner up was Val and Roy Thurston's pastel 'Ndwedwe Eureka' and 2nd runner up Sean Chubb's *Broadleaf Orange*. One highlight was when Emmy Wittig, of 'Wittig's Peach' fame, arrived with a huge jar of multi-coloured *clivia* seedpods. The nominal price was for a handful...

needless to say they quickly evaporated! Tour members dispersed for the early afternoon, some going to private collections, sightseeing, etc. Kelvin Lew and William McClelland stayed behind to assist Henriette Ströh in measuring and cataloguing all the show winners.



Emmy Wittig

Photo: Marilyn Paskert

On Saturday afternoon we reassembled for a tour of the KwaZulu-Natal Botanical Gardens with curator Brian Tarr. The Gardens specialise in the conservation of eastern grassland plants, including *Kniphofia*, *Watsonia*, and *Dierama*. The *Clivia* are grouped with other plants from their same habitat. For those of you who have never met Brian, he is one high-energy fact-spewing machine, so here come some cultivation notes; Note #2 *Clivias from the Midlands area in KZN show little variation but by line breeding an astonishing amount of variation will present itself.* Note #3 *The KZN miniatas are mostly in semi-deciduous forest with sandstone substrate on east- or south-facing slopes. (In the northern hemisphere think north). There is good drainage, both air and water; the sun is low but the increased light under the almost leafless trees in winter initiates blooming.* Note #4: *The pH of these habitats is usually 5.5 to 6.5.* An entire book could be written on Brian's insights on many plants, not just *Clivia*...the Gardens are indeed lucky to have such an enthusiastic spokesman! After our tour of the Gardens, Brian took us behind



Photo: William McClelland

Growing bags

the scenes to the *Clivia* shadehouse. *B e s i d e s* the usual flowerpots, advantage was taken of every support post by hanging geofabric bags from them and growing *Clivias* in them; they certainly had excellent

drainage! It was already getting dark when we left the garden and after dinner another big event, the KZN *Clivia* Club auction. This was a smaller venue than the auction in Pretoria but lovely plants commanded steep prices: Val and Roy Thurston's 'Ndwedwe Msubo Wow' *C. miniata* fetched R5000 as did one of Marie van der Merwe's green-centered peaches. Another short night's sleep before Day 3 but no one complained!

Sunday morning Brian Tarr joined our group as we revisited Howick Falls. He told us that the area had been a large *C. miniata* habitat but local people had decimated the population by chopping the plants up for "muti", tribal medicine. Muti would be made fresh and whatever didn't sell that day would be thrown out. On a more positive note, miniatas can grow in the very misty conditions found in this area... so here's Cultivation Note #5; *Clivia miniata* grow well in humid areas with excellent drainage.

After leaving Howick Falls, we enjoyed morning tea at the beautiful home and garden of Glenn and Liz Boyd in Karkloof. Liz's shade house was a stunning sight, a breathtaking shock of colours, we just felt so privileged to be able to see this! Outside, under trees and



Photo: Graham Osborn

Liz Boyd's shadehouse



Brian Tarr looking at the *Clivia* in Habitat

shade cloth Glenn had large plantings of habitat miniatas from their property. Our group hiked back into the Karkloof Reserve where more wild miniatas were growing on rocks and leaf debris. Surprisingly we even saw one growing epiphytically up in a tree! Little yellow crabs scampered underfoot in the creek bed. It started to rain but no rest for our international group of *Clivia* addicts; next on the agenda was an old farmhouse that had been in the Burdon family for over 3 generations. Time apparently had stood still on this charming farm; habitat miniatas were clumped on the periphery as they probably were over 100 years ago. We were told by the Burdons that the last seven years' *C. miniata* blooming had been poor due to lack of chill but that this year they had had at least five days of frost: Cultivation Note #6: *Bloom is improved by several days of chill but not freezing in the winter.*

By now, Sunday afternoon, the rain was persistent and our group was more than ready for lunch. Luckily for us we had a short drive to the outskirts of Greytown to the rolling hills of the Gem Wild Flowers farm where we were greeted with a home-cooked lunch and the special hospitality of the Van Rooyen family that made us feel like we had always belonged there! Pieter and his son Francois guided us through the shade houses where many of us found treasures to buy or at least photograph. I enjoyed visiting with Ginny, Francois' wife, who turned out to be from Texas in spite of her at this time very strong (to my ears!) South African accent. The warmth of this family, the stunning display of clivias... it doesn't get better than this! It was a long day already but little did we realize the adventure in store for us...

Did I mention it was raining? Well the unpaved road allowed only one car out...Tino Ferero and family joined us at the Van Rooyens and departed first. By the time we left the road had turned into deep impassable mud. Our futile attempt to push the bus only resulted in spinning wheels with, you guessed it... us covered in mud! I was in the first bus and we all decided to hike out to the main road over rolling grassland. The second bus managed to escape our fate. After our bus was pulled out of the muck with a tractor, both buses turned back and took a long alternative route. As we waited for the bus in the rain we were welcomed into the hut of a woman who was cooking dinner over an open fire inside. There were other structures on the property where we took refuge from the rain and smoke. Since this day I have thought back often of the generosity of this woman who had so little to all these strangers who didn't even speak her language. By the time the bus arrived

we were cold and wet, but it wasn't too long before we were back in our warm rooms to eat and catch some sleep.

Monday, Day 4, and our destination was the coastal area. The further east we drove the ever more tropical the scenery became with papaya and banana farms. At Umtamvuna Nature Reserve we had a long hike down into the gorge. *C. miniata* were growing under the riparian canopy and the silence was shattered with screams from unseen baboons - only in Africa! I was surprised to see so much clivia seed scattered about. Something clearly liked the pods but not the seed... pretty resourceful evolution tactic for the clivias! From here we traveled to Kawa Zami farm, a banana farm with a swampy tree-covered depression between the fields. In this swamp *C. robusta* were thriving. OK, at this time disregard the miniata cultivation notes as the bases of the robusta plants were indeed sitting in water and thriving! Our afternoon ended with a drive through the resort city of Durban and the opportunity to touch the Indian Ocean and wash some robusta swamp mud off our feet before heading back to our hotel.

We saw more miniatas on Tuesday, the last day of our trip, than all the other days put together! First we were greeted by the Chubb family at their farm. To see the beautiful plants Sean Chubb is breeding is exciting and humbling at the same time. Many of us found treasured plants to buy, a veritable clivia shopping frenzy! As if we hadn't seen enough (can one ever see too many clivias?) then it was on to Roly Strachan's dairy farm with acres, yes, acres of habitat miniatas in full bloom! Due to the sheer number of

plants many exciting hybrids such as 'Roly's Kaleidoscope' have evolved on this farm which leads to Cultivation Note #7: *When breeding plants it is indeed a numbers game; the more plants the more chances!*

The Strachan family invited us in for a delicious farm lunch prepared by Mrs Strachan. Great bags of seed were for sale. Following this, the last stop on the tour, plants and seed had to be cleaned before bedtime for the trip home or - for the lucky few - to take with them on the Cape and Mirabilis tours. The hotel acquired quite a bit of soil in their garden beds before we were through!

The KZN tour was over now except in our memories but what an adventure! I will never forget the fun and colourful group of fellow tour participants, the scenic vistas of the South African countryside, but most of all, the hospitality and kindness of the people! If this tour is offered again in 2010 do whatever it takes to be there. It is so worth it!



Photo: Graham Osburn

The Group strung-out, with Ilie Gaceu and Ken Smith at the front, heading for the Umtamvuna Gorge

The 2006 *Clivia caulescens* Tour

Rex Williams, New Zealand

After deciding in 2004 to take part in the Fourth Clivia Conference to be held in Pretoria I was excited to see that post-conference *Clivia* habitat tours, organised by James and Connie Abel, were once again offered. This was an opportunity not to be missed and so we booked well in advance to be sure of getting seats. As it turned out, the 2002 *C. caulescens* tour was so enjoyed that we had four repeat attendees in 2006!

The week immersed with domesticated *Clivia* was contrasted by our visit to the untamed versions in habitat, although both were equally enjoyable. Departing Pretoria at 8am in an air-conditioned luxury coach we left the highveld and travelled through bushveld with short shrubby trees punctuated by impressive colonies of euphorbias and aloes. On route Wynand Malan gave us a very informative talk on South Africa's political history.

After a quick stop at Magoebaskloof to unload luggage and check into very comfortable accommodation with views down bush-clad valleys of the upper Drakensberg

it was off to our first *C. caulescens* habitat. Travelling over forestry tracks through tall rainforest and pine plantations it was hard to believe we were in South Africa and not the New Zealand King Country.

A short trek over dipping rock faces took us into the bush. At last! Wild *Clivia* - and hundreds of them! Although only a few were in flower many more were pushing scapes. Just being amongst them was a dream come true. The dry climate was a surprise, it not having rained for approximately three months. The *C. caulescens* grew in a southeasterly aspect to take advantage of mists that rolled in early morning. Despite the mists the soil and leaf litter were tinder dry. A few plants were seen growing on a creek edge in boggy conditions, though the water was well aerated and constantly moving. It certainly was an eye-opener to see the extremes to which these plants have adapted.

Up early the next morning for a magnificent breakfast, and then we were off to visit Margot McNeil, widow of the late Gordon McNeil, a legendary early *Clivia* breeder. We travelled through eucalypt forests, avocado,



Photo: David Olsen

Green tipped orange-red *C. caulescens* flowers



Photo: Jan Coates

C. caulescens in habitat with insect damage to a flower

mango & banana plantations as well as an abandoned tea plantation till we reached the entrance to the Lekgalameetse (meaning 'The place of much water') Nature Reserve. Here we transferred to pick-up trucks for the 5 km drive up dirt tracks and over several fords to the 'Shack' which the McNeils had made their holiday home. Set in a valley with sheer rock outcrops, with a cool stream running through the property, the location alone was breathtaking. Exotic trees provided shade for us as well as a large planting of *Clivia*, mainly *C. miniata*, including the 'Four Marys' group. Many thanks to Margot for her talk about the McNeil collection. After more photos and some purchasing of plants it was off for a quick visit to see the spectacular geological formations at Blyde River Canyon and Bourke's Luck Potholes. The bus trip was enlivened by Christo Topham, who gave an interesting history of the local people, as well as a running commentary on the region's plants and geology.

After a night in Graskop, a small town on the edge of the Drakensberg escarpment, it was day 3 and off early to 'The Pinnacle'. The landscape here is truly spectacular with sheer-sided valleys punctuated by a monolithic monument to Nature's magnificence. From our viewing area we could see *C. caulescens* growing atop the Pinnacle as well as on the sheer rock cliff we were standing on. The plants did show signs of stress (leaf tip dieback) but again this plant's tenacity amazed me.

Next stop was at 'God's Window'. This had to be the habitat highlight: postcard views, easy access and *C. caulescens* the dominant forest floor plant. The site is at an altitude of 1500 metres in the mist-belt with an annual rainfall of up to 3 metres.

Many of the *C. caulescens* were lithophytic with leaves up to 75mm in width and 1.5



Clivia caulescens growing on moss covered rocks

Photo: Ian Coates

metres in length. Several beautifully variegated plants were seen. I can't help but wonder if these plants still exist in the habitat today. There were only a few plants in flower. James informed us that roughly 15% of the plants flower every year. It would be interesting to monitor the number of leaves grown annually by individual plants and to see what effect carrying a full head of berries has on future flowering. An umbel of 55 flowers was counted. We also saw a scape sporting secondary pseudo-umbels.

We travelled to Barberton via the Nelspruit Lowveld National Botanic Gardens, which is reputed to have the largest Cycad collection in South Africa. Substantial collections of *Clivia* are also grown, including many *C. miniata* from the Coromandel strain, as well as accessions from the Bearded Man.



Casual visitor or pollinator?

Collections of *C. nobilis*, *C. robusta* and *C. caulescens* are also cultivated. A painted reed frog nestling inside a Coromandel hybrid attracted a lot of interest.

At the end of day 3 we enjoyed a traditional braai (barbecue) at the Cockney Lix Hotel. This was a good time to catch a breath and compare notes with the rest of the group. Chris Welgemoed treated us to a display of Tipperary Peaches in the Hotel social area. My appetite was whetted and so my wife Deirdre and I made the decision to forfeit the tour to Bearded Man and to instead visit Chris the next day.

Chris was very generous with his time, collecting us from Barberton and driving us to his property in Nelspruit. We were both impressed by the diversity of Chris's collection, with reds, green throats, pastels, ghosts and variegates, to name but a few he has bred. Of course the Tipperary peaches were outstanding, the best of which were delicate pink shades with ice-green centres, absolutely mouth watering.

Knowing of my interest in horticulture, we were shown trees of interest in the area on the way to a friend of Chris's who has an outstanding collection of cycads, *Cussonia* & succulents. From there we drove to the Agricultural Research

Council (ARC) where Chris is a nursery manager for the Institute of Tropical & Subtropical Crops (ITSC). Here we sampled all manner of exotic fruits and saw plants I had never heard of before - a really educational visit.

In 1996, while working for the ITSC, Chris had visited Rory Niven, the then owner of Tipperary Nursery to discuss the grafting of Macadamia nut trees. It was during this visit that Chris saw his first peach *Clivia*. A request for pollen resulted in an invitation to breed *Clivia* for Rory. There were 14 peach plants of which seven had different colours and leaf forms. Chris's aim is to breed a variegated, short broad-leafed, broad-tepaled, green centred ghosted, bicoloured peach! He is half way there with a variegated broad-leafed, broad-tepaled green throat peach. Our time with Chris was brief but one of the highlights of our South African trip.

All good things come to an end and after a quick stop at a local nursery we were reunited with the tour bus for the trip back to Pretoria. I can thoroughly recommend the *Caulescens* Tour, should it be offered, to anyone contemplating attending the next International *Clivia* Conference.



(*C. miniata* x *C. caulescens*) x self — hybrids of these species have often produced interesting results

Clivias from Bearded Man

Roger Dixon, South Africa

On Day 3 of the 2007 *Caulescens* Tour we awoke to a beautiful day, well rested after a good nights sleep in Barberton, and boarded our bus for what was for me the highlight of our tour – a visit to the much spoken of Bearded Man Mountain, home of *C. miniata*, *C. caulescens* and *C. x nimbicola*.

Situated in the Barberton Centre of Endemism, the 1337 m Bearded Man Mountain is on the border of Mpumalanga and Swaziland. This area marks the northern limit of *C. miniata* and the southern limit of *C. caulescens*, and as far as I know is the only region in which the two species occur together. The bus took us up to the forestry station, much to our tour planner's surprise, and then our guide, Johan Schoeman, accompanied by Attie le Roux, showed us the next level of comfortable travel – an enclosed truck with a few small windows high up! A few of us were not so brave and accompanied the guides in their vehicles, and so our procession went through the forests on extremely dusty roads right to the edge of the forest where our quarry lurked.

At this altitude the northern slopes are mainly scrubby bush or grassland, with dry forest tending towards the southern slopes. The trees in these forests are not overly large, getting larger in the more sheltered areas. I was in the first group that went into the

forest, heading towards the *C. x nimbicola* site.

As we entered the forest, the forest floor was covered with dry leaf litter. *C. miniata* were the first plants encountered, growing in the humus layer, with shallow, surface roots. There were a few scattered rocks. Most of the plants were single specimens, with little sign of clumping. We followed the path further in and started upwards around the mountain. Here it began to get steeper and rockier, and some *C. miniata* plants displayed distinct aerial stems, and then we were in *C. caulescens* habitat. We noticed a number of freshly uprooted plants on the path, and wondered how they got there. The slope abruptly became extremely steep, and the *C. x nimbicola* site was pointed out to us – downwards. These plants were growing horizontally out of the steep slope which plunged at a very steep angle, more than 70°. There was less tree cover here than on the shallower slopes, and the plants were also at the end of their flowering period.



View from the west towards Bearded Man. The Eucalyptus plantations are on the left and the south-facing indigenous forest on the right

Photos: Roger Dixon

At this spot we saw that one of the plants, with a very long trailing stem, had recently had a portion amputated and had been treated with a sealant! Obviously the source of the loose plants on the path was related to a recent collecting trip – the sealant was most probably to ensure the plant would survive for future harvesting. This is worrying as harvesting by locals for muti (traditional medicine) would start with the easiest plants at the edge of the population, not at one of the most inaccessible places. There is no access to this site for visitors except via the forestry gate that has strict security. However, we were shown roads leading from adjacent gold mine properties that led directly up to Bearded Man, and were told that it was not possible to control traffic from that source. There were very few *C. x nimbicola* – we saw maybe ten plants at this locality. Depending on who you talk to there are possibly three or four more localities, all with very few plants. It would appear that “collectors” are about, illegally removing plants from private property.

While the hybrid was nearing the end of its flowering period, with only a few heads of dark red flowers left, the *C. miniata* plants were just beginning to come into flower, with only a few scattered individuals in full bloom.

The *C. caulescens* plants were only starting to push scapes. This struck me as a bit odd – if the *C. nimbicola* were truly hybrids surely they should have characteristics intermediate between the two parents? In addition, all the hybrid flowers we saw were very similar to each other.

Even though there were not many plants in flower, members of the party explored both the forest and the grassland and a pleasant time was had by all. But I was not satisfied with the lack of *Clivia* flowers, and arranged with Johan to come back at the beginning of October when the flowering of the other two species would be more advanced.

The day arrived when I returned with Johan, but this time in my own comfortable car! This time most of the *C. miniata* plants were in flower. The umbels tended to have a low flower count, but the flowers were large and beautiful. Their throats were mainly white, with a distinctive star shape, with yellow limited in most cases to the anthers. The flower colour varied from light pastel orange and pink to darker orange. The *C. caulescens* had not yet begun flowering in any numbers here at Bearded Man, which according to Johan was



Photo: Roger Dixon

C. miniata in full bloom at Bearded Man in October. The low and open nature of the canopy allows in lots of light



Photo: Roger Dixon

C. x nimbicola. The two stems are one plant. The older rear stem shows the distinctly caulescent nature of the taxon.

Photo: Roger Dixon



C. miniata from Songimvelo, further to the West. Note the typical star-shaped throat and large size, as at Bearded Man.

due to the cold weather recently experienced, but he said that further along the mountain ridge towards the west they would be in flower, as it was a bit lower and warmer.

We proceeded to travel towards the Songimvelo Game Reserve, along the steep incised mountain terrain with many habitats suitable for clivias but very inaccessible. After once again travelling through plantations that are eradicating vast tracts of indigenous bush, forest and grassland, we came to another habitat.

Once again, the *C. caulescens* plants were found mainly on the rocky outcrops that formed the higher, steeper parts of the slopes.

Photo: Roger Dixon



C. miniata from Songimvelo, further to the West. Note the typical star-shaped throat and large size, as at Bearded Man

Here the well-drained humus rich soil is present in pockets between the rocks and the more open canopy lets in a lot of light. The *C. miniata* plants tended to occur where there were fewer rocks. The *C. miniata* flowers were very similar to those at Bearded Man, with possibly a higher flower count, but still very attractive. The *C. caulescens* was in full flower here and the blooms were magnificent. When viewed *en masse* in the dappled shade under the canopy they presented a very tranquil and pastoral scene, quite different to many other places I have been to where only remnants remain, due to the zealous and avaricious "collectors" who are too impatient to wait for a seed to grow.

I would like to thank James Abel for his organisation of the entire 2007 *Caulescens* Tour and the enthusiastic organisation and guidance that was provided by Johan Schoeman and Attie le Roux at Bearded Man, and the management of the Sappi Forestry Station for their generous assistance with access and transport. A most enjoyable trip and one I will always remember!



C. caulescens
f r o m
Songimvelo.
These plants
are very robust
and have a
beautiful
colouration

Competition Winners

Best Photograph



Best Photo in Competition
Parentage 'Vico Yellow' x 'Vico Orange'

Photographer Gordon Fraser Breeder Edgar Fevrier



Winner *C. miniata* Section 'Pete' Photographer Tessa Nel

Below Right: Second Runner-up Single Flower, 'Peaches and Cream' Photographer and Breeder Mick Dower

Below: Runner-up Single Flower, 'Pure Joy' Photographer Galeon Scheepers



Runner-up *C. miniata* Section
'Julia D'
Parentage 'Floradale Apricot' x
'Oribi Gorge Yellow'
Breeder and Photographer
Mick Dower



Below: Winner Single Flower An Interspecific

Photographer Helen Marriott





Winner Pendulous Section A yellow *C. caulescens*

Photographer Helen Marriott

Runner-up Pendulous Section
Title: Close Friends
Photographer Gordon Fraser



Second Runner-up
Pendulous Section

Photographer
David Olsen





Winner Interspecific Section 'Patsy'
Photographer Helen Marriott



Second Runner-up Interspecific Section 'Pastel Bells'
Photographer Helen Marriott



Runner-up Interspecific Section 'Spring Bonnets'

Breeder: Yoshikazu Nakamura
Grower and Photographer Mick Dower



Below: Runner-up Habitat Section
C. caulescens
Photographer Gideon Scheepers

Above: Second Runner-up Habitat Section
C. nobilis
Photographer Gideon Scheepers





Winner of the Habitat Section. A typical *C. ensilescens* habitat showing plants high-up on top of moss covered rocks.
Photographer Gideon Scheepers

Clivia mirabilis Hybrids

John Winter, South Africa

The discovery of *Clivia mirabilis* in the Mediterranean climate of the Northern Cape in 2001 rates as a major botanical find, considering that the distribution area of this new species occurs 800kms west of the previously known distribution of the genus. Although not the most spectacular of the species of the genus *Clivia* it is unique for a number of reasons.

Clivia mirabilis has adapted well to winter rain and dry summers with vegetative growth occurring during the winter months. The rapid development of the seeds within 4 months in early autumn allows for germination to take place when the winter rains commence. Two distinguishing features are the prominent white stripe on the upper surface of the leaf of some plants and the carmine-maroon base of the leaves that form the leaf sheath.

In September/October of 2002 orange and yellow forms of *Clivia miniata* were pollinated with pollen from *Clivia mirabilis*. Later that year *Clivia caudescens* was also pollinated. The seeds matured in 4 months and were sown in March/April 2003.

Typical of hybrids, the young seedlings grew well displaying vigour. These hybrids have been re-potted regularly each year to encourage rapid growth. In September last year some of the orange *Clivia miniata* crosses flowered for the first time. None of the other crosses have flowered as yet.

The majority of the hybrid seedlings are easily distinguished by the deep carmine-maroon coloured stem-base. The leaves of some of the plants do display a faint white stripe down the centre of the upper side of the leaf.



Photo: Claude Felbert

Even mature *mirabilis* hybrids have a pigmented base.

The peduncle is strong and supports the inflorescence of 22-26 pendulous flowers set well above the leaves. The colour of the flowers range from orange to dark orange as can be seen from the illustrations.

With the flowering I have pollinated these hybrids with *C. miniata* plants ranging from dark to light orange, yellow, multi-lobed as well as pollen from one of the hybrid siblings. Reverse crosses have also been made using pollen from *C. mirabilis* hybrids onto various *C. miniata* plants.

Considering what Mr Nakamura has achieved with interspecific *Clivia* breeding another species in the mix will certainly provide us with exciting expectations for the future.



Photo: Helen Marriott

Note the yellow throat and green tipped tepals



Photo: Mick Dower

Above: *C. miniata* (orange split for yellow) x *C. mirabilis*
Below: *C. miniata* (orange) x *C. mirabilis*. First flowering



Photo: John Wintner

Clivia caulescens and its Hybrids

Helen Marriott, Australia

Until recently I had been wondering what to make of *C. caulescens*. Charl Malan had earlier described *C. nobilis* as being the "Cinderella" of *Clivia* species (Clivia 7, p.45) but where did that leave *C. caulescens*? It does not commonly appear on the various publicly-available seed lists and we hardly ever hear of anyone discussing a particularly superior form of it. In contrast to *C. gardenii*, *C. robusta*, *C. nobilis* or even *C. mirabilis*, it has been unusual to hear reference to variation in the colour of *C. caulescens*, flower count or flower shape. The prominence given to *C. caulescens* in the recent Clivia News 16:1 was therefore most welcome, especially the cover photograph of Fred van Niekerk's spectacular specimen from the Blyde River Canyon, with 54 flowers. This reference followed the naming and publication of the natural hybrid from Bearded Man Mountain involving *C. caulescens* and *C. miniata*, *C. x nimbicola*, in Clivia 8 (2006). The natural hybrid at the Kirstenbosch National Botanical Gardens in Cape Town is shown at the end of this article.



Photo: Helen Marriott

'Gay Delight' shows the potential of *caulescens* crosses

Local and overseas participants on the 2002 and 2006 *Caulescens* tours organised by James and Connie Abel (cf. Clivia 5, 61-62; Clivia News 16:1, 14-17) observed considerable variation in the growth habit of plants across the different *C. caulescens* populations (see *The Caulescens Tour and Bearded Man* articles in this issue), even if many plants were not in flower at the time of the tours. In the case of this species, the tall stem that sometimes displays considerable elongation is a notable characteristic, and is one that also occurs in the intermediate forms of *C. miniata* found in the same area in the Bearded Man Mountain.

Despite relatively little discussion of the colouration of *C. caulescens*, from time to time reference is made to a yellow-flowering form that appears to have been found in at least several different South African locations (including God's Window and the Soutpansberg area). One major South African grower has made offsets available for sale in recent years. However, the breeding outcomes of hybridization of this yellow form with Group 1 or 2 yellow-flowering *C. miniata* are reportedly unknown at this stage. Crosses by George Mann have produced seedlings with pigmented bases, but as we know with other interspecific hybridisation, this may not be indicative of the flower colour.

In an earlier period of his breeding, Yoshikazu Nakamura used *C. caulescens* in his interspecific hybrids and produced many exquisite F1s and F2s. One of his own favourites is *C. 'Tricolour'*, the name chosen in reference to the three colours of orange, yellow and green

Photo: Helen Marriott



A yellow form of *C. caulescens*

found on the flower's broadish tepals - *C. 'Day Dream'*, bred from (orange *C. miniata* x yellow *C. miniata*) x (*C. caulescens* x yellow *C. miniata*) is an elegant, semi-pendulous flower from Nakamura's breeding. Despite *C. caulescens* being only one of the four plants used in its background, 'Day Dream' is a large and vigorous plant that flowers twice yearly. 'Mandala' is a recently named *C. miniata* x *C. caulescens* of Nakamura.

Photo: Shigetaka Sasaki



A Nakamura interspecific 'Mandala'

In much of his breeding, Nakamura has commonly used orange and yellow forms of *C. miniata*, his notion being that use of different species and colours in combination could give rise to new mutations, including colour mutations.

Among other collectors who have accessed seed of *C. caulescens* from various areas of South Africa and also used them in their breeding programs, is Keith Hammett from New Zealand. An example of *C. caulescens* growing in his garden is shown in the photo below. Hammett has meticulously kept records of his hybridization, something all serious breeders must do. Using *C. caulescens* either as the seed or pollen parent, he has produced a range of F1 and F2 generation crosses. For instance, shown



Photo: David O'Brien

C. caulescens growing in Keith Hammett's garden

below is an F1 *C. caulescens* x *C. miniata*, where the latter parent was a pale yellow *C. miniata* received as seed from Kevin Walters (Australia). Hammett then made sibling crosses. From this population, a seed grown and named by Rex Williams is



Photo: Keith Hammett

C. caulescens x *C. miniata*

Photo: Rex Williams



'Delilah' ((*C. caulescens* x yellow *C. miniata*) x self)

'Delilah'. An F2, 'Golden Nugget' consisting of ((*C. caulescens* x *C. miniata*) x self) is another recent naming. Hammett reports on segregation of forms with increased *miniata* flare emerging in the F2 populations. At the same time, he has observed more tubular flowers arising in the F2 generation, along with some yellow flowering forms as well.

Photo: David Olsen



'Golden Nugget' ((*C. caulescens* x *C. miniata*) x self)

Shigetaka Sasaki has made a number of observations about *C. caulescens* interspecific hybrids. Firstly, he notes that due to hybrid vigour, *C. miniata* x *C. caulescens* seedlings grow quickly, and that the seed actually germinate quicker than any other hybrid (so much so that they often germinate in the berry without being peeled).

Secondly, in relation to flowering, Sasaki reports that while *C. miniata* require six new leaves in order to produce a flower, like *C. nobilis*, *C. caulescens* require only four leaves, and that this pattern is also found in the interspecific hybrids of *C. miniata* x *C. caulescens* and in *C. miniata* x *C. nobilis*. Consequently, if the *C. miniata* x *C. caulescens* hybrid makes eight to 10 new leaves in one year, two flowers typically appear, sometimes in mid-summer and in mid-winter.

Thirdly, Sasaki says that to flower under normal conditions in spring, *C. miniata* needs a cold treatment of about one month (5-10 degrees C), and that if this cold treatment does not occur, the flower stem often does not elongate but flowers down low between the leaves. He also thought that in South Africa, because the flowering period for *C. caulescens* is soon after that of *C. miniata*, it too would need a sufficient cold treatment for it to flower and to produce an adequately long flower stem. However, he observes that *C. miniata* x *C. caulescens* hybrids produce a flower stem of the same length and with a similar number of flowers, whether it flowers in winter or in mid-summer. To him, this fact indicates that *C. miniata* x *C. caulescens* hybrid does not require a cold treatment in order to flower but, rather, that it is the number of leaves which is important for flowering. If it is the case that *C. caulescens* does not require any cold treatment, then in places such as Hawaii, it could be enjoyed as a pot plant.

As a fourth point, Sasaki stresses that *C. miniata* x *C. nobilis* hybrids also flower twice a year, but when they flower in early summer or autumn the stem may not elongate well, or the flower appears down low between the leaves or even sometimes rots. This suggests that a strong cold treatment is necessary for the flower stem of

C. miniata x *C. nobilis* to extend. As a plant which does not require a cold treatment, which flowers twice a year, and which produces a flower stem that is much longer than for any other hybrid, the *C. miniata* x *C. caulescens* hybrid is eminently suitable for the cut flower market.

Most importantly, for breeding purposes, Sasaki reports that even small differences among habitat species (for instance, *C. caulescens* or *C. gardenii*) can result in a big range of variation when used in breeding. For instance, Nakamura has frequently used a small *C. caulescens* flower that has roundish tepals in his breeding, and when combined with *C. miniata* has resulted in very round tepals in the interspecific hybrid. While a majority of *C. caulescens* flowers are rather straight, some are slightly flared at the tips, with this feature becoming more pronounced in the interspecific cross.



Photo: Rex Williams

Note the tendency toward rounded tepals

Among those who have grown numerous Nakamura interspecific hybrids of *C. miniata* x *C. caulescens* x self from seed, Laurens Rijke (Melbourne, Australia) has selected out a number of superior plants from this F2 generation, many of which he has named. There is considerable variation in the shape and colour of the flower, but a large proportion of the plants that he has grown are highly attractive. 'Clementina' was one of the early

ones to flower for him (*Some of these can be seen in Yearbook 8*). Nick Powell (Queensland, Australia) has named another Nakamura interspecific as 'Moulin Rouge', while Geoff Wilson (Melbourne, Australia) owns a yellow interspecific, also from Nakamura's *caulescens* breeding. In addition to frequently selling his F1 *C. miniata* x *C. caulescens*, Nakamura has also sometimes backcrossed his F1s to yellow *C. miniata*.



'Moulin Rouge'

Photo: Helen Murrill

These interspecific hybrids typically flower around August in Melbourne, overlapping with early *C. miniata* flowers, or just before them, and then may re-flower in early summer; however, occasional flowering seems to occur throughout the whole year.

Variegates of *C. caulescens* in the habitat seem to occur only very rarely, but two were seen by some *Caulescens* Tour spotters in 2006 (cf. *Clivia News* 16:1, 15). Interspecific variegates are also uncommon to date, but include the exquisite plant bred by Chris Welgemoed using variegated *C. miniata* "Tipperary peach strain" x *C. caulescens*.

As with the majority of other interspecific hybrids, it has been common to utilise *C. miniata* as a parent, typically as the seed parent. However, breeding among the

Photo: Keith Hammett



C. nobilis x *C. caulescens*

pendulous species themselves has produced some outstanding hybrids. Using plants given to him by Nakamura in the early 1990s, Hammett has crossed *C. nobilis* x *C. caulescens* to produce a very attractive interspecific, with strong *nobilis* characteristics observable in the leaves, colour of flower stem and the floriferous character of the umbel. Hammett has also grown from Nakamura seed a very vigorous hybrid, *C. gardenii* x *C. caulescens*, which he has called "Woodland Glory" (a collective, not a cultivar name, see below). He reports that this hybrid produces flowers throughout the year, which, in turn, give rise to fruit at all stages of development. Its leaves are long and relatively broad, and could therefore be used in floristry.



From the 'Woodland Glory' Group

John Winter's recent cross of *C. caulescens* x *C. mirabilis* (see this volume) has produced vigorously growing seedlings, with observable

median stripes coming from *C. mirabilis* as the pollen parent, and we look forward to the flower with much interest.

By combining the pendulous species themselves in his breeding, in early 2007 Rudo Lötter produced *C. 'Pink Baby'*, bred from *C. 'Pink Sensation'* F2 (((*C. miniata* x *C. gardenii*)) x ((*C. nobilis* x *C. gardenii*))) x *C. 'Ballerina'* F1 (*C. miniata* Giddy yellow x *C. caulescens*). Lötter observes that while still semi-pendulous, this new hybrid has inherited the flower shape of the Giddy yellow and the salmon pink flower colour from 'Pink Sensation' on the outside of the tepals and cream white on the inside. (cf. <http://users.iafrica.com/c/cl/Clivia/Gallery.htm> photo no.26).

Rijke used one of Nakamura's F1 (*C. miniata* x *C. caulescens*) and crossed it with the Australian yellow/cream *C. miniata* 'Aurea'. From this cross, he has obtained a number of excellent plants, with larger, shapely flowers which display considerable variation.



'Patsy' ((*C. caulescens* x *C. miniata*) x 'Aurea')

Photo: Helen Marriott

While the seed count from *C. caulescens* and its interspecific hybrids may be lower than in some of the other species and hence make it less commercially profitable, by flowering twice annually, extra seed can be obtained. Furthermore, with these and other interspecific



Photos: Helen Marriott

'Madeline'

hybrids in our collections, buds or flowers can be found throughout the full year.

This text is an enlarged version of a contribution to the NZ Clivia Club Newsletter 5.1 Summer 2007. My thanks to those who have contributed content, photos or both.



Photos: Helen Marriott

'Princess'



Photos: Claude Felbert

The beautiful peachy pink hue of a natural hybrid from the Bearded Man.

Brooklyn Botanic Garden *Clivia* collection

Karla Chandler, USA

Clivia have had a place in the collection since nearly the start of Brooklyn Botanic Garden (BBG), which was founded on an ash dump in Brooklyn, New York, in 1910. It was spread out upon 21 hectares (52 acres) and was divided up into many small gardens, including a rock garden, a rose garden, a world renowned Japanese Hill and Pond Garden, and - a first of its kind - a Children's Garden. In order to fulfill the goal that it be an educational garden, a conservatory was subsequently added.

The conservatory consisted of one large glass house with six wings. The main house was called the Economic House, which held such tropical necessities as banana plants, a bread fruit tree and tropical palms. The six wings were named and used accordingly as: Instruction, Research and Propagation, Orchid and Tropical Dicotyledons, Cacti and Synoptic Collection, Cycads and Cool House Dicotyledons, and Bryophytes and Tropical Monocotyledons. The *Clivia* must have been housed - although I have not found the records - either with the Synoptic collection or the Cycads, due to the presumed temperatures of those wings.

The earliest recorded *Clivia* was a plant that was documented as a herbarium specimen of the BBG collection in 1921. It was collected by one, Margaret Bardick, who was an assistant to the assistant curator at the time. It was a *C. miniata*, and could possibly be the parent plant of the clump of *C. miniata* that is still in the collection today.

The Steinhardt Conservatory, built in 1987, consists of three pavilion-shaped glass houses, and an entry glass house with two wings.

At the time of this great project two important people, Dr. Elizabeth Scholtz and Dr. Steven Tim, were already in place. Betty, as everyone here calls her, hails from Pretoria and had been the Director of the Garden since 1972. Dr. Tim, also originally from South Africa, was head of the Science Department. Their significance to BBG was and is monumental and relevant to this *Clivia* history account. Betty Scholtz supported and helped curate our South African collection along with other plant collections. Dr. Tim helped to ensure that the three pavilions stayed congruent in their theme; each one displaying plants from three major climate type regions: Tropical, Desert and Warm Temperate. The title 'Warm Temperate' serves as an umbrella term for many types of climate, some differing markedly from the other, such as: the forests of south



Photo: Karla Chandler

One of the Glass Houses at the Brooklyn Botanic Garden

eastern China and the more dry places north of the Cape in South Africa. As the Gardener / Curator of The Warm Temperate Pavilion I am delighted to work with such a broad palette, from which the native flora is the most beautiful and interesting in the world. If the theme were to include only Mediterranean-type climates then I may not have had the honour of taking care of our small but special *Clivia* collection, not to mention the other special plants from the eastern part of South Africa.

From the opening of the Steinhardt Conservatory in 1988 there have been about six different gardeners/curators of what is officially called The Helen Mattin Warm Temperate Pavilion. Each curator cared for and added to the *Clivia* collection we have today.

Most of the stories about our *Clivia* acquisitions are somehow linked to Betty Scholtz, who is widely known for her scholarly wisdom of the botanic world. Equally, she is well known for being well known, having a friend, a connection, or a plant affiliate in just about every corner of the globe. She joined the Garden in 1960 in the Instruction Department, and was appointed Director of the Garden in 1972. She retired in 1986, but stayed on at BBG as Director Emeritus. Along with coordinating and guiding

horticultural tours around the world, Betty is a mentor, a source of knowledge and a plant 'liaison' for all of us. Our *Clivia* 'Vico Yellow' was given to us in 1990 through Betty, by her friend, the creator of the hybrid, Sir Peter Smithers. The three hybrids: *C.* 'Raisin', *C.* 'Sylphide', and *C.* 'Gitane' were purchased by Betty Scholtz at a meeting with Margot McNeil, at Ms McNeil's South African estate.

These three hybrids have yet to flower, but they have been promised to be a nice red, a pink and green, and a pink and yellow. Our collection also includes 15 plants that were grown from seed given to the Garden by Mr Yoshikazu Nakamura from his collection of mixed hybrids, whose heritage was *C. miniata*, *C. gardenii*, *C.x cyrtanthiflora* and *C. nobilis*. The seeds were irradiated by Mr Nakamura with cobalt 60. The plants from these seeds have flowered, and I have only recently started keeping some records. None of the flowers, as I remember, have been anything to shout about. However, I was advised at the 2006 *Clivia* Conference that it is the next generation of these plants that needs to be watched.

Our rather special *Clivia* 'Sir John Thouron' was purchased at a rare plant auction in 1997 by Judy Zuk, the garden's



Two blooms from the Brooklyn Botanic Garden



Photos: Karla Chandler

then President. Although Ms Zuk paid a hefty price, it wasn't nearly as extravagant as when the plant was first introduced by White Flower Farm Nursery, located in the state of Connecticut. For the details on this story, Ms Scholtz referred me to her friend Steve Frowine. Mr Frowine was the Vice President of Horticulture at White Flower Farm Nursery during the height of the 'Sir John Thouron' buzz. He is now a well published horticultural author. He remembered asking Sir John Thouron, a knighted, ex Major of the Black Watch in World War II, turned gardener, if the flower he had bred and cloned could be introduced to the public. A few years went by before Sir John would agree to Mr Frowine's proposition. Meanwhile, the flower was winning awards year after year at the Philadelphia Flower Show in Pennsylvania. Sir John Thouron had given one of the first clones to Queen Elizabeth II, a few to close relatives, and several to Longwood Gardens, a public garden built on an estate which was purchased by his wife's prestigious family, the DuPont's, in 1906. It was 1994 when the press release in the New York Times announced that the divisions of the precious plant were to be sold for the first time at White Flower Farm Nursery. Sir John agreed with Mr Frowine to name his *Clivia* after himself and introduced forty of the plants to the market, under the strict guideline that they would only be sold one per customer. The first press release quoted \$495.00 per one division. The reception and the inquiries to this offer made Mr Frowine confident that he could safely raise the price to \$995.00. He was more than right. The reaction to the sale could be described as frenzied. Famous people such as Ralph Lauren were calling, and others were sending people to Connecticut in helicopters to pick up the coveted treasure. One person went

so far as to sneak his sister in as a buyer so that he could procure two plants for himself. It is no wonder that this *Clivia* received such attention, with its large butter cream yellow inflorescence and broad leaves. This spring our specimen of the special plant flowered perfectly, a fitting tribute to its breeder who recently passed away this last February. He is best known in the United States for founding The Thouron-University of Pennsylvania Fund for British-American Student Exchange.

The only *Clivia* that has been acquired so far during my seven years as curator is a *C. mirabilis*. This plant was entrusted to me by John Winter, former curator of Kirstenbosch National Botanic Garden, while I was in South Africa for the *Clivia* Conference last year. Again, this transaction was made possible by Mr Winter's friendship with Ms Betty Scholtz!



A *C. mirabilis* in John Winter's Kirstenbosch shade house. Note the non-typical bloom colour.

Photo: Claude Felbert

Along with these highlighted plants we have several other *Clivia* hybrids which were either purchased by, or donated to, the Garden. A number of these are listed in the Appendix below. So far, little emphasis has been placed on the breeding of *Clivia* since, as a Botanic Garden in the north-eastern United States, our contributions to the hybrid world have centred on plants that are hardy to cool temperate climate regions. However, my predecessor, Mr Scott Canning, did create a cross with a large flowered form of *C. miniata* and our *C. miniata* 'Vico Yellow'. We are still waiting to see the flowering results of this cross.

My understanding and appreciation for *Clivia* flowers has been an ongoing process. I must admit that when I first took over this collection, they were just an orange blur, as I was pretty overwhelmed with the rest of the plants under my care. I made sure the mealy bugs didn't eat them alive and that they got the proper water, food and temperatures in their glass home. Each spring, as a few more plants bloomed my interest grew, but nothing was as inspiring as the International *Clivia* Conference of 2006 in Pretoria, South Africa. Even if you hated the flower you had to like the people - and I fell in love with both! Now I am counting tepals, measuring inflorescences and planning hybrids. I saw so many amazing plants and learned so much on my visit, as my amazing host Danie van Vuuren shuffled John Ingram of California and me around to every grower in the area. The growers I met, and all the speakers at the conference, were so generous with their knowledge and their hospitality. I can say that it was truly a wonderful trip for me and that the small but elegant *Clivia* collection at Brooklyn Botanic Garden has an enthusiastic caretaker and a hopefully bright future.

Appendix:

Currently there are thirty specimens growing in our greenhouse, labelled as follows:

- Clivia miniata* 'VicoYellow'
- Clivia miniata* - red form- x *C. x cyrtanthiflora*
- Clivia* 'Sylphide' (pink and green)
- 15 *Clivia* hybrids — these seeds were irradiated with cobalt 60 1.0 kr/h. They are mixed hybrids of *C. miniata*, *C. gardenii*, *C. x cyrtanthiflora* & *C. nobilis*
- Clivia miniata* -yellow flowered form
- Clivia miniata* x *Clivia gardenii*
- Clivia miniata* 'Flava'
- Clivia miniata*
- Clivia miniata* 'Sir John Thouron'
- Clivia miniata* 'Grandiflora' x 'Vico Yellow'
- Clivia miniata* var. *citrina*
- Clivia* 'Roisin'
- Clivia mirabilis*
- Clivia nobilis*
- Clivia* 'Gitane'



Photo: Karla Chamber

An Interspecific from the Brooklyn collection

Two Classic *Clivia* and their Progeny

John van der Linde, South Africa

Classic *clivias* grown at Kirstenbosch and a look at some of their progeny.

Two yellow *C. miniatas* frequently mentioned in early Newsletters of the old *Clivia* Club are 'Kirstenbosch Yellow' and 'Natal Yellow'. The purpose of this article is to describe these historic plants, which are on display in the 'Glasshouse' at the Kirstenbosch National Botanical Garden in Cape Town, and to mention some of the exceptional progeny that have been bred from them.



Photo: SANBI

'Kirstenbosch Yellow'

The first reference to them that I have come across is in an article by Graham Duncan, published nearly 22 years ago in the September 1985 quarterly issue of 'Veld and Flora', the journal of the Botanical Society of South Africa:

"The Kirstenbosch bulb collection contains two distinctly different forms of *C. miniata* var. *citrina*, both of which are highly attractive and have large horticultural potential. The first of these was obtained in October 1951 from the former Reed's Nursery, in Wynberg, Cape, but unfortunately no details of their origin are available. It is a very slow-growing form, and the two plants which

were originally received had increased in number to only five by 1979. It has broad, fairly light-green leaves and blooms in September. The light yellow flowers have well-reflexed petals, and the base of the segments is a deep yellow, RHS colour Chart 12D and 13A respectively.

The flowers have a sweet fragrance reminiscent of azaleas, while the bright yellow fruits are small, and contain up to four seeds each. I have not come across this form anywhere else, and in order to distinguish



Photo: Mick Dowser

Giddy 'Natal Yellow'

it from other forms, the cultivar name 'Kirstenbosch Yellow' has been applied to it. The plants seen at Kew Gardens and at the New York Botanical Garden would appear to be most similar to 'Kirstenbosch Yellow', but their background information is also very scanty.

The second form in cultivation at Kirstenbosch is also *ex hort*, having been kindly donated by Mrs. Cynthia Giddy of Natal.

Mrs. Giddy gave this plant to Graham when he visited her at her nursery in Pietermaritzburg in the early 1980s. He used the term 'ex hort' in his article, because it came from her nursery,

though it may well originally have been collected in the wild. (Eds.)

Also very attractive, it differs from 'Kirstenbosch Yellow' in having narrower, dark green leaves. It produces suckers vigorously once established. Its unscented flowers have a more tubular shape and are a different shade of yellow, again having a darker shade at the base, RHS Colour Chart 16D and 16A respectively. It blooms slightly later than 'Kirstenbosch Yellow', being in full flower in mid-October. The bright yellow fruits are large and contain up to eight seeds. The cultivar name 'Natal Yellow' has been applied to this form.

Seedlings of both 'Kirstenbosch Yellow' and 'Natal Yellow' are due to flower within the next two years, the results of which should prove interesting. A cross between these two forms is also due to flower soon and possibly the fragrance of 'Kirstenbosch Yellow' combined with the vigour of 'Natal Yellow', could produce a satisfactory garden plant.

Graham reported his results in a 1992 article in "Herbertia", the journal of the International Bulb Society. This article was reproduced in November 1995 in Volume 4(5) of the Newsletter of the old Clivia Club, the predecessor to the Clivia Society. He wrote "All the seedlings of 'Kirstenbosch Yellow' have turned out yellow, all those of 'Natal Yellow' are orange and the cross between the two, although quite superb, is orange!"

As we now know, 'Kirstenbosch Yellow' is a Group 1 yellow, whilst 'Natal Yellow' is a Group 2 yellow, and crosses between the two groups invariably produce orange flowered plants, because 'Natal Yellow' contains a mutant allele at a different locus from that in

many other yellows, including 'Kirstenbosch Yellow'. Graham found that fragrance was indeed inherited, but only where 'Kirstenbosch Yellow' was used as the mother plant, suggesting that, in this case anyway, fragrance was maternally inherited. Incidentally, this result – the maternal inheritance of fragrance from 'Kirstenbosch Yellow' – has since been confirmed by other breeders.



Photo: SANBI

'Kirstenbosch Supreme'

One of the orange-flowered offspring from the cross was so special that it was given the cultivar name 'Kirstenbosch Supreme' by John Winter. This plant has subsequently been crossed with 'Noyce's Sunburst' a Group 1 yellow, to produce a range of very showy seedlings of prize-winning quality. These are both orange and yellow flowering, since 'Kirstenbosch Supreme' has the recessive 'Kirstenbosch Yellow' genes in its genetic mix. Selected offspring from the original cross were sibling crossed amongst each other, to produce what might be called the 'Kirstenbosch Supreme' strain.

In following years Graham made crosses between 'Natal Yellow' and the few other yellows available to him at the time. One of these plants was one that had been found in 1988 growing in "The Wilds", Johannesburg, by the horticulturist in charge, Rodney Saunders. When he noticed its rich yellow flowers he removed it and brought it down to Graham at Kirstenbosch. Rodney named this cultivar 'Butter Yellow'. Graham crossed 'Natal Yellow' onto 'Butter Yellow' and seedlings from this cross eventually flowered, and yes, much to Graham's delight, they were yellows. 'Butter Yellow' was obviously also a Group 2 yellow and thus bred true when crossed with 'Natal Yellow'.



Photo: SANDIE

'Noyce's Sunburst'

Seedlings from this cross, now confidently known to flower yellow, were made available to the public at the Kirstenbosch fund-raising plant sales held in March each year, along with rare cycads and other eagerly awaited and scarce special releases. Pat Gore, a well-known Pretoria member of the Northern Clivia Club, came down to Cape Town for one of these sales. He was one of the many who queued outside the sales area to be sure of being among the first through the gates when they opened. He made a bee-line for the Clivia sales area and got one of these special, and then still rare, yellow Clivia that were on sale. When his plant bloomed back in Pretoria later that year Pat's purchase turned

out to have a large umbel of over 20 magnificent, rich, butter-coloured flowers. We know his plant today as 'Pat's Gold'. Sean Chubb considers the cultivar 'Pat's Gold' to be the best of all the Group 2 yellows he has come across.

Another yellow to which Graham Duncan had access in those early days was a 'Watkins Yellow' sent to him by Brian Tarr, his colleague at the Natal Botanical Gardens in Pietermaritzburg. According to Brian, this is a robust free-flowering plant which has a compact head of well formed flowers carried well above the leaves. Graham pollinated it with 'Butter Yellow'. To thoroughly shake up the genes John Winter put pollen from one of the resultant seedlings (JW37) onto a Kirstenbosch 'Natal Yellow' (JW11). The resultant seedlings grew strongly, all with green stems. In due course they flowered and John selected out one beauty, which he named 'Golden Fleece'. Due to the late-flowering influence of the Group 2 yellow genes that this plant carries, it flowers too late for any of the annual shows; otherwise it might walk off with an award or two!

At this point it is worth emphasizing that the plant called 'Natal Yellow' at Kirstenbosch may not have come from the plant which Cynthia Giddy herself called 'Natal Yellow', and which, since it also suckers profusely, has over the years been widely distributed – picking up a



Photo: Claude Felbert

'Golden Fleece'

variety of names along the way, I may add! The plant from her nursery that she gave Graham Duncan to take back to Kirstenbosch may well be one from her 'Cynthia's best' strain. Johan Spies and his team did not have access to DNA from the plant in the 'Glasshouse' for their ongoing DNA fingerprinting work - described elsewhere in this Yearbook, so we will have to wait a while for its appropriate identification.

'Kirstenbosch Yellow' has now been at the Gardens for 56 years. The two original plants from Reed's nursery have been divided, intercrossed and selections made. They and their offspring have been distributed far and wide. It is more correct to term all of these plants as from the 'Kirstenbosch Yellow' strain. The broadish light green leaves, distinctive well-reflexed petals, protruding stamens and stigma and full ball-like umbel are typical of the strain and are immediately obvious.

The emphasis at Kirstenbosch changed dramatically in the early 1990s. As John Winter wrote in the March 1994 issue of *Veld and Flora*, "We are encouraged to generate funds at every opportunity and plants with horticultural promise are seen as potential money-spinners for the future". In line with the change in policy John began a *Clivia* breeding venture to raise funds for what is now known as the South African National Biodiversity Institute. Seedling sales from the crosses he has made, including 'Kirstenbosch Supreme' x 'Noyce's Sunburst' have raised significant sums for SANBI over the years. John of course is a renowned *Clivia* breeder in his own right.

Mick Dower and Ian Brown, also in Cape Town, have also used plants of 'Kirstenbosch Yellow' origin in their breeding programmes. Mick has a plant, selected by John Winter for its broader leaves. He pollinated it with pollen from a Transkei wild-collected *C. miniata* with pinkish



Photo: John van der Linde

'Kirstenbosch Supreme' x 'Noyce's Sunburst'

flowers, to produce a range of seedlings with very attractive flowers. In fact, one of them was chosen to grace the front cover of *CLIVIA 8*.



Photo: Mick Dower

'Kirstenbosch Yellow' x 'Transkei Pink'

John Winter put pollen from 'Appleblossom', a really beautiful and well-known wild-collected Transkei *miniata*, onto a selected 'Kirstenbosch Yellow'. The seedlings from the cross have bloomed with lovely full umbels - but all a bright, bright orange! Ian Brown had a similar result when he crossed his Kirstenbosch plant with his 'Powderpuff'. John Winter has also flowered a very attractive interspecific cross between a 'Kirstenbosch Yellow' *miniata* and a Ngome yellow *gardenii*.



C. miniata ('Kirstenbosch Yellow' x 'Powderpuff')

Experience over the years has shown that where 'Kirstenbosch Yellow' is used as the mother plant the resultant seedlings are slower-growing than those from a reciprocal cross, so these days breeders are tending to rather use it to pollinate other plants, which it generally does very well, producing excellent seed sets and more vigorous seedlings.

The origins of these two historic 'classic clivias' on display in the 'Glasshouse' may be uncertain but, to my mind, what is far more important than where they came from is the heritage they have given us in terms of the superb offspring that have been, and will continue to be, bred from them.

Of course, other magnificent seedlings have been bred, by Sean Chubb and other South African breeders, using both 'Cynthia's Best' and the plant she named 'Natal Yellow'. They are beyond the scope of this article, but would merit an article in their own right. The special qualities of these plants have also been recognized in other countries. For example, the 'Natal Yellows' have flower buds and newly opened flowers that are tinged with green. Toshio Koike in Japan has used this attribute to breed a range of green

flowered yellows, a particularly striking one being 'Hirao', pictured in Bill Morris' article in this Yearbook, "How to breed green *Clivia miniata* flowers", and also on the back cover of CLIVIA 7.

What struck me in my researches is the almost exponential progress that has been made over the past 22 years - four or so *Clivia* generations - in understanding *Clivia* genetics and in identifying the breeding habits of particular plants. The main protagonists in this story have also moved on.

In 1985, when Graham Duncan wrote his article, he was a young man in his twenties, at the start of his career. Today he is widely recognized as an expert on South African bulbous plants, awarded the prestigious Herbert Medal of the International Bulb Society. He is no longer closely involved with breeding *Clivia*.

John Winter, former Curator of the Kirstenbosch Gardens, has been retired for some years now but still curates part of the *Clivia* Collection, mainly the wild-collected plants. He is as enthusiastic as ever about stimulating interest in *Clivia* and encouraging the general public to grow native flora. Amongst his other *Clivia* activities John is doing pioneering work involving crosses between *C. mirabilis* and the other *Clivia* species.

See the article by John Winter in this Yearbook.
(Eds)

I would like to thank Graham Duncan, John Winter, Johan Spies, Sean Chubb, Mick Dower and Ian Brown for their comments on earlier drafts of this article.

Breeding for Colour in *Clivia miniata*

Rudo Lötter, South Africa

Introduction

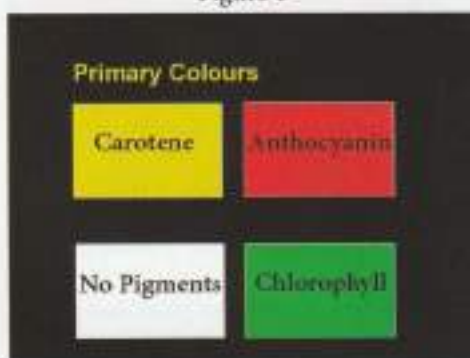
I am a horticulturist and plant breeder, more specifically a *Clivia* breeder – I am not a geneticist. I observe my plants and the results of my breeding and try to draw conclusions from them. In this I am assisted by the knowledge passed onto me by my father, Wessel Lötter, from the more than 30 years of work he has done on *Clivia*. I have written this article as a tribute to him, to build on what he has taught me, and specifically to elaborate on his article '*Clivia* mutations and colour variations' published in CLIVIA 1, back in 1999.

This article relates to *Clivia miniata* only. In what follows, the word '*Clivia*' is used throughout as short-hand for *Clivia miniata*. I begin by discussing the colour pigments in *Clivia*, firstly the primary colours, then the distribution of the pigments chlorophyll and carotene in the mesophyll – the inner layer of the petal. Next, I deal with the anthocyanin pigments that are found in the epidermis, or outer petal layer, and their colours, and the distribution and concentration of pigments in the cells that contain anthocyanin. Then I move on to dilute mutations, anthocyanin absence due to recessive mutations, a discussion of how secondary colours are formed, and the influence of pattern genes as they affect the distribution of colour in *Clivia* flowers. I conclude by speculating on some possible new colours that could be produced.

Colour pigments in *Clivia* flowers

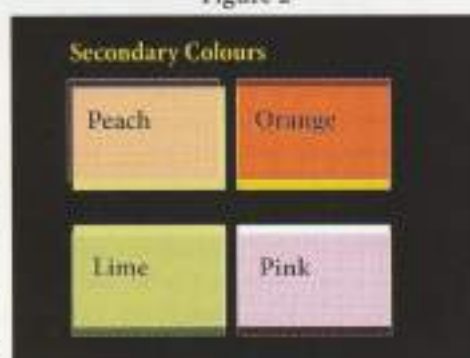
There are basically four *primary* colours in a *Clivia* flower, namely red, yellow, green and white (Figure 1). These primary colours are the result of three pigments contained in the cells: anthocyanin (red), carotene

Figure 1



(yellow) and chlorophyll (green). White, the fourth colour, is the result of cells that do not contain any of the above three pigments and which thus reflect white light to the eye. These primary colours, in combination, make up the *secondary* colours that are what we actually see in the *Clivia* flower.

Figure 2



The pigments in the mesophyll

The mesophyll is the spongy inner layer of cells that underlies the epidermis. It contains the chlorophyll and carotene pigments in what almost looks like little grains of sand. The shade of green or yellow that we see may vary with the distribution of either of these

pigments. The more sparsely they are spread the lighter the shade will appear. For example, a sparse distribution of carotene will show up in the flower as a cream colour. Conversely, a denser distribution will cause the green or yellow to be more intense. Thus, more tightly packed carotene-containing cells will give a darker yellow colour. On the other hand, a lack of these pigments in these inner cells will show up as white or cause them to appear colourless. Because those in the epidermis overlay these inner colours I term them *background colours* (Figures 3, 4).

Figure 3

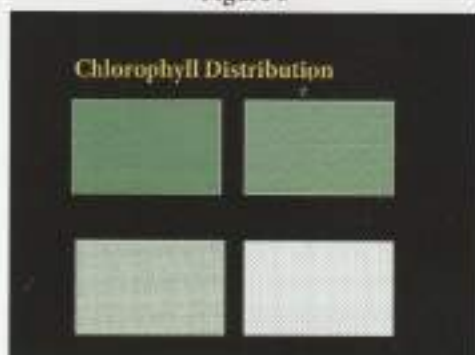
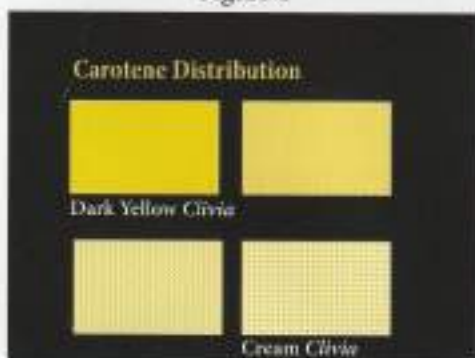


Figure 4



Through selective breeding it is possible to select plants with no chlorophyll and no carotene in the underlying mesophyll. Now if, in addition, there were no anthocyanin in

the epidermis, the flower would appear to us as white. It is, as we know, not a difficult task to get rid of the anthocyanin within two generations by crossing our selected plant with a suitable yellow. I understand that white *Clivia* have already been bred in China. Of course, in any normal *Clivia*, there will always be a little of both pigments, usually more carotene than chlorophyll, but in rare cases the reverse may apply. Then, if there is no anthocyanin present, the otherwise yellow flowers will appear distinctly lime coloured. On the other hand, if



The cream and green colours of 'Charl's Green'
A yellow and green miniata of Rudo Lötter

Photo: Courtesy Rudo Lötter



Photo: Courtesy Rudo Lötter

anthocyanin is present, and in good quantity, the overlay of red pigment in the epidermis, over the predominant green in the mesophyll, will result in flowers that appear bronze or even brown.

The pigment in the epidermis

The layers of the tepal on either side of the mesophyll are thin and are made up of large cells containing only one pigment, anthocyanin. Anthocyanin gives the last of the primary colours in the *Clivia* flower - red. However, we do not see the flower as red. Rather, our view of the flower is similar to that obtained by placing a red-tinted transparency over an underlying piece of paper, coloured green, yellow or white, as described in Figure 5. An orange *Clivia* flower appears orange to us because of the overlay of red pigment over a yellow background.

Figure 5



Anthocyanins are water-soluble and are distributed through the cell sap. The distribution of these coloured cells will create lighter and darker shades of red and what we see will thus vary in colour and intensity. Figure 5 illustrates this point. The denser the distribution, the darker the shade of red; sparser distributions of anthocyanin-containing cells result in pastel, peach and pink colours.

The concentration of the coloured cells can be so reduced that it is theoretically possible - and I am certain that such plants do exist - for the flowers to appear peach, and also yellow. It will be impossible to tell these peaches and yellows apart from those that are mutations, and breeding with such plants will be interesting.



'Elroy' with its low anthocyanin concentration

If a *Clivia* with a low anthocyanin concentration is cross-pollinated with a *Clivia* with a higher concentration, the result will be a flower with an intermediate concentration. This is termed 'intermediate inheritance'. It is important, however, to remember that



This bloom shows colour from mid-orange to pastel orange, as well as peach and pink near the edges. Near-white can also be seen.

in a recessive yellow *Clivia* mutation the concentration of anthocyanin-coloured cells is still present, even though the colour is not expressed. If such a yellow is crossed with a pastel the result could be flowers that are orange, rather than a colour intermediate between the colours of the two parents. It would thus be preferable to cross a plant with *C. miniata* 'Appleblossom'-like colours with another of similar colouration, in order to develop a line of plants with colours like those of the parents.



Clivia miniata 'Appleblossom'

Some rare colours

Let us first move to the other end of the anthocyanin spectrum. Very dark red or true red *Clivia* are extremely rare. It is in fact almost impossible to obtain red *Clivia* through selective breeding. The ones that do exist are more likely to be the result of an anthocyanin mutation.



A true red

Another rare colour in *Clivia* is true apricot, which is different from a pastel arising from a sparser distribution of cells containing the normal red anthocyanin. Breeding results suggest that apricot arises from a recessive mutation that changes the colour of the anthocyanin to orange. In order to establish that the anthocyanin in such a flower is indeed orange you would have to peel the epidermis off a petal and lay it on a piece of white paper. If that thin outer layer of petal remained orange when viewed over the white paper then you would know that you were dealing with a very special plant!

True pink flowers exist but are also extremely rare. Furthermore, it is difficult to distinguish pink from pastel or peach because the pink in the epidermis overlays the carotene in the inner tepal layer, to produce a flower that looks pastel or peach. The pink can only show up properly if there are in fact no yellow pigments in the underlying mesophyll.

At this stage let me summarize - there are three possible causes of unusual colours:

1. Those due to changes in the way normally coloured pigments are distributed;
2. Those due to mutations in pigments; e.g. red anthocyanin to orange or very dark red; and
3. Those involving a combination of the above two causes.

Dilute mutations

These may involve mutations that cause partial blocking in the pathway for the production of anthocyanin, whereby the end result is not the normal red pigment but a diluted version, because only a little anthocyanin is produced. We see this for

Photo: Courtesy Rudo Tötter

Photo: Claude Felbert

example in the Chubb and Tipperary peaches. In both cases these are recessive mutations, though each arises at a different stage in the anthocyanin production pathway.

These dilute mutations are recessive to the normal orange colour, but Chubb peaches generally breed intermediate shades when crossed with Group 1 yellows. One of their characteristics is that they open almost yellow and then flush with colour from the dilute anthocyanin as the flowers mature.

Breeding with *Clivia* where the anthocyanin colour has been altered can initially be difficult. Because it is a mutation, the inheritance of the mutation first needs to be determined. Is it dominant over, or recessive to, the normal orange colour? What colour will arise when a plant is self-pollinated, or when it is crossed with a Group 1 or 2 yellow?

In the case of the lighter colours, the mutation could be recessive but almost impossible to distinguish from other known mutations. Anthocyanin, which is so dilute that it appears colourless, will always result in a yellow *Clivia* that looks like any other yellow *Clivia*.

Anthocyanin absence

We now know that a yellow *Clivia* may be the result of no coloured cells in the tepals; the cells may be present but the anthocyanin in them is colourless, or the anthocyanin is so diluted that the flower appears to be yellow.

A fourth type of yellow is obtained when there is a mutation in the anthocyanin pathway that completely blocks the production of red pigment. There are many positions in the pathway where such a blocking mutation could occur. For example, Group 1 yellows have a block at a different position from that

giving rise to the Group 2 yellows. These two mutations are not compatible. If a yellow *Clivia* with a mutation on position A is crossed with one with a mutation on position B, all the offspring will be normal orange *Clivia*. The reason for this is that the one mutation corrects the 'mistake' in the other one. Since each mutation is recessive, the orange offspring will be split for both yellow groups.

Both Group 1 and Group 2 yellows are true-breeding *provided* they are crossed with other yellows *within* their group. Group 2 yellows can sometimes be identified by the red spots on the tepals and berries. There is also a yellow mutation with red berries.

How secondary colours are formed

We can now add all the pigment colours together to see how the different colours in *Clivia* are obtained. If there is a yellow (carotene) background under a red (anthocyanin) overlay, the flower colour is seen as orange. If there is a white or very pale yellow background colour beneath the red outer layer, the colour of the flower will appear dark orange or red. In pink, peach and pastel *Clivia* the chlorophyll and carotene are reduced and the anthocyanin is also less intense. To create a bronze, much more chlorophyll is needed in the background and more anthocyanin is needed in the overlay.

Pattern genes

Some of the most interesting *Clivia* to me are picotees, and those with bi-coloured or bleached flowers. Pattern genes are those genes responsible for the distribution of anthocyanin to certain parts of the petal but not to others. In normal *Clivia* anthocyanin is distributed to about one half of each petal, giving the impression of a yellow throat, the shade of which depends on the carotene content of the inner petal layer. In extreme cases the throat

can be enlarged. The 'Ramona' and 'Bull's Eye' *Clivia* are nice examples of flowers with a large yellow centre. It seems that flowers like this can only be obtained through selective breeding.

The distribution of colour in the tepals can also be affected by mutations in the pattern genes. Some cause normal anthocyanin to be distributed to only the very edge of the tepals. Such flowers are called picotees. Another mutation affecting the distribution of anthocyanin gives rise to bi-coloured flowers.

Anthocyanin is normally broken down as a flower ages, but bleached flowers are curious because they open normally and then start to bleach away more quickly than usual as the flower matures. The anthocyanin seems unstable and thus fades faster in certain parts of the flower.

Conclusion

In conclusion, there are five ways in which nature can produce yellow *Clivia* by altering the anthocyanin in the flower:

1. There can be so few cells containing anthocyanin that the flower appears yellow.
2. The anthocyanin may be colourless.
3. The anthocyanin may be so dilute that it appears colourless.
4. There are recessive mutations that cause anthocyanin not to be produced or to be produced erratically.
5. Finally, there are yellows that are the result of mutated pattern genes, so that anthocyanin is not

distributed to where it is supposed to be.

It is important for the breeder to understand not only how colour in *Clivia* flowers is produced and distributed, but also which variations are mutations and which can only be obtained through selective breeding. Compatibility, and how the different colours and forms inherit, are of crucial importance in creating new cultivars.

More mutations in the anthocyanin pathway can open the door to a larger spectrum of colours. A mutation causing blue anthocyanin is a real possibility. Even with blue anthocyanin in the outer petal layer, a blue *Clivia* will be hard – but not impossible – to breed because of the green chlorophyll and yellow carotene in the inner petal layer. Certainly, if we can add blue to the spectrum, some new *Clivia* colours will emerge.

(Blue anthocyanin – pelargonidin – was detected in the flowers of Nakamura Crimson, a dark red miniata, as described by Keith Hammett in his article "Pigment Surprise" in CLIVIA 8. Eds.)



An orange *Clivia* flecked with white, belonging to Ian Brown, shows where anthocyanin and carotene are present in sufficient quantity, you will see orange but where absent you see white.

Photo: Claude Felbert

Breeding Green Flowers

W. Morris, Australia

Shigetaka Sasaki in his *CLIVIA 7* article "New developments in clivia breeding in Japan" refers to the breeding of green flowers. The article below is a simple "how to do it" guide, using plant material that is reasonably easily available.

(Eds.)

In the past decade there have been illustrations of green *C. miniata* flowers in the Clivia Society Yearbook and on the internet, most of which have been bred in Japan. I suggest the following method to obtain them, other than by chance.



Photo: Shigetaka Sasaki

C. miniata 'Hirao' as seen on the back cover of YB 7

We have all seen *C. miniata* flowers with green throats. Red, orange or yellow cultivars sometimes have green throats which at times are quite deep green. What is needed is to get the green colour throughout the whole flower. The only flower that I have seen that is decidedly greenish throughout is *Clivia* 'Natal Yellow' which opens a definite greenish yellow. However, this green tint fades in a few days and the flower becomes simply yellow. What is required is to keep that green tint over the whole flower and not just in the throat, and to intensify it. The easiest way to do this is to

cross it with a plant which *already* has green throughout the flower, and then to select from the offspring.



Photo: Ken Smith

A 'Natal Yellow', Grower Fred van Niekerk

I suggest the following two successive crosses as suitable. *Clivia* 'Natal Yellow' is one parent; the other is a strongly green-throated flower, such as a bronze flower e.g. *Clivia* 'Bertie's Bronze'. Bronze flowers are a bronze or brownish orange because the normal orange or red pigment in the external layer (epidermis) of the flower is underlain by green chlorophyll in the deeper tissues. Breeding for deeper and deeper brownish flowers is really only breeding for more and more chlorophyll in the deeper



Photo: Claude Felbert

A dark bronze green throat



A yellow with a persistent green throat

tissues, and this chlorophyll is not destroyed over time, as it is in 'Natal Yellow'. Now the offspring of a bronze x 'Natal Yellow' cross (the F1 generation) will be orange/red as the yellow colour is recessive, but the colour will be bronze or brownish orange/red in 50% or so of the seedlings. The chlorophyll is in the chloroplasts in the deeper layer and the chloroplasts are inherited from the mother plant, therefore the bronze flower plant should be used as the pod parent.

Next, the seedlings with the best bronze flowers should be selected and crossed with each other (sibling crossing) and, because they carry the recessive 'Natal Yellow' genes, these F2 plants will give around 25% non-orange flowers (yellow).

These flowers will vary, but most should be deeper green than 'Natal Yellow' and most should hold the green colour (as the bronze flowers do). Thus the green flowers will occur in the second generation and through further line breeding and selection, one will be able to intensify the green colour. In the F1 generation all the seedlings will have pigmented bases. However, in the F2 generation the green, greenish-yellow and

yellow flowers will have unpigmented bases and will all be Group 2 plants.

One further comment is that I believe the production of green chlorophyll in *Clivia miniata* is temperature sensitive. In my climate, green throats in orange or yellow *Clivia miniata* flowers will occur in some years and not others, and never as regularly as in colder climates like Toowoomba, Queensland. I am near the coast in central New South Wales (just near Newcastle) in a frost-free area and by our flowering season, the winter cold has gone. So it seems likely that green flower breeding will be easier and the colour better, at least to begin with, in places with a cool spring.

The advantage of this suggested method, rather than line breeding of 'Natal Yellow' with its progeny, or the line breeding of green throated yellows, followed by selection in both cases of more greenish flowers, is that this suggested method should produce green flowers in only two generations.

The flowers that will result from the breeding outlined in this article, though green, will be perfectly normal in every respect. They are totally unlike the long-lasting green flowers which occasionally - due to a developmental mutation - occur on some plants. In such cases the flower segments and reproductive parts are not normal, and characteristically these flowers do not open fully. Their thick and stiff green petals sometimes have some orange in them.

Another benefit of this approach is that, if the bronze parent has broad leaves, then some of the green, greenish yellow and yellow-flowered progeny will also have broader leaves than the 'Natal Yellow' parent. (Eds.)

Victorian Peach and New Clivia Creations Victor Murillo, USA

Let me begin by telling you a little about myself: where I work, and how I first became involved with *Clivia*. In 1996, when I was 21, I started working at Sunlet Nursery in Fallbrook, near San Diego, California. Sunlet Nursery is a wholesale nursery that produces a wide range of flowering plants for the wholesale trade, retailers and chains of garden centres all over the United States. Most of our material is shipped to customers outside California. Having grown up in the nursery industry family, this was nothing new to me. I immediately became involved in the breeding of *Astroemerias* and also *Clivia*, which remain my favourites.

I had to learn about *Clivia* on the job, as I took over the existing *Clivia* breeding program started by my boss, John Kister. He had been developing a salmon/peach range and asked me to continue developing peach colours. By 1998 I was breeding with a mission. The start of the peach breeding program included a Belgian peach and two high quality yellows given to John by Eric Anderson, which originally came from the Vic Daniels collection. They produced a group of original peach-flowering plants, with which I then began to work.

Each blooming plant used in the breeding program was assigned a unique identification number such as 98-12. I still use this numbering system, although I occasionally started to name a favourite here and there. In my breeding program I began to take careful notes and pictures of both parents for future breeding. What I wanted to know was: What would happen if I crossed two particular peach-flowering plants? Would some or all of the offspring also flower peach? If so, would the colour be the same as that of the parents or

would colours differ? And would the resulting seedlings have the same characteristics as the parents with regard to features like leaf width, flower count, etc?

My first crosses bloomed in three years, thanks to a good fertilisation program. The first seedling to bloom flowered on January 22, 2001 and is still one of my favourites. The actual cross is 98-12 x 98-13. It has a nice compact habit, a dark peach colour, broad leaf width, and good flower count. Seedling after seedling that bloomed was peach. Peach *Clivia* were blooming consistently in light, medium and dark forms. The years of work put into the program had begun to pay off.



A multi-lobed Peach

We began to select for characteristics such as large flower heads with large flowers, multiple blooming periods per year or multiple spikes at each blooming, and also broad leaves. We knew that our plants were of a much higher quality than generally available to the public. Also, my breeding results indicated that we had great material to produce a stable and high quality line of peach-flowering plants. Based on this, we made the business decision to go into

Photos: Victor Murillo

full production, using the parent plants that we had to create our own line of peach *Clivia*. For a successful commercial introduction a name would be needed for our 'new product'. Many names were considered until Janet Kister, my boss, suggested that since the plants were my 'babies', the name of the strain should be 'Clivia Victorian Peach'. The name of the strain was then trademarked and a special label was created to identify each and every peach from that strain as 'Clivia Victorian Peach'.

The range was introduced to the public in 2001 at Plant Tour days – an annual nursery event in Southern California, attended mainly by large customers from other States. *Clivia* 'Victorian Peach' includes a range of peach colours from light to dark shades. They have broader leaves than all other peaches I have



Photo: Victor Murillo

A dark 'Victorian Peach'

seen. Both landscapers and hobbyist breeders have found them to be full and vigorous plants that breed true from seed. 'Clivia Victorian Peach' made an impact and has been featured in specialist gardening publications such as *The Pacific Nurseryman Magazine*, *Grower Talks Magazine*, and in more widely read newspapers – *The Los Angeles Times* of April 2004 and the *San Diego Union Tribune* of April 2005. The plants have often been mentioned on the *Clivia* Enthusiasts discussion group on the internet, resulting in sales as distant South Africa, Australia, Japan, and of course, all over the USA.

In 1994 while still working with 'Clivia Victorian Peach' at Sunlet Nursery, I also set up my own company and 'boutique' breeding program, called 'Murillo's Exquisite



Photo: Victor Murillo

A light and a medium 'Victorian Peach'



Photo: Victor Murillo



Photo: Victor Murillo

'Victorian Peach' Seedlings

Clivias'. Many of you are familiar with M.E.C and some of my recent named *Clivia*. My main goal is to continue to create some of the best *Clivia* in the world. For example, using some of my best green-throated yellows my aim is to develop a stable strain of green-throated yellows with good flower form. In addition



Photo: Victor Murrillo

Attractive Green-Throat

to peach, yellow and cream colours, I am also working with variegated pastels and pinks and with different leaf forms, including broad leaves and compact Daruma types, incorporating variegation in various colours.



Photo: Victor Murrillo

A variegated Pink

Pen Henry once told me, "Victor you're a creator now." Since then I admire every plant that I work with. I look at my breeding

as a work of art, creating a living thing that people can enjoy in their gardens. Watching an inflorescence form in the centre of a crown, then slowly rise while developing its buds that will soon turn into flowers, is truly a breathtaking experience - especially after waiting three to four years for this to happen. Once the first, the second and the third flower start to open, you can release that breath and truly enjoy what you've created to share with *Clivia* lovers worldwide. Keep in mind that there's always something hidden in a breeding program. This is what makes breeding plants so unique and exquisite.

Acknowledgements: I would like to thank Sunlet Nursery, John and Janet Kister for giving me the opportunity to work with Victorian Peach and for teaching me the aspects of what a 'well respected' nursery truly is; Dave Conway for being there for me when I had questions about *Clivia*. I will never forget his laugh. (Was he laughing at me or with me? Probably at me!) Last, but not least, I would like to thank my wife Danielle for being there for me from day one. She had to hear about every new *Clivia* that bloomed for me. Till this day she supports my *Clivia* addiction, she traveled halfway around the world to be with me at the *Clivia* Conference. Isaiah, my son and my best bud, I love you, the future of *Clivia* lies in your hands.



Photo: Claude Fedbert

A South African owned 'Victorian Peach'

Some Show Photographs

Northern



Above: Best on Show

Grower: Chris Vijoer

Below: Third best flowering plant on Show

Grower: Bets Rossouw





Above:

Grower: Danie van Heerden

Below:

Grower: Ernie Hobbs





Above:

Grower: Wimpie van der Walt

Below:

Grower: Pat Gore



All photos on these three pages are courtesy of the Northern Clivia Club

Joburg



Above and Below: Best on Show and Runner-up

Grower: Glynn Middlewick





Above and Below: Gold Medal Winners

Grower: Ken Fargher



All photographs in the Joburg section are by Gideon Scheepers



Above: A near white. Grower: Ken Fagher. Below: Second Runner-up 'Berties Bronze'. Grower: Chris Viljoen.



Waterberg



Above: A Gold Medal Winner at the Nylström Show
Below:

Gröwer: Piet van der Merwe
Gröwer: Piet van der Merwe





Above and Below:

Grower: Bets Rossouw



Photographs in the Waterberg Section: Rina van der Merwe

KwaZulu-Natal



Above: Best on Show

Grower: Marie van der Merwe

Below: First Runner-up 'Tureka' Roy and Val Thurston





Above: Best Any Other Colour

Grower: Brenda and Etzel Nuss

Below: Second Runner-up Grower: Sean Chubb





Best Pink on Show.

Photographs in the KwaZulu-Natal section: Clive Graham

Cape



Above: Best on Show
Below: Runner-up

Grower: Ian Brown
Grower: Gerrit van Wyk





Above: Reserve Runner-up

Grower: Johan Botha

Below: Best Narrow Tepal

Grower: Johan Botha





Above: Pastel Apricot

Grower: Ian Brown

Below: Best First Time Flowerer

Grower: Riel Lötter



Accent on Single Flowers

Photo: Mick Dover



Photo: Claude Felbert



Photo: Issa Nel



Photo: Gudrun Scheepers



Photo: Gudrun Scheepers



Photo: Gudrun Scheepers



Accent on Single Flowers

Photo: Helen Marriott



Photo: Felicity Woodlen



Photo: Mick Dower



Photo: Claude Felbert



Photo: Gordon Fraser



Photo: Claude Felbert



Pleasant Surprises

Michael Jeans, U.K.

Over the years, I have enjoyed many pleasant surprises when *Clivia miniata* seedlings flowered for the first time. Whatever the plant, the first flowering of a carefully bred seedling is always awaited with great anticipation, sometimes only to be followed by disappointment. However, *C. miniata* is a plant that is frequently generous to the breeder and occasionally manages to pull the completely unexpected "out of the hat". In this article, I shall discuss a few of the more unusual flowers that have appeared in my collection of *C. miniata*.

As time has gone on and my facilities have become ever more stretched, I have tried, and usually failed, to follow certain self made rules as to what I should grow on. I am very appreciative of *Clivia* plants that have a good form and look tidy. When in good condition and with fairly broad dark green leaves, *C. miniata* makes an attractive foliage plant and, if grown in a conservatory, earns its keep for those 11 months in the year when it does not have any flowers. From nothing more than personal observation and without any formal investigation, I think that a good tidy plant with broad leaves is far more likely to have a good head of well shaped flowers with reasonable tepal overlap, than a narrow leafed untidy plant. Another personal observation, again unfounded on any formal investigation is that when a batch of seed is sown, the last plants to flower often have the best flowers. As it generally takes from three to five years for my plants to flower from seed, the last to flower are often somewhat neglected and in need of potting on by the time they win me over with their superior flowers!

My breeding goals are now limited to attempting to produce two good seed-grown strains of *C. miniata*, giving good robust plants of tidy form with full heads of flowers carried well above the leaves on strong stems. One strain has orange, red or darker pastel flowers, and the other strain is centred on Group 1 yellow flowers and pale pastel colours. In both cases, I favour flowers with a good degree of tepal overlap. My hope is that *Clivia* growers will add their own favourite plants to a gene pool produced from these strains and consequently have a unique gene pool which is being continually improved. New plants added occasionally should improve the genetic quality of the pool and contribute to the general health of the seedlings as well as adding interest as the unique gene pool develops.

Since *C. miniata* only flowers at a set time every year, it is worth sowing seed at the earliest opportunity. About 6 months after pollination, the umbel of fruit can be picked and hung upside down by its stem (peduncle). After a month, the seed should be ready to sow and this can gain a few months over waiting for the fruit to change colour to indicate that it is fully ripe. Sometimes this can make all the difference in helping the plant to flower a year early. I tend to use the whole umbel in a cross pollination and tie a label to the umbel to show the cross that has been made and the date on which it was made. It is also worth mentioning that seed bought from a breeder is a year ahead of ones own pollination, and offers an additional route to building up an effective gene pool and breeding program in a reasonable time.

My orange and red strain of *C. miniata* is being produced from a wide range of *miniata*, including some old named cultivars and a wide variety of plants that have been obtained at various times. Since the usual orange *C. miniata* has been bred for over a hundred years in Europe, there are quite a few nice plants to choose from. On a couple of occasions, I have seen a single very dark red flowered *C. miniata* amongst a large display of *miniata* offered for sale at a garden centre. On both occasions, I have bought the plant to include it in my gene pool. The plants, grown in mainland Europe, are always in a peat substitute growing medium. Controlled release fertiliser is always added to the pot that, even by European standards is much too small for the plant. The following year when the plant is in a less acid growing medium and a larger pot, the dark red of the flowers is replaced by a dark orange colour. The very dark red flowers are usually very small, and to date I have failed to transpose the dark red colour onto a plant with larger flowers. The picture below shows an old cultivar 'Westonbirt Perfection' which often gives its fully rounded flower



The attractive flower head of 'Westonbirt Perfection'

shape to its progeny. The next two pictures are progeny of 'Westonbirt Perfection'. The first shows a typical head of nicely formed flowers held well above the leaves on a strong stem. As



Good form

A sparse flower head

Photos: Mike Jeans

a contrast, the picture shown alongside it is a rather delicate and ethereal seedling that makes an attractive foil to the more robust flowers usually associated with broad leaved *C. miniata*.

'Salmon Sensation' the picture below, with fruit, is a dark salmon *C. miniata*, and which had lost its labels by the time that it first



'Salmon Sensation'

Photo: Mike Jeans

flowered and is therefore of unknown parentage. The next two photographs show a couple of seedlings from 'Salmon Sensation' with different yellow *miniata* seed parents. However both have inherited the attractive flower form and 90-100mm. flowers from 'Salmon Sensation'. Some of the surprises in the darker strain are plants that should have been yellow flowered but

finish up with orange flowers, often well formed and brightly coloured. There are relatively few surprises in this group, probably because most of the plants have been selectively bred in Europe over many generations and have straightforward genetic inheritance.

Photo: Mike Jenks



A 'Salmon Sensation' offspring

Photo: Mike Jenks



A 'Salmon Sensation' offspring

It is in the group of the pale flowered plants that most of the surprises occur. Heading the next column is a Group 1 yellow *miniata*, originally from Cape Flora Nursery and



Photo: Mike Jenks

Note the tepal overlap

described as 'Dr. Hirao x Nakamura' strain. With its funnel shaped flower giving good tepal overlap and a much more consistent yellow than usual, I thought that it should make a good seed parent. Many of its progeny have flowers of a more realistic yellow than that typically found in yellow *C. miniata*. In some of the crosses, I used pollen from a (meristem) 'Vico Yellow' in an attempt to increase flower size. The first time flowerer, shown below, is an attractive yellow seedling from this cross, with good shape. The first picture on the next page shows a



Photo: Mike Jenks

An excellent dark yellow colour

seedling with tepals 38mm wide. As the picture opposite indicates, the unexpected is never far away and the near-white flower has the same parents. The 100mm. flowers had most of the things that I sought, and opened exactly the same colour as it had when the flower was going over. The last picture shows a yellow spider flower over 130mm. across.

As I do not have any spider flowers in my *Clivia* collection, it is as difficult to imagine the genetic heritage of that plant also with the near-white flower. My collection has a few *C. miniata* 'striata', but only one of them has yellow flowers and it has poor random variegation and very poor split flowers.

The 'striata' seedling shown opposite has attractive, well shaped, yellow flowers and reasonable leaf variegation. Unfortunately, it is another casualty of my poor labelling, having lost its identity on the way to flowering.

Although there are more surprises in a poorly labelled collection, there has to be less control and slower progress if successful crossings cannot be repeated because the parents cannot be identified. I realise that there is absolutely no merit in poor labelling and am making a determined effort to improve my labelling. The labels are probably lost in 'potting on' as I have them in the soil rather than tied to the plant.

Many genera can only be bred professionally because thousands of seedlings are required to get perhaps a single plant with any commercial value. Not so with *Clivia*. My



A near white flower head

Photo: Mike Jenms

Photo: Mike Jenms



Wide tepals



A variegated yellow

Photo: Mike Jenms

experience over about ten years of flowering home bred seedlings is that quite frequently seedlings appear that are of superior quality to both parents. Many of the plants illustrated cannot be compared to their parents

as they are very different from them and I am unable to see anything in my gene pool that can be responsible for some of their characteristics.

It is immensely satisfying to find a stranger flowering in the midst of one's collection, far more so than buying a plant from a nursery, even if it is in flower!



A yellow spider

Photo: Mike Jenms

A Trilogy of Chinese Clivia

Hein Grebe, South Africa

Part One: The Beijing Clivia Scene



Photo: James Forsyth

South African tourists at Tiananmen Men Square

Beijing is a huge metropolis with many ultra-modern skyscrapers and an ever-changing skyline. It is home to more than 15 million people, which is a third of South Africa's population. With tourist attractions like the Great Wall, Forbidden City, Summer Palace, Tower of Heaven, Ming Tombs, Ghost Market and many other historic places, it is seen as the cultural capital of the Peoples' Republic of China. The Far East's two top universities, Tsinghua and Peking Universities can also be found here. It is a city of many opportunities even for those *Clivia* growers more than 1000 km away.

Every spring festival is a huge opportunity for flower growers. Hundreds of thousands of flowers in pots get placed in strategic places or planted in gardens alongside roads and highways so as to make the capital city beautiful and create a spring atmosphere. Many of these plants are grown on a 100ha site, which consists of thousands of glass houses. You need more than a week to visit most of the glasshouses. Unfortunately only a few *Clivia* of ordinary Chinese standards can be found there.

When visiting Beijing for the first time in 2004, I heard on the radio that 1.2 million tourists had visited Tiananmen Square on the first day of October that year to see the flower displays and other attractions. Tiananmen Square is in the centre of the city and the biggest city square in the world. Tourists visiting Beijing during the first week of October 2004 spent more than 4 billion RMB or Rand. The Chinese sometimes refer to the first week of October as the Golden Week, because most Chinese go on holiday during that week and billions are being spent. In 2005 Beijing's nominal GDP was 84 billion USD (compared to SA's total GDP of 200.5 billion USD for 2006), a year-on-year growth of 11.1% over the previous year. Its GDP per capita was 44 969 RMB or Rand, an increase of 8.1% over the previous year and nearly twice as much as the GDP for 2000.

To find *Clivia* in Beijing is not that easy. I had heard stories of overseas Mandarin speaking *Clivia* enthusiasts visiting Beijing in the hope of buying *Clivia* plants without finding any. The easiest way to find a *Clivia* or two is to walk in an old suburb where plants are being grown



Pagoda Flower Market and a 'special' *Clivia*

Photo: Hein Grebe

on balconies. You are guaranteed to find some there, but to communicate with the owners is another story, because more than 99.9% of the older generation cannot speak English.

In my case, things were much easier. During all three visits to Beijing, I was staying with the Qi family. Mr Qi Yonghe and his son, Biao, are bonsai specialists who have won numerous prizes with their plants and displays. They belong to various botanical societies and know the entire flower growing areas and flower markets.

For a person who is interested in buying *Clivia*, a flower market is the most important place and the only place where you will be able to buy high quality *Clivia* plants - at a good price if you have superior negotiating skills.

A flower market is a place where you can buy many things. It is mainly a place where specialist plant growers sell their plants and florists sell all types of fresh and artificial flowers. It is also a place where you can buy ornaments, pets, insects, jade, paintings and many other valuable articles.

Price haggling or negotiation was something new for me as most things for sale in

South Africa are priced, but in China only the supermarkets usually price their goods. There are several things to keep in mind before you buy plants in China. If you are a European they will think you are rich and have lots of money to spend. If they see you are buying more than one plant, they will know that you are a tourist and not a foreigner working in Beijing. They will also know that every day you stay in the city will cost you money, that the good flower markets are hours away from each other, and that you are likely to give in to higher prices.

On the other hand, most of the sellers come from cities far away. It costs them money to get to Beijing and stay there. Their families expect them to bring money back which they can only do so if they sell their plants within a few days, as Beijing is an expensive city if you cannot stay with relatives. This means there is a sort of balance between buyer and seller, but if you visit commercial growers that balance is disturbed and everything is in the favour of the seller as he has nothing to lose, only his time. The balance is only in your favour if you find a seller with only a few plants left. If you make him a reasonable offer for the lot, he will most probably accept your offer, because he can then return home immediately.

To buy a bargain you must not look too interested in the item. Rather suggest you want to buy it as a gift for someone. On the other hand you must not insult the seller with too low an offer. Then you can forget about buying anything. This happened to me last year when I tried to buy pollen of a variegated LOB. The more I explained that I could not afford the plant but was willing to pay a good price for the pollen - which meant that he had nothing to lose as the buyer would hardly notice that a few pollen grains are missing - the more upset the seller became as he was only interested in selling the plant. After a few minutes he refused to communicate with me.



Photo: Helm Grebe

After tough negotiations mixed feelings reflect on the face of the seller of this compact multipeal.

To prevent this you must have knowledge of the product you are buying. *Clivia* must be one of the most difficult plants to grow and sell in China. The more I interact with Chinese *Clivia* growers, the more respect I have for them and the more I admire them. Most commercial growers are perfectionists.

They grow their *Clivia* in the harshest conditions with outside temperatures that vary between minus 20°C to plus 35°C or more. In the summer months there is the threat of fungal diseases and in the winter the freezing of plants or low light. Sometimes there is no light for days when the glasshouses must be covered with straw mats so that ice is not formed on the glass roofs. The change in light conditions and hours of sunlight make it extremely difficult to grow perfect plants with all the leaves the same length and width. They have mastered the technique of manipulating the growth of every leaf on the plants in their glass houses. These growers eat and dream *Clivia* and it is impossible for someone to convince them that you can find better *Clivia* than theirs.



Photo: Hein Grebe

An Anshan glasshouse and an unexpected snowfall

After three years of hard work, most of the plants will be flowering size. A good quality plant that is professionally grown and planted in a beautiful pot can fetch R250 or



Photo: Hein Grebe

Inside the glasshouse of Huang Qiuyi we see a display of numerous awards he has won for his *Clivia*

more in Beijing's flower markets. If the flower or leaves are damaged you can expect a big discount of up to 50%.

The most expensive and popular *Clivia* on the market is the "crinkle face" (guolan) with a good pagoda style and leaf form as well as variegated and miniature types like Jade and Swallow. Many sellers at flower markets display photos of their glasshouses in the background as well as the different prizes their *Clivia* have won in competitions. This is an easy way to convince prospective buyers of the quality of the *Clivia* they are buying. The general public however is not so much interested in the breeding quality of the plant, because they simply wish to put something with a flower in their house or shop. Many *Clivia* end up in the rubbish bin when the flower is gone or when they find a more interesting replacement, because space is the main consideration in Beijing. It is common knowledge that Beijing has on average some of the smallest dwellings in China, because land is very expensive.

Most *Clivia* sellers at the Flower Markets are middle men, who buy plants from commercial growers as soon as they start to



Zhao Baoyi's display in a modern Beijing flower market

push flowers, travel to a big city like Beijing with the plants

and sell them there. Not all sellers traveling with plants to Beijing are successful in hiring a space in a Flower Market. The reasons are obvious. There are only a few Flower Markets and the selling space in each market is limited and is most of the time taken. Apart from that, you must have a license to trade, which also costs money and is not so easy to obtain if you are not a Beijing citizen.

Some flower growers and sellers overcome this problem by arriving early on a Saturday morning in Beijing, traveling to the Flower Market with their goods before sunrise. They then bargain with licensed sellers to buy all their plants at irresistible prices, which vary from 10% to 20% of the going price inside the Flower Market. Those with better plants get their plants sold first and the other might have to drop their prices further to get them sold so as to be able to take the train back home in time.

Mr Qi told us this secret and in October 2004 we woke up very early one Saturday morning to reach the Pagoda Flower Market before sunrise when everything was still closed. The Pagoda Flower Market is famous for good

Clivia and many top growers from Anshan, Changchun, Shenyang and elsewhere sell their *Clivia* there. It is also the place where I bought the best *Clivia* in Beijing. Some prominent Beijing *Clivia* growers regularly pay a visit to the Pagoda Flower Market on a Saturday morning to look for quality stock plants or to have a chat with growers from other towns to swap information or ideas.

When we arrived at the market, we saw people transporting all types of goods, from furniture to pets to plants. We found several people selling *Clivia*. Most of the *Clivia* were of inferior quality, but luckily I found one trader who was selling promising young broad leaf Daruma seedlings. I bought 10 plants for R250, with one of the plants having a leaf that was already 120 mm wide.

Later, when the market opened, we went inside and could clearly see the price difference inside and outside the market. Obviously when the market opens, no one is allowed to sell their goods outside, especially without a license. There is thus no chance to compare the quality and prices before you buy. The only plants I bought that day were the ones outside the market.

October is a perfect month for buying *Clivia* as the weather is perfect and it is the last month growers from far travel to Beijing to sell their plants, because in November it starts to snow and it is very risky to transport *Clivia* in freezing weather, as I had experienced myself in China previously.

In 2006 I visited China to celebrate the Chinese New Year with the Qi family and also to see Chinese *Clivia* in flower. Unfortunately for me the winter of 2005/2006 was an extremely cold one, which delayed the flowering season. I was told that February is the time when you can



A 15cm Broad Leaf with all leaves the same width

find thousands of flowering *Clivia* on the Flower Markets, because most people buy one to put it in their houses for the coming Spring Festival. We visited a few Flower Markets, but could not find many flowering *Clivia*. Average quality flowering plants were selling for R250 a plant, plants I would hardly purchase for R50 a piece.

One Saturday morning I asked Tracy Qi and her father to take me to the Pagoda flower market. I was expecting high quality plants with beautiful flowers and maybe one or two with a rare flower. When we arrived there, we looked around, but could not find a single *Clivia*. Mr Qi asked around and one person explained that it was too cold to sell *Clivia*. The Pagoda Flower Market is one of the oldest markets in Beijing and does not have any central heating inside the building, such as the modern Flower Markets do. Later on we found out that there were a number of growers trying to sell *Clivia*, but that they were hiding close to the market in their hotel rooms. Most of them were from Anshan and, for obvious reasons, did not bring their best *Clivia* to the market. They had been trapped inside their rooms with their plants for almost a week now. One cold spell outside their rooms and the leaves of the plants would get damaged by frost which would leave them with nothing to show for their 3 years labour. We had

a chat with them, took photos and returned back home. I had been in Beijing now for a couple of weeks and had not bought a single plant.

Then I got the bright idea to visit the commercial growers in Anshan, Shenyang and Changchun. There I would see thousands of flowering *Clivia* and could pick the very best, as I had done in the past. I convinced Tracy and Yuanhau to go with me, because I was not confident enough to go on my own. We decided to travel by train this time, as it would be safer and quicker, because we could sleep in the train if we departed late in the evening. We arrived on a sunny morning, but another disappointment awaited me. After greeting some old friends and eating and drinking together, the *Clivia* expedition started. After visiting a few glass houses, with thousands of *Clivia*, I hardly saw a *Clivia* in flower. Yuanhau's father explained to us that as soon as a *Clivia* pushed a flower, it gets covered with a newspaper to delay the flowering process. Every day buyers came to buy plants to sell on the Flower Markets. They selected only those with flowering stems, as they would be the easiest to sell. As soon as the plants are sold, they return to collect more. I could only see a few breeding plants in flower. The cold winter had also delayed the flowering season here.



Hein receives a valuable gift from Zhao Baoyi of a Painted Face Daruma

As we visited growers, I bought plants, because I knew there would not be time for revisits. It amazed me that everyone still remembered and recognized me from my previous visit almost two years ago! The next day a snowstorm arrived. Everyone covered their glass houses with straw mats to prevent the ice being formed on the glass and to keep the cold out. No more visits, because everything was covered in darkness. Yuanhau's family helped me to pack the *Clivia* I bought in a box. We decided to go further north and to visit Mr Zhu in Shenyang the next day. When we woke up the next morning the snow was already more than 150 mm deep. There was no train to Shenyang that day and we would have to take a bus. Only after an hour did we find out that there was no bus going to Shenyang, because the highway was closed as result of the heavy snow.

We walked around in the snow for hours trying to find someone to take us to Shenyang. I was getting worried about the *Clivia* in the box, because it was very cold outside and the box was getting wet despite me regularly removing the build-up of snow. At last Tracy found a taxi driver mad enough to take us to Shenyang. I decided to keep the *Clivia* on my lap to keep them warm. Wherever we went, we found closed roads. However, like a good taxi driver, he knew all the back roads and it was not too long before he found a way out of Anshan en route to Shenyang.

After half-an-hour's drive, things started to look worse. It kept on snowing and I was praying for a safe arrival, thinking back to a visit near Tibet to Dali in 2004. Tracy and I had decided to travel on a metal rowing boat with a Dutch couple to an island on the other side of a very big lake. An old couple was willing to take us there in their boat. A few kilometers

from the shore they complained that they were too tired to row any further and that we would have to help them. Luckily we made it to the island, but on our way back a storm came up and caused huge waves on the water. Suddenly I started to think of the consequences if the boat overturned ... our cameras gone and we might not be able to swim the 10 km back in the icy waters. I was thinking of the story of Jesus who calmed his disciples who were in the same situation on a stormy sea many years ago. That afternoon I prayed all the way back to the shore and - thank God - we arrived safely on the other side.

Now we were in the same situation again and so many things could go wrong - the car could slide off the road, the engine could die and suchlike - then we would die in the snow because no one would expect people to travel in these conditions on a lonely road. Luckily for us the driver was very experienced and did not try any tricks on us. He did not recognize Shenyang's streets, because everything was white. Only the main routes were in use. We contacted Mr Zhu and he said that he would wait for us along the main road, because the road to his house was not accessible any more. We found him and when I opened the boot to remove our luggage I saw that it was frozen. I



Zhu Jifa in a glasshouse with some of his *Clivia*

Photo: Hain Grebe

had made a very good decision not to put the *Clivia* in the boot. We walked in the snow to Mr Zhu's house. In some places the snow was almost knee deep. Inside Mr Zhu's house it was very warm, we exchanged *Clivia* news, had a look at his plants of which some were in flower. I bought a couple of his famous variegated Daruma. Apart from giving me pollen of his best plants, Mr Zhu gave me a very expensive gift – 4 line bred miniatures. We went to a good restaurant and enjoyed a wonderful meal and drinks. Mr Zhu managed to find train tickets for us to return to Beijing. He accompanied us to the station and on the way to the station the driver of the mini bus taxi lost control and we slid off the road, first missing a tree, then a huge stone, before crashing into a bank of snow. It was dark outside and we were lucky no one was hurt. Most of us got out of the taxi and pushed it back onto the road again. Luckily we arrived in time at the train station and we could not wait to be in Beijing again with all the luxuries, comfort and heat.

Back in Beijing I visited more flower markets. Suddenly we saw plants with stunning flowers: multi-petals, bi-colors, large white centers, green centers, ghosts and plants with light colored flowers.

Unfortunately I could not buy any more plants, because I bought too many in Anshan and Shenyang. My luggage was already overweight. But now I know that many Chinese plants have flowers that can compare with the best in South Africa. At one flower market I saw a selection of plants with particularly beautiful large flowers that reminded me of Eric Heine's plants. I found out that the grower, Mr Zhao Baoyi, was from Beijing. We visited him one day when everything was still covered with snow. I was stunned with his beautiful collection of broad leaves, variegated and Light



Photo: Heine Grebe

A bloom seen at a Beijing flower market

of Buddhas. He showed us shed after shed, at least 10 of them, each with an estimated 10 000 to 15 000 *Clivia*. His collection is the biggest I have seen in China.

Many of his plants were in flower and I asked him for the pollen of a beautiful broadleaf painted face Daruma. The next moment he asked someone to bring the plant to him and gave it to me as a gift! He also gave me a semi miniature and showed me his breeding plants behind a barred area, full of seed heads. From the pod colours I could see that the flowers must be of a wide colour range. He invited me to take some of the pods. After I explained that I had already got more than I wished for, he picked a few seed pods and gave them to me. We returned home very happy after I promised Baoyi that I would return with plants of my own.

Apart from visiting a few other Beijing growers, we also visited Mr Huang Qiuyi. He is a second-generation grower and specializes in growing 'crinkle face'. He has won numerous prizes and medals with his *Clivia* and also has a collection of other *Clivia*, like yellow flowering *Clivia* which includes a yellow multi-petal from Japan and some of China's original unimproved *Clivia* that were grown in the

Chinese Emperor's palace. He gave me seeds of a good quality 'crinkle face' stock plant and afterwards we looked at the flowers of some of his plants on his computer. I saw a photo of a very broad leaved plant with the widest leaf of 180 mm, but also with some 160 and 170 mm leaves. I asked him who the owns this plant, because I had been hunting for a super broad leaf for several years. He explained that the plant belonged to his father, but that he was now the new owner. When we left I explained to Tracy that she should try to buy the 180 mm broad leaf for me. She had known Qiuyi for more than a year by then and would do a better bargaining job than me. Approximately six months later she told me the good news that I was now the new owner.

In Beijing I had seen quite a number of super broad leaf plants, including China's number 2, a plant with a widest leaf of 186 mm! But my search and hunt for super broad leaves is another long story.

In October last year some of the biggest role players in the production of *Clivia* in Beijing invited me to an informal meeting at the house of Mr Zhao Baoyi. He is undisputedly recognised as the biggest *Clivia* grower in Beijing with an estimated 150 000 *Clivia* (my own estimate). I have also met Mr Guo Qiang who founded the Beijing *Clivia* Association in the 70s. He is the second biggest grower with 12 *Clivia* sheds or green houses as they are named



A Beijing flower market where *Clivia* are being grown in fish bowls complete with cold water fish to fertilise the plants. Note the special plastic trays that support the plants.

Photo: Hein Gericke

in Beijing. He told me that he specialized in a type of semi-miniature with long flower stems, which he had developed himself. I have not seen his plants or sheds. It was in the 70s that professionals like Mr Guo Qiang, Mr Liu Mingde, Mr Sai Yongyi and others first introduced excellent *Clivia* cultivars from Changchun as a flower crop to Beijing. Presently there are approximately 30 commercial growers based in Beijing with approximately 1000 *Clivia* club members. Some of them buy seedlings and grow them on for a year or two for placing on the flower markets. They grow their *Clivia* in an estimated 65 to 75 green houses that vary in size from 50m² to 1700m².

Only a few of the *Clivia* green houses are located in Beijing City. Most of them are on the outskirts of the city, which means that you can visit only one grower on a given day if you are lucky to find his address. In 2004 Mr Qi undertook to take Tracy and me to a grower they had visited a few months before my arrival. We spent the whole afternoon trying to find him, but had to give up when it started to get dark. The problem is that in many of the country areas the streets do not have names and all the houses look the same. Privately owned *Clivia* sheds are traditionally half underground in Beijing and are called *Clivia* cellars. Many of these *Clivia* cellars are used for provisional cultivation before selling, as many *Clivia* are transported to Beijing every year.

Beijing *Clivia* growers have been unknown until recently. In late 2006 I met Mr Pang Chunquan who started a web site with Mr Ma Xiaohai to unite Beijing *Clivia* growers and make communication between members easier. Mr Pang worked overseas for a number of years and can speak English fluently. The web site also introduces Beijing *Clivia* growers

and their activities to the world and will make it easier for overseas *Clivia* enthusiasts to make contact with Beijing *Clivia* growers.

For overseas enthusiasts who are interested in buying Chinese *Clivia*, Beijing is the ideal destination. Almost all the different types of *Clivia* are being grown there. Accommodation and transport are freely available as well as the services of CITES and the Beijing Customs Department to arrange for a phyto-certificate for your plants.

As a luxury potted flower, *Clivia* is widely used in hotels, restaurants, ceremonies, banquets and conferences. It is a regular decoration for the National People's Congress (NPC) and the Political Consultative Conference. Every second year the Hortifloorexpo China which is the largest floricultural and horticultural expo in the East is held in Beijing with the next one in 2008 being named Green Olympic, because the Olympic Games also takes place the same year in Beijing.

The future of *Clivia* growers and *Clivia* or junzi-lan as it is named in China looks bright in Beijing. Junzi-lan is being widely appreciated not only for its appearance, but also for its inner beauty. The wax-like green or coloured leaves with their delicate quality, the straightness and regularity of the plant shape and its longevity is being viewed as dignified, poised and elegant, just like the temperament of "Junzi" - a person who is honest, morally upright, tolerant and widely admired.

Note:

Special thanks to Yuanhao, Tracy and her father Yonghe and brother Biao who spent days of their free time to take me around and assist me in communicating with *Clivia* growers and sellers. Without them this article would not have been possible. Thanks are also due to Chunquan who supplied me with important information about the Beijing *Clivia* Club, thereby making this article more complete.

Part Two: Zhu Jifu's New Babies – Line Bred Swallow and Jade

Mr. Zhu Jifu is without any doubt China's most famous *Clivia* breeder. You can mention his name to any Chinese *Clivia* enthusiast and they will know who he is. He has been on National TV several times, is the author of two *Clivia* books and is busy working on his third book, which he says will be the best *Clivia* book China has ever seen.

As the deputy president of the China *Clivia* Association with more than 24,000 members and the Executive Chairman of the Shenyang *Clivia* Research Institute, he regularly comes into contact with China's best growers and the latest development and technology to improve *Clivia*.

Mr. Zhu has become famous for breeding variegated Darumas. He has done this by line breeding selected long-leaved variegated plants with a 14 cm green (i.e. non-variegated) broad-leaved Japanese Daruma which he bought for R40,000 many years ago. The selected off-spring of these plants were then line bred to obtain a good quality variegated Daruma. Some of his 2nd and 3rd generation variegated plants already have leaves wider than the original pollen parent.



Photo: Hein Grebe

Zhu Jifu with his photographer and a large *Clivia* picture

From the offspring of the 2nd and 3rd generation variegated Darumas, miniatures started to appear. Typically, their leaves are wider than they are long, approximately 6 to 7 cm wide and 6 cm long. They seldom flower, but when they do the pollen of these miniatures can be used to make the leaves of the more regularly flowering Darumas shorter.



Photo: Hein Grebe

A Zhu Jifu dwarf

To line breed this type of plant is extremely difficult. In 2006 Mr. Zhu explained that the behaviour of these miniatures could not be predicted. It was almost as if some of them were stupid and did not know how to behave like normal *Clivia*. Some are very slow growing, some will never flower, some will flower out of season, most of the time with flowers between the leaves because of a shortened flower stem, some will multiply by offsets while others will never multiply.

In 2004 I saw only a few of these plants in Mr. Zhu's collection, but their numbers had grown remarkably by the time of my visit in 2006. Mr. Zhu explained that he bought a certain plant at a very high price from a friend and used this plant extensively to accelerate his breeding program of miniatures.



Zhu Jifu Daruma seedlings

During my 2006 visit Mr. Zhu surprised me with four of these plants, two green leaf and two variegated plants. He explained that these plants, when fully grown, would be very highly sought after in China. They are the first line-bred miniatures in China. I

have now had these plants in my collection in South Africa for more than a year, and although they grow in a completely different environment and under different conditions, their leaf width/length ratio has stayed the same, i.e. a maximum 6 cm long and 7 cm wide. The plants have a very strong root system and grow at the same rate as a normal *Clivia*. Next year they will be fully grown and it will be interesting to see whether they will be more productive in South Africa.

These four miniature *Clivia* are the most prized *Clivia* in my collection and I will be forever thankful and in debt to Mr. Zhu who gave me almost 10% of his line bred miniature collection, before even starting to exploit their financial potential.



A meeting of *Clivia* minds

Part Three: Futuristic *Clivia* with Paintings on their Leaves

In 2004 I visited China to search for the famous Anshan Light of Buddha (LOB) grower. He had amazed the *Clivia* world by creating a new type of variegated *Clivia* with leaves that changed colour from a light green or yellow to a dark green, as they get older. Many *Clivia* growers, including some in China, believed that the plants were grown artificially by covering the young leaves with aluminium foil or paper to keep them yellow.

It took us almost two days to find the original LOB grower. He had two glasshouses or sheds as they are called in Anshan, stacked with LOB plants! More than half were flowering size plants. After enquiring about his prices, I decided to shop around first, because I had noticed that many growers had a few LOB plants in their glasshouses.

The following day I was introduced to a grower from whom I bought a 12 cm broad-leaved LOB for R1800. He invited me to visit his house and glasshouse in the afternoon. There I got the biggest surprise of my life. He showed me a collection of approximately 30 variegated LOB with the most amazing colours, stains and patterns on their leaves. His plants were far more advanced than anything I had seen so far. I never could have thought that plants like these could ever exist. It was like seeing these plants in a dream. Unfortunately the prices were out of my reach and so I decided to return the following year with enough money to buy some of these plants.

But when I returned in 2006 I was in for a big shock. The owner had sold all the mother plants I had admired so much. Fortunately, I saw some variegated LOB seedlings in a corner and negotiated to buy the whole lot.

They in fact looked of better potential than the mother and father plants. Now, with the introduction of Zhu Jifu's variegated Darumas as well as Starlight and X-ray LOB, my plan is to create a new 'type' of *Clivia*, which I will call the *Painted Leaf Strain*. I already have plants in my collection whose leaves resemble paintings. One characteristic of these plants is that not a single leaf has the same pattern on them. Each plant is a living work of art. Every time a new leaf is formed, it is a new painting created by nature. This 'painting' also changes as the leaf matures. Each plant can be seen as a book and the leaves as the pages of the book. You can see all the different paintings created by nature by "paging" or lifting up the leaves to inspect the patterns and colour combinations on it.

The plants in my collection are only the starting point. Years of breeding and hybridising still need to be done. Variegated LOB, Fukurin LOB, Mandarin Duck LOB, Tiger LOB, X-Ray LOB & Starlight LOB will be used to create the different lines and figures on the leaves; Bubble Leaf and Painted Face will be used to create a special effect or background; *C. mirabilis* can introduce red for sunrises or sunsets and Zhu Jifu's variegated Darumas will be used to create the 'square paper' effect. Different colours can be introduced to the leaves by using his Five Coloured Orchid and his other plants with multi-coloured leaves

Fortunately, the results of crossing different plants can be seen in the second year and selection of potential breeding material will hopefully be easier than breeding for flowers. On the other hand it can take more than a lifetime to create a living "Picasso"!



A variety of leaf colours and patterns demonstrates Hein's contention that each leaf is like a painting made by nature. All leaves shown above are different types of Light of Buddha except for the first leaf in the second row which is a Painted Face. All Photos by Hein Grebe



A variegated *C. nobilis* leaf



An X-Ray Light of Buddha

Green Gold — Clivia in Changchun

Xueguan Song, China

The contents of the address by Xueguan Song, head of the delegation that attended the 2006 International Clivia Conference are summarized below. (Eds.)

Our delegation from the Changchun Clivia Miniata Society feel greatly honoured to visit the beautiful country from which Clivia originated and to attend this meeting and share in its proceedings. Thank you for this opportunity to tell you about our ongoing development of Clivia miniata.

There is a good market for Clivia in China, a market that has been booming since 1996. Clivia are produced commercially in about 30 cities in China, including Anshan, Dalian, Beijing, Zhengzhou, Changsha, Shanghai, Guangzhou and Nanjing. Clivia have been grown in the city of Changchun, in the north-east of China, for over 70 years. Changchun, from where we come, is the cradle of Chinese Clivia and thus has an outstanding position in the Chinese Clivia market. Some important factors contributing to our success are:

Large-scale production:

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Our experience and "know-how":

Changchun has long been regarded as the homeland of Chinese Clivia. We have developed more than ten good strains of Clivia,

including Dashengli, Youjiang, Ranchang etc. The National parliament normally orders our products. Our *Clivia* breeders are known throughout China as leaders in three important areas: good strains, quality, and *Clivia* "know-how": since *Clivia* have been grown in Changchun for many years, we have built up a lot of experience and are always trying to improve.

Location:

In addition to the factors mentioned above, we have the advantage of an ideal geographic location. Changchun is located at 43° 05' N and 124° 18' E, in the middle temperate zone with a continental monsoon climate, and varying temperature. This environment is ideally suited for *Clivia miniata*.

Transport:

The location is also ideal for transport. Changchun is near the sea ports of Yinkou and Daliang, and the borders of North Korea and Russia lie to the north. In addition, we have an international airport with air links to Hongkong, Japan, Korea and Russia. A new

airport project has already been launched which will make it even more convenient to connect to the world and communicate with more than 180 countries.

Our plans for future development:

Our philosophy is to follow the laws of nature, using science to achieve beneficial results by producing plants that people will wish to own. The aim of our association is to assist our *Clivia* producers and to bring about advances in employment, if necessary by expanding *Clivia* planting. We put effort into maintaining Changchun's status as the centre for breeding good strains of *Clivia* in China. We believe that our developments also improve our city's charm and its attraction for tourists. The government supports us with good policies that promote our *Clivia* industry. We expect that by 2010 *Clivia* plantations in Changchun will cover 700,000 square metres with up to 500 million *Clivia*, including seedlings and young plants, and total employed workers reaching 100,000 in number.

We invite all our international *Clivia* friends to visit Changchun and see our *Clivia* plantations. Thank you and best wishes for a successful conference.

Clivia are so loved in Changchun that in October 1984 *Clivia miniata* was made the official flower of the City. The fascinating story of how *clivias* first reached Changchun can be read in "The great Chinese *Clivia* Bubble", by John van der Linde, in CLIVIA 3.

(Eds.)



The Chinese Delegation — with Roger Fisher at the Northern Clivia Show

The Pretoria Clivia Auction

John van der Linde, South Africa

The Northern Clivia Club held an auction of selected Clivia on the Saturday evening of their Show, which followed the International Clivia Conference. There was a full house at the indoor lapa of the Forensic Science Laboratory, an ideal venue, with everyone being close to the action. It was a great evening, very professionally and slickly handled, and excitement ran high as prices were bid up and up... Not only was there an excellent catalogue but as each plant came up for auction its picture was flashed up onto a big screen for all to see. Let us look at some of those pictures and at some facts and figures; they may be boring – but they tell a story.

There were 58 plants on offer, with 20 coming from NZ, Holland, Australia, USA, Belgium and Japan, 7 from KZN, and 3 from the Eastern Cape. The remaining 28 plants were put up for sale by Joburg CC and Northern CC members, and included the Best on Show plant, which the owner decided to put on the

auction. In addition, there were 3 magnificent photographs which Ian Coates, a UK Clivia grower and professional photographer, who was a speaker at the Conference, donated to be auctioned. The photos realized a total of R5800.



Lot 35 Pierre de Coster - Belgian Multicolor



Lot 11 Chris Viljoen - 'Lobster'

At the end of the evening 8 plants remained unsold as the highest bids were below the sellers' reserve prices and were not accepted by the sellers. The 50 plants that were actually sold realized R208250. The top price of R32000 – *nearly nine times* the average of R3600 for the rest of the plants – was paid by a South African buyer. The plant he bought was the well-known 'Charl's Green', an interspecific from Charl Coetzee of Port Elizabeth. I think Charl was as surprised as the rest of us as the bidding went up and up... and up. I have written a separate article about this plant, and why it might have been in such demand.

There seems to be a general impression that overseas buyers are prepared to pay more than us locals, but is this really the case? What do the auction statistics show? Firstly, I think one must exclude the price paid for 'Charl's Green' as this was so exceptional. Of the remaining 49 plants sold, 11 went to overseas buyers at an average price of R3709 per plant, only 4% above the average price of R3564 paid by South African buyers for the other 38 plants. I don't think that this difference is significant at all. Of course, if you want to include 'Charl's Green', the average price paid by "locals" is pushed up to R4294, which is 16% above the average price paid by the visitors!

Looking at the overall results of the auction, I could not help noticing how many of the sellers - 11 in total - were also buyers, reinvesting part or all (or even more!) of their proceeds to buy some of the really interesting plants on offer.

Have yellow *miniatas* lost their attraction? Out of 58 plants there were only two of them on offer. A yellow *caulescens*



Lot 57 Dawie Strydom - 'Peggy's Peach'

was not sold as the highest bid was below its reserve price (R6500) and was not accepted. A yellow *gardenii* was sold for R6000, even though this was below the reserve of R10 000 originally put on it by the seller. Compare this with the R1250 paid for an Ngome yellow *gardenii* at the subsequent SANBI/CCC internet auction!

Live *Clivia* auctions are fun. The adrenalin flows, and I enjoy being there - but I prefer to sit on my hands!



Lot 22 Gem Wildflowers - 'Gem's Malachite'

Charl's Green :- The coolest **Clivia** you've ever seen

John van der Linde, South Africa



Can you imagine anyone paying R32000 for a *Clivia*? Yes, this was the top price paid at the Pretoria Auction of the Northern Clivia Club. The plant was an interspecific put up for auction by Charl Coetzee of Port Elizabeth. This was an offset of his well-known 'Charl's Green', a plant that Charl had grown from Nakamura seed that he had bought from Charl Malan of Grahamstown.

Well, what is so special about this plant? Have a look at its picture. Firstly, the colour of the flowers is very unusual; secondly, although it is an interspecific the flowers almost look like those of a *C. miniata*; and thirdly, and most importantly, this plant is regarded by Prof. Harold Koopowitz as possibly being a stepping stone on the way to breeding a genuinely white *Clivia*.

In his view, one of the main problems in breeding whites is to get rid of the yellow carotenoids, the pigments that give even the palest near-white *Clivia* a touch of yellow in

the petals. 'Charl's Green' does not express the carotenoids as such, although they are probably still present but are trapped in the chloroplasts that we see as green. If you look carefully towards the edges of the petals in any of the many 'Charl's Green' photos that are available you will see that the petal blade is white. The flower may almost be described as white with a large green throat. Because the plant is self-fertile Harold believes that one should be able to get some offspring with considerably less green in the throat. Of course, others may be even greener.

It may take several generations to get the desired flowers, but he believes the experiment could be worth it and could pay off handsomely. The plant may also be useful in producing good clear pinks, because it is the yellow pigments normally present that are turning them apricot or peach.

It would be interesting to know what plans the buyer of this plant has for it.



Auction Lot 23 Charl Coetzee - Charl's Green
NB Colour difference in the two pictures of Charl's Green are due to the photographs being taken in different light conditions (Eds)

The Clivia Society

www.cliviasociety.org

The Clivia Society caters for Clivia enthusiasts throughout the World. It is the umbrella body for a number of constituent Clivia Clubs and Interest Groups which meet regularly in a number of South African cities and towns. In addition, the Society has individual members in many countries, some of which also have their own Clivia Clubs. An annual Yearbook and regular Newsletters are published by the Society. For information on becoming a member and / or for details for the following Clivia Clubs and Interest Groups contact the Clivia Society secretary or where appropriate, the International Contacts, at the addresses listed below.

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INTEREST GROUPS: Border, Lowveld, Northern KZN, Overberg, Waterberg, Zoutpansberg.



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Green Gold — Clivia in Changchun

Xueguan Song, China

The contents of the address by Xueguan Song, head of the delegation that attended the 2006 International Clivia Conference are summarized below. (Eds.)

Our delegation from the Changchun Clivia Miniata Society feel greatly honoured to visit the beautiful country from which Clivia originated and to attend this meeting and share in its proceedings. Thank you for this opportunity to tell you about our ongoing development of Clivia miniata.

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