

Editorial

DNA in Bulb Taxonomy and What Constitutes a Species

In the question time of Ferojah Conrad's talk on DNA at the September monthly meeting, a member asked a question which has been in all our minds since we were informed that *Galaxia* was sunk, as a Section, into the (super) genus *Moraea*: how decisive is DNA analysis in taxonomy? This is not exactly as the question was put (the question was actually is DNA analysis going to take over from all other plant characteristics in the classification of plants), but it was the underlying problem. The Chairman over-rode the answer that Ferojah was formulating because it would have widened the talk into the whole subject of DNA, whereas the talk had been, as intended, on the technical steps taken in a laboratory towards the DNA analysis of a species or genus. The fact of the matter is that all taxonomy is based on an evaluation of characteristics. The characteristics selected for evaluation are, in principle, a subjective decision of the evaluator. Over the centuries the selection has moved from the reproductive method of a plant in 1650 to its general morphology in 1950. Since 1950, DNA has become a major, perhaps **the** major, characteristic accepted by botanists. This does not mean that it is the ultimate truth. There is a danger that it becomes a label read without question, without looking back at just causes. We were told in the popular press that chimpanzee DNA has a 95% similarity to human DNA, and the implication was that the chimpanzee is 95% human. This is a quantitative evaluation applied to a qualitative phenomenon. It is not the 95% similarity that is important, but the 5% that is different. Where morphology and DNA agree 100% we can accept that there is a strong presumption of fact, but wherever there is a disparity, even of as little as 1%, the fact is not established. There is a discrepancy which must be resolved and explained. We feel this instinctively. *Galaxia* was sunk into *Moraea* in defiance of the majority of morphological characteristics, on the basis of a DNA analysis, but IBSA members continue to use the word *Galaxia* (as in *Galaxia versicolor*, now "properly" *Moraea versicolor*) rather than the word *Moraea*. In effect, members identify a plant by the Sectional and Specific combination rather than the Generic and Specific. This is not to denigrate DNA analysis, but merely to recognise that it is a characteristic, one which must be given due weight in evaluation, but not necessarily an over-riding one. Discrepancies must be resolved and explained before we are comfortable with a fact.

At Specific level, the problem is compounded by the difference in definition, by different botanical schools of thought, as to what constitutes a species. We are all too well aware that there are "lumpers" and "splitters". We discussed this in detail some years ago in the Bulletin over the taxonomy of *Strumaria* and *Hessea*, and we came down heavily on the side of Dr. Snijman (lumper) rather than of the Drs. Muller Doblies (splitters). An IBSA member in Gauteng complained bitterly in correspondence (not published) that Cape botanists unfairly lump plants to Cape species, thus denying the right of (the old) Transvaal forms to be split. In his letter he ascribed this to Cape botanists being jealous of Transvaal botanists, and that regional prejudice sullied the pure science of taxonomy. We do not think he was justified in putting the matter on a sociological basis, almost a political one, but it is

a feeling which has surfaced in many parts of the world in respect of many taxa. What constitutes a species, what qualifies it? In correspondence between IBSA members it is important, or at least convenient, for us to agree on names of plants and so, rightly or wrongly, we presumably do tend to "take sides". The question of naming goes further: just as there are divisions "above" species within a genus - Series, Sections, sub-genera - how far "below" species should we go? Drs. Goldblatt and Manning, in their revision of *Gladiolus*, admitted sub-species in two instances, whereas Lewis and Obermeyer were prolific of varieties, all eliminated by Goldblatt and Manning. In IBSA we are edging away from varieties, but we do recognise local and colour differences without necessarily (or even usually) applying varietal names. If, for instance, there is a white and a blue form of a species and we particularly want the white form, we normally say so instead of applying the varietal name "alba". A famous man once said that in the compilation of lists, there is no end. That is so, but it does not mean that we must coin or apply a plethora of names. Provided we make our wants clear, our purpose is served.

Names are, and always will be, a bugbear. However, as long as we know what we are talking about and describe it in clear simple language, we cannot really go wrong. ❁

Carl Peter Thunberg

Carl Peter Thunberg arrived in the Cape in April 1772 as a ship's physician working for the Dutch East India Company. He spent the next three years (until March 1775) travelling in the Cape interior, plant collecting. He found over 3 000 species of plant during this time, more than one third of which were new. An extract from the book "Carl Peter Thunberg" travels at the Cape of Good Hope 1772 - 1775" illustrates Thunberg's observations:

"The baboons of Table Mountain, besides paying frequent visits to, and plundering the gardens of the Europeans, feed also upon the pulposus bulbs of several plants, which after digging up, they peel and eat. Heaps of these parings were frequently seen left after them, particularly near the rocks, where they had been. The *Gladiolus plicatus* (now *Babiana plicata*) appears to be the most favourite plant with those that live near the Cape, for which reason also this plant is known by the name of the baviaan. The root of this vegetable is sometimes boiled and eaten by the colonists.

Those that are but in a small degree acquainted with botany need not be told, that by the opening and closing of flowers one may frequently know with certainty, as from a watch, what hour of the day it is, as well as if the weather will be fine or rainy. Plants of this kind are common on the African hills. The *Moraea undulata* never opens before nine o'clock in the morning and before sun-set, at four in the afternoon, it closes again.

The *Ixia cinnamomea* (now known as *Hesperantha falcata*) opens every evening at four, and exhales its agreeable odours through the whole night.

The approach of rain is announced by the flowers of various bulbous plants, such as ixiias, moraeas, irises and galaxias, the tender flwoers of which do not open in the morning, if rain is to be expected soon; and if a shower is to fall in the afternoon, they close some time before.

Several of these likewise diffuse an agreeable fragrance, particularly at evening or night, somewhat like a faint scent of carnations: such are the *Gladiolus tristis* and *recurvus*, the *Ixia pilosa*, *falcata* and *cinnamomea*."

A guide to the *Brunsvigia* species of Namaqualand and the Cape

Dee Snijman

More and more flower enthusiasts make a point of travelling to Namaqualand and the Cape to enjoy the brief flowering of several spectacularly beautiful amaryllids in autumn. There can be little doubt that the brilliant displays of *Brunsvigia* provide one of the major attractions. Many people are happy to experience the sheer exuberance of these floral displays but as many are curious to know more about these botanical gems. This article attempts to provide some guidelines on how to identify the species of *Brunsvigia* currently recognised in Namaqualand and the Cape. The area under consideration extends from the Orange River to the Cape Peninsula and Port Elizabeth, and reaches inland to the Roggeveld escarpment and Cape Fold Mountains of the Eastern Cape.

Brunsvigia is endemic to southern Africa. At present a total of 17 species are recognised of which six are found in Namaqualand and nine are known in the Cape. All *Brunsvigias* are deciduous plants but unlike the summer-rainfall representatives that often flower and leaf at the same time, the Namaqualand and Cape species produce their leaves in winter, after they have flowered.

Because the flowers or leaves themselves are often insufficient to determine certain species, the serious bulb enthusiast may need to observe the plants through all their stages. Hopefully, the following notes on diagnostic characters will be useful when combined with the species descriptions and the notes on habitats and geographic distributions. Taxonomic studies on this genus are far from complete but through careful observation, these beautiful plants should reveal more about their lives and relationships.

Useful diagnostic features

Bulb: Both the position of the bulb in the ground and the outer dry coverings can point to a plant's identity. Most species have a subterranean bulb. In *B. herrei* (from Namaqualand) and *B. josephinae* (from the Cape), however, the bulbs are usually half exposed, except in places like road verges, where the soil-level is often disturbed. The bulb tunics of *B. josephinae*, like *B. litoralis*, are brown and papery, whereas all the other Namaqualand and Cape species have brittle, tan coloured tunics.

Leaf position is a useful feature to identify some species in the vegetative state. Only *B. litoralis*, *B. josephinae*, and *B. herrei* have leaves that stand clear of the ground. The upright leaves of *B. litoralis* are distinctly twisted in the upper half, although this may be lost to some degree if the plants are heavily shaded. *Brunsvigia josephinae* has succulent, greyish leaves arranged in a prominent spreading rosette, whereas those of *B. herrei* remain more or less opposite and are dull green and leathery, outlined by a thick reddish margin. In contrast, all the other Namaqualand and Cape species have leaves that lie flat on the ground. Often these press down so firmly that the leaves come to rest vertically if the bulb is removed from the ground.

Leaf number per plant varies with age so this is often not reliable to distinguish species. However, the species with small bulbs – *B. radula*, *B. comptonii*, and *B. namaquana* – generally have fewer than three leaves per plant at maturity. Most other *Brunsvigia* species have at least four or more leaves per bulb and *B. josephinae* has the distinction of producing as many as 20 leaves when fully mature.

Straw coloured bristles on the upper leaf surface are probably one of the most striking features that distinguishes certain species. Such bristles are found in two Namaqualand species – *B. radula* and the recently described *B. namaquana*. In addition, softer scale-like hairs on the upper leaf surface sometimes occur in populations of *B. striata* along tributaries of the Breede and Gouritz Rivers.

Inflorescence: Irrespective of plant size, the inflorescences of all the species are extremely eye-catching, mostly due to their presence in autumn, when few other plants are in flower. At least three inflorescence forms can be recognised, based on differences in the pedicels, and floral form and colour. Although discussed separately below, these structures are highly integrated functionally and bring about pollination by birds or various insects, and seed dispersal by tumbling. Although the different inflorescence forms are useful to group species for identification, they often result in artificial assemblages of species that are not necessarily closely related.

Pedicels: When flowering, most species have straight pedicels but *B. litoralis*, *B. josephinae*, and *B. orientalis* have distinctively curved pedicels that make them easy to identify. Furthermore, these curved pedicels bear specialised, red flowers in which the tepals closely overlap and roll back from the apex – the three upper tepals more so than the lower three. Anyone who has seen the ease with which malachite and lesser double collared sunbirds perch on the pedicels and probe the flowers will appreciate how perfectly suited they are to bird pollination.

Just three species (*B. pulchra*, *B. marginata*, and the recently described *B. elandsmontana*) have more or less erect pedicels. These make the inflorescences compact and brush-like, unlike the almost spherical flower heads found in the majority of species. The pedicels of *B. pulchra*, *B. marginata*, and *B. elandsmontana*, nevertheless, spread apart as soon as they begin to dry, enabling the heads to tumble in the wind. The flowers of *B. pulchra* are ruby-red. Those of *B. marginata* are most often brilliant scarlet, whereas *B. elandsmontana* has bright pink flowers.

Floral symmetry: Another floral feature that closely corresponds with inflorescence shape is flower shape. In general, compact, dense inflorescences possess radially symmetrical flowers whereas open, lax inflorescences have bilaterally symmetrical flowers. Thus the flowers in *B. pulchra*, *B. marginata*, and *B. elandsmontana* are nearly radially symmetrical, whereas those in *B. comptonii*, *B. radula*, and *B. namaquana* are highly asymmetrical due to the upward curvature of at least five tepals.

Tepal width also affects floral form. In both *B. herrei* and *B. bosmaniae* the tepals are almost uniformly broad from base to tip, hence they overlap in the lower half making the

flowers trumpet-shaped. In contrast, the tepals in *B. striata* and *B. gregaria* taper to a narrow base giving the flowers a wide-open appearance.

Flower colour can easily be used to identify certain species if the plants being named are typical colour forms. Typical red-flowered species are *B. marginata*, *B. orientalis*, *B. litoralis*, and *B. josephinae*, although the latter three species most often have yellow on the flower tube as well. Pink flowers are otherwise the norm. Occasional white flowers are known in *B. bosmaniae* and *B. gregaria*, and lemon-coloured flowers sometimes appear in *B. orientalis*. Floral markings are mostly unreliable but *B. bosmaniae* and *B. gregaria* often have dark veins on the tepals, whereas in *B. striata* the tepals have a dark central stripe.

Stamen length: The relative lengths of the outer and inner stamens can also provide a clue to species identity. The outer three stamens are consistently half as long as the three inner stamens in *B. herrei*, as well as in populations of *B. bosmaniae* from the northern and eastern parts of its geographic distribution. The difference in length, however, is less pronounced in populations of *B. bosmaniae* from the Western Cape. In the rest of the species the stamens are usually equally long.

Capsules: The majority of species have three-angled fruit capsules, although the extent to which the angles are ribbed differs among species. Those with heavily ribbed capsules are mostly from the west – *B. bosmaniae*, *B. herrei*, *B. orientalis* and *B. pulchra*. Only *B. josephinae* and *B. litoralis* have capsules that are not angled. Instead, they have spindle shaped capsules with only slightly thickened ribs. In all the species the capsules only open partially along the three main ribs releasing their seeds from the apex.

Species descriptions

B. bosmaniae F.M. Leight. (including *B. appendiculata* F.M. Leighton)

Illustrations: centrefold of this Bulletin, Paterson-Jones & Snijman (1996), Manning & Goldblatt (1997), Van Rooyen & Steyn (1999).

Plants variable in size, up to ca. 20 cm high; bulb 5–10 cm diam., tunics brittle. Leaves 6–8, pressed to the ground, oblong, 5–12 cm wide; upper surface rough, dark green; margins red and cartilaginous. Inflorescence a dense round head with straight pedicels. Flowers 20–70, pale to deep pink, the throat often greenish yellow, the veins often deeper pink, scented of narcissus; tepals 20–40 mm long, almost free to the base, broadly oblong; outer stamens often much shorter than the inner; filaments often toothed at the base. Capsule 30–60 mm long, sharply 3-angled, the angles heavily ribbed, more or less flat-topped, tapering to a narrow base. Flowering March to May. Open flats, in coastal sand, loam or granite derived soils. (Southern Namibia, Namaqualand to Tygerberg, Nieuwoudtville to Roggeveld).

B. comptonii W.F. Barker

Illustration: see centrefold of this Bulletin.

Small plants, up to 12 cm high; bulb 2.5–4 cm diam., often compressed, tunics brittle. Leaves usually 3(–5), pressed to the ground, elliptical to strap-shaped, 1.5–4 cm wide; upper surface minutely papillate. Flowers 5–19, widely spreading, on straight pedicels shorter than 25 mm, pale to deep pink with dark veins, yellowish at the base; tepals 20–25 mm long,

almost free to the base, all flared upwards or often one remaining basal; the outer stamens slightly shorter than the inner. Capsule 10–20 mm long, rounded, tapering to the base, scarcely ribbed. Flowering February to March. Gravel plateaux and slopes, often between slate chips. (Loeriesfontein, Tanqua Karoo, Roggeveld, Laingsburg).

B. elandsmontana Snijman

Illustration: see centrefold of this Bulletin

Compact plants, up to 20 cm high; bulb ca. 4 cm diam., tunics brittle. Leaves 4–6, pressed to the ground, elliptical 2.5–7 cm wide; upper surface dark green with pink, crisped, cartilaginous margins. Flowers 6–18, in a compact head, bright pink; pedicels radiating in fruit; perianth tube up to 5 mm long; tepals 15–20 mm long, outspread; stamens and style nearly straight, slightly spreading, shorter than or equalling the tepals. Capsule 1–2.5 cm long, 3-angled, the angles thinly ribbed, rounded above, tapering to the base. Flowering March to May. In lowland fynbos and renosterveld, in pebbly soils. (Tulbagh, Elandsberg).

B. gregaria R.A. Dyer

Illustrations: Vanderplank (1998, 1999).

Plants up to 40 cm high; bulb 3–6 cm diam., tunics brittle. Leaves 4–8, pressed to the ground, tongue-shaped, up to 6–10 cm wide; upper surface rough; margin red or pale, scabrous. Flowers 30–50, on straight, spreading pedicels, pink to red; perianth tube 4–5 mm long; tepals 25–40 mm long, tapering to pointed tips, more or less evenly spreading, 5–10-veined; stamens more or less equally long. Capsule 25–35 mm long, 3-angled, the angles moderately ribbed, heart-shaped. Flowering January to April. Sand or clay, flats or slopes, (Jeffrey's Bay, Port Elizabeth, Eastern Cape).

This species is difficult to separate from *B. striata*.

B. herrei F.M. Leight. ex W.F. Barker

Illustration: Cowling & Pierce (1999).

Plants up to 45 cm high; bulb ca. 10 cm diam., partly exposed, tunics brittle. Leaves 6, suberect to spreading, strap-shaped, 2–9 cm across, greyish green, with narrow red margins, tough-textured. Inflorescence 20–40 cm across, widely spreading. Flowers up to 40, on straight pedicels, delicate pink; tepals 40–55 mm long, stamens of two lengths, the outer less than half as long as the inner. Capsules 45–50 mm long, sharply 3-angled, the angles heavily ribbed, more or less flat-topped, tapering to the base. Flowering March. High plateaux, in gravelly or rocky substrates. (Southern Namibia, Richtersveld, Namaqualand Rocky Hills).

B. josephinae (Redouté) Ker Gawl.

Illustration: see centrefold of this Bulletin

Large plants, up to 65 cm high; bulb usually exposed, ca. 20 cm diam., tunics parchment-like. Leaves 8–20, recurved, oblong, up to 20 cm wide, greyish, smooth. Flowers 30–40, in an open, widely spreading head, dark red, orange-yellow towards the base; pedicels stout, curved in flower, straight when fruiting; perianth tube up to 1.5 cm long; tepals 45–80 mm long, overlapping before recurving strongly; filaments stout. Capsule 30–50 mm long, more or less cylindrical, ribs moderately thickened. Flowering February to April. Rocky slopes

and clay flats, renosterveld, (Nieuwoudtville, Roggeveld, Worcester, Malgas to Willowmore).

B. litoralis R.A. Dyer

Illustration: Vanderplank (1999).

Plants up to 60 cm high; bulb 10–13 cm diam., deep-seated, tunics parchment-like. Leaves ca. 18, upright, 4–7.5 cm wide, with a half twist towards the apex, greyish, smooth. Flowers ca. 20, sometimes ca. 40, widely spreading, similar in shape and colour to *B. josephinae* but with the perianth tube 1.5–2.5 cm long. Capsule ca. 30 mm long, more or less cylindrical. Flowering February to April. Coastal sands, (Cape St. Francis to Port Elizabeth).

B. marginata (Jacq.) Aiton

Illustrations: see centrefold of this Bulletin, Burman & Bean (1985), Paterson-Jones & Snijman (1996).

Compact plants, up to 20 cm high; bulb ca. 6 cm diam., tunics brittle. Leaves 4, pressed to the ground, elliptical, 4–10 cm wide, leathery. Flowers more or less radially symmetrical, 10–20, in a compact, hemispherical head, usually brilliant red; pedicels straight, elongating in fruit; perianth tube 5–10 mm long; tepals 20–30 mm long, outspread to slightly recurved; stamens central, tightly clustered, well exerted, nearly straight. Capsule 20–25 mm long, 3-angled, thinly ribbed, tapering to the base. Flowering March to June. Rocky mountain slopes, in shale bands, (Citrusdal, Tulbagh, Paarl, Worcester).

B. namaquana D. & U. Müll.-Doblies

Illustration: see centrefold of this Bulletin

Small plants, up to 10 cm high; bulb 2–3 cm diam., tunics brittle. Leaves 3 or 4, rarely 2, flat on the ground, oval to strap-shaped 1.5–2 cm wide, upper surface more or less covered with straw-coloured bristles. Flowers 4–10, in a small head, pale pink with a yellow-green throat; tepals 12–19 mm long, curved into the upper half; stamens curved downwards, of different lengths, slightly longer than the tepals. Capsule egg-shaped, 5–7 mm diam., thin textured. Flowering April. Upland in quartzite and granite outcrops. (Northern Namaqualand, Bushmanland).

Not easily separated from *B. radula* as their characters overlap.

B. orientalis (L.) Aiton ex Eckl.

Illustrations: see centrefold of this Bulletin, Burman & Bean (1985), Manning & Goldblatt (1996), Paterson-Jones & Snijman (1996), Mustart *et al.* (1997), Van Rooyen & Steyn (1999).

Large plants, 40–50 cm high; bulb 10–15 cm diam., tunics brittle. Leaves 4–8, flat on the ground, oblong, 8–19 cm wide; upper surface usually velvety. Flowers 20–40, rarely more, in a large spherical head, bright to light red; perianth tube up to 5 mm long; tepals 40–60 mm long, otherwise like *B. josephinae*. Capsule 30–70 mm long, 3-angled, the angles strongly ribbed, flat-topped, tapering to the base. Flowering February to April. Sandy flats along the coast, riverbeds or inland sand plumes. (Southern Namaqualand to Worcester, Cape Peninsula to Plettenberg Bay).

B. pulchra (W.F. Barker) D. & U. Müll.-Doblies

Illustrations: Cowling & Pierce (1999), Duncan (2002).

Medium plants, up to 30 cm tall; bulb 5–6 cm diam, tunics brittle. Leaves 5–7, prostrate, broadly strap-shaped, 5–10 cm across; margins narrowly red and cartilaginous. Inflorescence compact, up to 10 cm across, radiating widely in fruit. Flowers 30–70, on straight, 4–8 cm long, upright pedicels, ruby red, more or less radially symmetrical; tepals 25–30 mm long; stamens suberect, equally long. Capsule 30–45 mm long, 3-angled, the angles strongly ribbed, rounded above, tapering to a narrow base. Flowering March to May. Uplands, on steep or gentle slopes, in gravely or granite derived soils. (Namaqualand Rocky Hills).

B. radula (Jacq.) Aiton

Illustration: None

Small plants, up to 10 cm tall; bulb 3 cm diam., tunics brittle. Leaves 2, pressed firmly down, elliptic, 2–4 cm across; upper surface densely covered with straw-coloured bristles. Inflorescence 3–8 cm across. Flowers 8–15, on straight, spreading pedicels, pink, with lemon-yellow towards the base; tepals 12–25 mm long, mostly curved into the upper half; stamens equally long, about as long as the tepals. Capsule egg-shaped, 1 cm wide, soft textured. Flowering February to April. On flats, in crevices of rock outcrops. (Namaqualand, Knersvlakte).

B. striata (Jacq.) Aiton (including *B. minor* Lindl.)

Illustrations: Manning & Goldblatt (1997), Van Rooyen & Steyn (1999).

Plants variable in size, 15–35 cm high; bulb 4–7 cm diam., tunics brittle. Leaves 4–6, pressed to the ground, elliptical, 3–7 cm wide, leathery; upper surface dark green, minutely papillate, rarely with a few scattered scale-like hairs; margin red, cartilaginous, often undulate. Inflorescence widely spreading, with straight pedicels. Flowers 8–30, pale to reddish-pink with the inner surface often paler; perianth tube 4 mm long; tepals 20–30 mm long, mostly 3–5-veined with a dark central stripe, tapering basally, 5 usually flared upwards and one remaining basal; stamens usually as long as the tepals. Capsule 15–25 mm long, rounded above, thinly ribbed, tapering to the base. Flowering March to April. Heavy or humus-rich, often stony soils, (Nieuwoudtville to Cape Infanta, Montagu and Baviaanskloof).

Extinct species

Named by D. & U. Müller-Doblies in 1994, *B. gydobergense* was described from bulbs collected on the Gydo Pass, which later flowered in a paper bag. Road building has since destroyed the original population and the authors reported that the species, which closely resembles *B. josephinae*, is extinct. Any new information about a large, red-flowered *Brunsvigia* from the Gydo Pass would be most welcome.

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Gene silencing

It has long been supposed that species are different because they possess different genes. But in the past couple of decades it has become increasingly clear that regulation of genes is as important to the form and function of species as the genes themselves. It has been noted that plants transported to new environments can show promiscuous mutation, as can prolonged inbreeding and out-crossing. This suggests that the genes are always within the plant, and it is simply the regulation of those genes that is changing. Gene silencing is an intriguing phenomenon. Apart from its use in differentiation and adaptation to new environments, gene silencing can be used to suppress viruses.

Two methods of gene silencing include methylation and heterochromatization. When chromosomes are being pulled into daughter cells during cell division, the DNA is condensed (heterochromatized), and during this time the genes are not expressed. This means that any DNA sequences which remain condensed longer than the rest will have less time to be expressed, so the effects of those genes will be reduced proportionately. If the pattern of gene silencing varies from organ to organ and from tissue type to tissue type, we have a mechanism for differentiation.

There is a misconception amongst some people that when a native plant is grown in different conditions from the site where the seed was originally collected, it will be genetically different from the original plants, and therefore must not be re-introduced back to its original community. It is almost certainly not genetic alteration that is allowing the plant to adapt to its new situation, but is the expression of genes that is changing. This means that if the plant is taken back to its native habitat, it will adapt back to its natural growing conditions by changing gene expression again.

An extract from the discussion of a PhD dissertation on “A Biosystematic Study of the Seven Minor Genera of the Hyacinthaceae”

Alison van der Merwe

The family Hyacinthaceae is characterized by geophytes of which the underground part is a bulb, the inflorescence a simple raceme, the perianth segments free or united at the base and the fruit a capsule. It includes, amongst others, the following South African genera: *Amphisiphon*, *Androsiphon*, *Daubenya*, *Massonia*, *Neobakeria*, *Polyxena* and *Whiteheadia*. The taxonomic history of the minor genera of the Hyacinthaceae largely reflects the significance that has been placed on morphological differences among the Hyacinthaceae in the past. Particular value has been placed on floral differences, resulting in the description of several monotypic genera for newly discovered species that were more or less distinctive in their flowers. Great significance was also attached to differences in leaf morphology, resulting in several new species of *Massonia*, which are now placed mostly in synonymy under *Massonia depressa* or *Massonia echinata*. Within the Hyacinthaceae, the taxonomic position of the genus *Neobakeria* has always been problematic as it has been recognized by some authors and completely ignored by others.

With the advancement in science and technology more tools become available for unraveling taxonomic relationships. One of the latest tools, DNA analysis, was used in this study and provided a useful phylogenetic analysis of the minor genera of the Hyacinthaceae. The main phylogenetic analysis revealed three distinct lineages i.e. *Massonia*, *Polyxena* and *Daubenya* with *Whiteheadia bifolia* remaining on a branch of its own outside of the *Massonia* clade.

The species within the *Massonia* clade are *Massonia depressa*, *Massonia echinata*, *Massonia grandiflora*, *Massonia jasminiflora*, *Massonia hirsuta*, *Massonia sessiliflora* and *Neobakeria heterandra*. The DNA data indicates that *Neobakeria heterandra* should be transferred to the genus *Massonia*. Morphological evidence also supports this as both the flowers, with the characteristic sigmoid curve in the perianth and the paired, ovate to suborbicular leaves of *Neobakeria heterandra* are very similar to that of the other *Massonia* species. Müller-Doblies and Müller-Doblies (1997) stated that the correct name for *Neobakeria heterandra* should be *Massonia pygmaea* Schlechtendal ex Kunth and although they based their research purely on the study of herbarium specimens, with no contribution of DNA data, they were correct in the assignment of the name *Massonia pygmaea*. *Massonia grandiflora* differs from *Massonia depressa* only in the size of the flowers and leaves, which are slightly larger in *M. grandiflora*. *Massonia grandiflora* has, however, often been considered deservant of its species rank by previous authors. DNA data shows the genetic sequence of *M. grandiflora* to be identical to that of *M. depressa*, thus indicating that it should be reduced to the synonymy of *M. depressa*. Jessop (1976) considered *Massonia hirsuta* to be a synonym of *Massonia echinata*, but Müller-Doblies and Müller-Doblies (1997) resuscitated it to species level, with which I agree. *M. hirsuta* shows

sufficient morphological variation, especially with regard to the leaf morphology and the hairy bracts (which are not found in any other species) to deserve its species status.

The *Polyxena* clade includes the species: *Polyxena brevifolia*, *Polyxena corymbosa*, *Polyxena longituba*, *Polyxena maughanii*, *Polyxena paucifolia*, *Polyxena pygmaea* and *Lachenalia pusilla*. The latter was included in the DNA study because of the differences in morphology exhibited between it and other *Lachenalia* species, as well as the similarities it showed to species in the genus *Polyxena*. The DNA results showed a close relationship between the genus *Lachenalia* and *Polyxena*. *Polyxena brevifolia* (Ker-Gawl.) A.M. van der Merwe is the correct name of the '*Polyxena corymbosa*' specimens from Gordon's Bay. Jessop (1976) considered *Scilla brevifolia* Ker-Gawl. to be a synonym of *Polyxena corymbosa*, but according to the original description *Polyxena corymbosa* has a corymbose inflorescence whereas *Polyxena brevifolia* has a racemose one. Sequence data supports the morphological differences between the two species and justifies the species status of *Polyxena brevifolia*. There appears to be a very close relationship between *Polyxena maughanii* and *Polyxena ensifolia*. Morphologically the two species differ only in the length of their stamens, which in *Polyxena maughanii* are included in the perianth tube with the three longest ones just reaching to the mouth of the tube, while in *Polyxena ensifolia* the three longest stamens are exerted beyond the tube. Both species share the same general distribution area, but *Polyxena maughanii* is restricted to limestone outcrops within this area. These two taxa should be lumped into a single species with separate varieties *Polyxena ensifolia* var. *ensifolia* and *Polyxena ensifolia* var. *maughanii*, providing for the minor difference in stamen length and the preference of *Polyxena maughanii* for limestone substrates. *Polyxena longituba*, although also very closely related to *Polyxena ensifolia*, reveals sufficient morphological variation both in flower shape and size and leaf shape to retain its specific rank. *Polyxena pygmaea* also shows sufficient variation, both in the DNA data set and morphological characters to retain its species status. *Polyxena paucifolia* and *Polyxena corymbosa* are very closely related, but they differ in flower morphology as well as in the number of leaves per species, with *Polyxena paucifolia* only having two leaves per plant, whereas *Polyxena corymbosa* has four to six. The pink flowers of *Polyxena corymbosa* are characterised by a short perianth tube, which is only about one third of the length of the perianth segments, while in *Polyxena paucifolia* the flowers are dark lilac to purple with a perianth tube that is equal in length to the perianth segments.

The *Daubenyia* clade includes all the monotypic genera (except for *Whiteheadia bifolia*), as well as *Neobakeria comata*, *Neobakeria namaquensis* and *Neobakeria angustifolia*. Two collections of *Neobakeria angustifolia* were made, one from Sutherland and one from Saldanha. These two specimens differ remarkably with regard to both inflorescence type and floral morphology. The flowers of the *Neobakeria angustifolia* specimen from Sutherland are yellow and firm textured, with yellow or orange stamens, while those of the specimen from Saldanha are white with a papery texture and purple stamens. In the Saldanha specimens the perianth tube is also much narrower than that of the Sutherland specimen. DNA analysis also reveals two different genetic sequences, confirming the morphological differences and justifying splitting the species into two. It has since been determined that the respective names of the species should be *Massonia marginata* Willd. ex

Kunth (Manning & Van der Merwe in press*) for the Sutherland specimen and *Massonia zeyheri* Kunth (Muller-Doblies & Muller-Doblies 1997) for the Saldanha specimen. DNA data shows that *Amphisiphon* shares a close relationship with *Massonia zeyheri* and *Massonia marginata*, but there are sufficient morphological differences to retain separate species status. DNA data also shows that *Daubenyia aurea* is closely related to *Amphisiphon stylosa*, *Massonia marginata* and *Massonia zeyheri*. Although *Androsiphon capense* and *Daubenyia alba* appear to be closely related, they differ morphologically in that the flowers of *Daubenyia alba* are white to pale lilac, whereas those of *Androsiphon capense* are bright yellow to orange. Another significant difference is the disc present on the top of the staminal tube in *Androsiphon capense*, that is lacking in *Daubenyia alba*. DNA data clearly shows that the species in the *Daubenyia* clade (*Daubenyia alba*, *Daubenyia aurea*, *Amphisiphon stylosa*, *Androsiphon capense*, *Massonia marginata*, *Massonia zeyheri*, *Neobakeria comata* and *Neobakeria namaquensis*) should be placed together in a single genus. As *Daubenyia* is the oldest genus within the group, the other species will all be transferred to *Daubenyia* and will be known as *Daubenyia alba*, *Daubenyia aurea*, *Daubenyia stylosa*, *Daubenyia capensis*, *Daubenyia marginata*, *Daubenyia zeyheri*, *Daubenyia comata* and *Daubenyia namaquensis*.

Whiteheadia bifolia is the only species that retains its monotypic status, and the DNA analysis supports the unique morphology of the species as it appears on a branch of its own on the outside of the *Massonia* clade

In the past most taxonomic classifications have been based solely on morphological differences or similarities, and although some of these classifications are still viewed as valid, many others have been proven incorrect as new data has become available. Morphological characters are the easiest to use when classifying taxa, as they are the most obvious to the eye. However, it is sometimes difficult to exercise objectivity when viewing them, as very often there are superficial resemblances between plants that support the pre-conceived ideas we have as to the relationships between them. The most reliable and realistic phylogeny can only be produced through the combination of all known data on the taxa, including morphological, anatomical, palynological and molecular information. In this thesis phylogenetic characters were used to bring clarity to the morphological characters and the morphological characters were used to test the phylogenetic tree.

Table of species currently recognized together with their synonyms

Species	Synonyms
Genus <i>Daubenyia</i>	
<i>D. alba</i> A.M. vd Merwe	New species
<i>D. aurea</i> Lindl.	<i>Daubenyia fulva</i> Lindl. <i>Daubenyia coccinea</i> Harv. ex Baker <i>Daubenyia aurea</i> var. <i>coccinea</i> (Harv.) Marloth
<i>D. capensis</i> (Schltr.) A.M. vd Merwe & J.C. Manning	<i>Androsiphon capense</i> Schltr.

- D. comata* (Burch. ex Bak.) J.C. Manning & A.M. vd Merwe
Massonia comata Burch. ex Baker
Polyxena comata (Burch. ex Baker) Baker
Neobakeria comata (Burch. ex Baker) Schltr.
- D. marginata* (Willd. ex Kunth) J.C. Manning & A.M. vd Merwe
Massonia marginata Willd. ex Kunth
Polyxena marginata (Willd. ex Kunth) Baker
Massonia rugulosa Lichtenst. ex Kunth
Polyxena rugulosa (Lichtenst. ex Kunth) Baker
Polyxena haemanthoides Baker
Neobakeria haemanthoides (Baker) Schltr.
Massonia angustifolia auct. non *M. angustifolia*
(=*M. echinata* L.)
- D. namaquensis* (Schltr.) A.M. vd Merwe *Neobakeria namaquensis* Schltr.
- D. stylosa* (Barker) A.M. vd Merwe & J.C. Manning *Amphisiphon stylosum*
['*stylosa*'] Barker
- D. zeyheri* (Kunth) J.C. Manning & A.M. vd Merwe
Massonia zeyheri Kunth
Polyxena zeyheri (Kunth) Dur. & Schinz
Massonia pedunculata Baker
Massonia burchellii Baker
Neobakeria burchellii (Baker) Schltr.
Massonia angustifolia auct. non *M. angustifolia*
(=*M. echinata* L.)
- Genus *Massonia*
M. depressa Houltt.
Massonia latifolia L.f.
Massonia sanguinea Jacq.
Massonia obovata Jacq.
Massonia grandiflora Lindl.
Massonia brachypus Baker
Massonia triflora Compton
- M. echinata* L.f.
Massonia scabra Thunb.
Massonia muricata Ker-Gawl.
M. longifolia Jacq. var *candida* Burch. ex Ker-Gawl
Massonia huttonii Baker
Massonia setulosa Baker
Massonia tenella Soland. ex Baker
Massonia versicolor Baker
Massonia calvata Baker
Massonia latebrosa Masson ex Baker

- Massonia amygdalina* Baker
Massonia parvifolia Baker
Massonia dregei Baker
Massonia coccinea Baker
Massonia candida Burch. ex Baker
Massonia modesta Fourc.
Neobakeria visserae Barnes
Massonia angustifolia L.f.
Polyxena angustifolia (L.f.) Baker
Neobakeria angustifolia (L.f.) Schltr.
- M. hirsuta* Link & Otto *Massonia orientalis* Baker
 Massonia bolusiae Barker
 Massonia inexpectata Poelln.
 Massonia sessiliflora (Dinter) U. & D. M-D.
- M. jasminiflora* Burch. ex Baker *Massonia bowkeri* Baker
 Massonia greenii Baker
- M. pustulata* Jacq. *Massonia schlechtendalii* Baker
 Massonia longipes Baker
- M. pygmaea* Schlechtendal ex Kunth *Polyxena bakeri* Dur. & Schinz
 Neobakeria heterandra Isaac
 Massonia heterandra (Isaac) Jessop
- Genus *Polyxena*
- P. brevifolia* (Ker-Gawl.) A.M. vd Merwe *Scilla brevifolia* Ker-Gawl.
 Dipcadi brevifolium (Thunb.) Fourc.
 Scilla brachyphylla Roem. et Schultes
 Periboea gawleri Kunth
 Hyacinthus gawleri (Kunth) Baker
- P. corymbosa* (L.) Jessop *Hyacinthus corymbosus* L.
 Massonia corymbosa (L.) Ker-Gawl.
 Scilla corymbosa (L.) Ker-Gawl.
 Periboea corymbosa (L.) Kunth
- P. ensifolia* (Thunb) Schönl. var. *ensifolia* *Polyxena ensifolia* (Thunb) Schönl.
 Mauhlia ensifolia Thunb.
 Agapanthus ensifolius (Thunb.) Willd.
 Massonia ensifolia (Thunb.) Ker-Gawl.
 Massonia odorata Hook.f.
 Polyxena odorata (Hook.f.) Baker
 Massonia uniflora Sol. ex Baker
 Polyxena uniflora (Sol. ex Baker) Dur. & Schinz

Polyxena calcioli U. & d. M-D.

P. ensifolia var. *maughanii* (Barker) A.M. vd Merwe *Polyxena maughanii* Barker

P. longituba A.M. vd Merwe New species

P. paucifolia (Barker) A.M. vd Merwe & J.C. Manning *Hyacinthus paucifolius* Barker
Periboea paucifolia (Barker) U. & D. M-D.
Periboea oliveri U. & D. M-D.

P. pygmaea (Jacq.) Kunth *Polyanthes pygmaea* Jacq.
Hyacinthus bifolius Boutelou ex Cav.
Massonia violacea Andr.

Genus *Whiteheadia*

W. bifolia (Jacq.) Baker *Eucomis bifolia* Jacq.
Basilea bifolia (Jacq.) Poir.
Melanthium massoniaefolium Andr.
Whiteheadia latifolia Harv.

References:

- Jessop, J.P. 1976. Studies in the bulbous Liliaceae in South Africa: 6. The taxonomy of *Massonia* and allied genera. *Journal of South African Botany* 42:401-437
- Muller-Doblies, U. & Muller-Doblies, D. 1997. A partial revision of the tribe Massonieae (Hyacinthaceae). 1. Survey, including three novelties from Namibia: A new genus, a second species in the monotypic *Whiteheadia* and a new combination in *Massonia*. *Feddes Repertorium* 108:49-96. ❁

Storage of pollen

Collect anthers that have just dehisced in gelatin capsules.

Place capsule into small plastic vial and place this into a bag with dessicant. Label clearly with little string tags. Close bag and keep at room temperature for 24 hours.

Replace dessicant if necessary. (Most dessicants change colour when moisture has been absorbed, going from blue to pink).

Store in freezer.

Pollen stored in this way will remain viable for at least 1 year.

A recent trip to the top of the Kamiesberg in mid-October revealed what late rain and cool weather can do to the flowering season. *Bulbinella latifolia* was still in flower (it started in early September), *Gladiolus equitans* in a burned area was flowering in profusion, *Pelargonium incrassatum* was still sending up its beautiful bright pink flower spikes, and the veld was still orange with annuals. A hot dry wind the day we left probably put paid to most of the beauty, but for the flowers that started in August, it was a good long spring.

An Introduction to the Sociology of South African Botanical Knowledge.

Charles Craib

The Sociology of Knowledge concerns the social embeddedness of the knowledge producing process. All knowledge is produced in a historical time frame based on preceding and contemporary research. The way in which botanists are socialized and trained reflects the manner in which they approach the plant world and consequently subsequent theoretical development. The aim of this article is to introduce the reader to the study of the botanist studying plants. One of the aims of the sociology of knowledge is to precipitate methodological self-reflection between the research techniques of the botanists and the objects of study.

The disciplines of botany must inevitably be based on classification. All cultures classify plants based on certain requirements and within specific kinds of parameters. These are usually representative of dichotomies such as edible, non-edible, medicinal, non-medicinal and so. The concepts of modern western botany appear to be aimed more at classifying for the sake of understanding the entity rather than its uses. The possibility of this approach and its historical development owes much to the concept of genus and species. Without a scheme such as this, delineating the plant world for the purposes of classification and consequent rational discussion was beset with numerous difficulties. The necessity of classification exists in the minds of botanists, but not in the objects they study. The plant world has to make itself apparent through the schemes of classification that are imposed on it for study purposes. On the other hand, there is no way of studying the plant world without describing and delineating it. This social and interactive process is what interests the student of the sociology of botanical knowledge.

If classification (taxonomy and systematics) underpins botany and is primary, then taxonomy itself needs to be understood as a process with social origins. Is it an art or is it a science? Convincing arguments may be built up to support both these views and they can be the subject of continual debate. Whether one takes the one view or the other will inexorably reflect the possibilities and constraints of methodological self-reflection on the part of the scientist. To the sociologist, both are important, since they exhaust the spectrum of contemporary possibilities of the manner in which knowledge is constructed. The enigma of classification schemes is the extent to which they are artificial constructs or devices which let through an understanding of the genus they purport to classify or revise. Anomalies within a given scheme serve as warnings which may reflect the inadequacy of the scheme as a classifying device or the inadequacy of given research. In certain instances both the research and the scheme may be inadequate, and a new genus may be instated. This does not necessarily mean that the new construct is any closer to understanding a "given reality".

Having introduced the broader philosophical questions it is worth briefly looking at knowledge production process itself. Professional South African botanists usually work in

institutions or universities as elsewhere in the world. A significant number of amateurs as well as trained scientists work independently, and their contributions are often part-time. Institutional work is usually funded and specified according to the requirements of the institution and the research paradigms it is currently using. There is sometimes a limitation of choices for study, based on practical and theoretical considerations. The latter are usually self-imposed via the medium of paradigm choice prevalent at the institution. Private research enjoys a wide element of choice and permits of fresh approaches as institutional constraints are not applicable. A very variable range of talent is brought to bear on the subject matter which enriches the knowledge producing process. In terms of knowledge production the non-professional component makes a major contribution. This has always been so, but is now more acute with ever increasing awareness of and interest in South Africa's floral diversity.

South African botanists work in teams where knowledge production may be open and transparent, in small tight-knit groups of collaborators, or independently. In the last mentioned case there is often collaboration but also often not, particularly where people working in the same field adhere to different paradigms. The knowledge production process is usually enhanced where there is a possibility of teamwork since a meeting of minds eliminates obvious mistakes by pooling knowledge. Also different perspectives lead to a more composite and better-rationalized product. For a number of reasons this quality end state is rarely achieved. Knowledge is more generally produced by fission and faction. Although this may delay a result, it does have the benefit of sharpening criticism, which may belatedly produce a more multi-dimensional research product.

With the perceived urgency of states of affairs such as global warming and species loss, criticism in theoretical development can be expected to play an increasing role. It is already significant as a device in the development of knowledge about certain genera such as *Haworthia*. Criticism in the study of *Haworthia* has raised the level of debate around levels of classification in this and related genera. It is essentially an art (distinguishing "good arguments" from "bad ones") which may have the effect of precipitating paradigm changes (the typical way in which science is advanced). A study of criticism will also soon become a subject around which concepts can be developed in the Sociology of Knowledge. ❁

Carl Peter Thunberg, the man known as "the father of Cape botany", lived from 1743 to 1828. He wrote of himself: "I, Carl Peter Thunberg, a Swede, having been led to these shores of the Southern World under the circumstances given in the preface to my *Flora Japonica*, from the years 1772 - 75, have sought out, carefully and diligently, collected, examined and described, natural objects of all kinds, especially the riches of the Cape flora. With this object I undertook several journeys often fraught with hardships and dangers. Indeed at first I penetrated every year to the more remote regions, the journeys extending to several months; and thus through sandy dunes, treacherous ravines, the parched karoo, undulating plains, salty shores, stony hills, lofty alps, mountain precipices, spiny scrub, and rough woods, I met the dangers of life; I prudently eluded ferocious tribes and beasts, and for the sake of discovering the beautiful plants of this southern Thule, I joyfully ran, sweated and chilled."

The new *Clivia*

John Winter

In October 2000 Dr John Rourke, Curator of the Compton herbarium of the National Botanical Institute at Kirstenbosch, phoned me to invite me to come and look at a fascinating specimen he had just received. The specimen had come from the Oorlogskloof Nature Reserve in the Northern Cape, and was labelled *Kniphofia*.

The Oorlogskloof Nature Reserve was established in 1983 and has since been managed and developed by the Northern Cape Department of Nature Conservation. Trails were established in the Reserve which opened up the area to hikers and rangers. It is customary for the rangers to collect flowering specimens while on patrol. The Officer in charge of the Reserve, Wessel Pretorius, sends these plant specimens on a regular basis to the Compton Herbarium for identification.

When I observed the specimen that had excited John Rourke, I too became excited. The specimen was not a *Kniphofia* at all - it clearly resembled a *Clivia*. But how was this possible in an area 800km away from the nearest known population? And in a climate and habitat quite opposite to that which is known for all other *Clivia* populations?

The rest is history! John Rourke described this remarkable plant, giving it the name "*Clivia mirabilis*" meaning miraculous or wonderful. Auriol Batten was commissioned to paint the specimen and the fifth *Clivia* species was announced, causing a ripple of excitement around the world.

Oorlogskloof is situated in the Bokkeveld Mountains of the Northern Cape. The climate is Mediterranean with an annual rainfall of approximately 415mm. Temperatures can range from a minimum of about 0°C in winter to at least 40°C in the heat of a summer day. The summers are very dry, but fortunately heavy dews at night and coastal mists relieve these severe conditions. The plants of *Clivia mirabilis* grow in areas that range from full sun to light shade, growing on rocky scree of Table Mountain sandstone. The leaves resemble those of *Clivia nobilis*, but they are thicker, fairly rigid, upright and bear a distinct characteristic of a light green stripe that runs down the centre of each leaf. I have observed some *Clivia nobilis* plants that have a similar green stripe in the leaf. The root system of *C. mirabilis* is extensive which makes it very difficult to remove these plants from the rocky scree on which they grow. The roots develop up to 20mm in diameter and act as excellent water storage organs. This is clearly how the species manages to survive in such a hostile environment. The roots anchor the plants into the rocks and absorb nutrition from the organic material that settles amongst the rocks.

The flowers of *C. mirabilis* are pendulous. Each flower head produces between 20 and 40 flowers from early October to mid November. The colour of the flowers when fully open is orange-red, the pedicels and ovaries being a rich red. As the ovaries develop, they turn from red to bright green. Within four months of flowering, the berries start yellowing and then

turn red and are ready to harvest. This is unlike any of the other *Clivia* species which take nine months for the berries to ripen.

Although the closest relative to *C. mirabilis* appears to be *C. nobilis*, the slowest growing species of all the *Clivias*, this new species grows a great deal faster than *C. nobilis*. All *Clivia* species reproduce vegetatively by producing suckers. However all of the *C. mirabilis* plants that I have observed in their natural habitat have been solitary plants and they unfortunately do not appear to produce suckers.

The NBI was granted a permit to collect a limited number of plants and seed from the existing *Clivia mirabilis* population in Oorlogskloof Nature Reserve. The Northern Cape Nature Conservation Department acknowledges the need to make seed and seedlings of this plant available to the general public in order to reduce pressure on these plants, greatly coveted by enthusiasts and breeders.

In time more will be learnt about this new species which is thought to be the primordial *Clivia* species. So perhaps this is but one chapter in the exciting story of this miraculous plant! ❁

Romulea hantamensis

Seeds of this species of *Romulea* are notoriously difficult to germinate, and in the words of a bulb grower in the UK, "if it germinates readily under non-stratification conditions, it is probably not *R. hantamensis*!". In cold areas, sow the seed and let it sit outside in a cold frame or where it may freeze at night. This should stimulate germination. In warmer areas, sow the seed, water the pot, then wrap the pot in a plastic bag and place it in the fridge (at 4°C) for 3 or 4 weeks. Then take the pot out and water again. Alternatively, soak the seeds in water, then place them in a plastic bag with peat or vermiculite and refrigerate the bag for 3 or 4 weeks. Then sow the seeds. Moist chilling the seeds of many cold climate plants is essential to release the germination inhibition. Dry cold does not usually work.

Romulea hantamensis grows on top of the Hantamsberg at an elevation of about 1400m. There is a radio mast on top of this mountain, and on the mast is a sign warning one of the possibility of ice falling off the mast! This implies that ice is a regular occurrence. Snow often falls and most nights in winter would be frosty. The area is wet in winter, so cold moist conditions would certainly occur. In September 2002, sheets of this beautiful *Romulea* were in full flower, revealing the variation to be found in the population. Some flowers were the characteristic pinky mauve with dark spots on the petals, others were pale pink with no markings, and others were white. All the plants were growing in very moist areas and some were almost submerged. By mid-October, these moist areas were much drier with little surface water seen. The plants were then in green seed. And in October, taking their place, were hundreds of blue *Moraea ciliata* plants, flowering particularly well in an area that had burned the previous year.

The old family Liliaceae

Rachel Saunders

In the Royal Horticultural Society (RHS) "Dictionary of Gardening" of 1975, Liliaceae is described as "A large family containing about 2 000 species arranged in about 200 genera, widely distributed over the world in temperate and tropical regions". There were a number of genera of South African plants included in the family, viz. *Agapanthus*, *Albuca*, *Allium*, *Aloe*, *Androcymbium*, *Anthericum*, *Asparagus*, *Baeometra*, *Behnia*, *Bowiea*, *Bulbine*, *Bulbinella*, *Caesia*, *Chlorophytum*, *Daubenya*, *Dipcadi*, *Dipidax*, *Dracaena*, *Drimia*, *Drimiopsis*, *Eriospermum*, *Eucomis*, *Galtonia*, *Gasteria*, *Gloriosa*, *Haworthia*, *Kniphofia*, *Lachenalia*, *Littonia*, *Massonia*, *Ornithogalum*, *Ornithoglossum*, *Pseudogaltonia*, *Sandersonia*, *Sansevieria*, *Schizobasis*, *Scilla*, *Thuranthos*, *Tulbaghia*, *Urginea*, *Veltheimia*, *Whiteheadia* and *Wurmbea*. The family consisted of herbaceous perennials, some annuals, as well as some woody plants, and contained many bulbous, cormous and rhizomatous species. Common characteristics included alternate parallel-veined leaves, perfect flowers with 6 perianth segments, 6 stamens, 3 carpels and a superior ovary. The fruit is usually a capsule but sometimes a berry, and the solitary flowers are racemose, paniculate or umbellate.

As one can imagine in a family of this size, many of the plants bear little resemblance to one another and the family was ripe for "splitting". This happened in 1985, and in "Seed Plants of southern Africa: families and genera" published in 2000, Liliaceae is described as consisting of 13 genera and about 400 species, mostly in northern temperate areas, with not one native South African species left! So what has happened to all those genera listed above?

In the revised RHS "Dictionary of Gardening" of 1992, the authors state that the correct classification of the monocotyledons, and particularly of Liliaceae, is a contentious issue. One point of view is that a broad view of the family should be taken and families such as Alliaceae and Amaryllidaceae should be incorporated into Liliaceae. The opposing view is that many small families should be distinguished, including a much reduced Liliaceae. There are merits and demerits in both systems, although the view of Dalgren, viz. the splitting of Liliaceae, is probably more accurate. This is the system adopted in South African botanical literature since 1985.

So what has happened to all the South African genera of the old Liliaceae? Well, it is a complex story that is not yet complete! The list below was compiled from two sources: "Seed Plants of southern Africa: families and genera", *Strelitzia* 10 (2000), and "Cape Plants", *Strelitzia* 9 (2000)

Agapanthaceae *Agapanthus*

Alliaceae *Allium*
 Tulbaghia

Anthericaceae	Anthericum has disappeared, partly into Chlorophytum Chlorophytum	
Asparagaceae	Asparagus	
Asphodelaceae	Aloe	Bulbine
	Bulbinella	Gasteria
	Haworthia	Kniphofia
	Trachyandra	
Colchicaceae	Androcymbium	Baeometra
	Dipidax = Onixotis	Gloriosa
	Littonia	Sandersonia
	Ornithoglossum	Wurmbea
Hyacinthaceae	Albuca	
	Amphisiphon has disappeared into Daubenia	
	Androsiphon has disappeared into Daubenia	
	Bowiea	Daubenia
	Dipcadi	Drimia
	Drimiopsis	Eucomis
	Galtonia	Lachenalia
	Ledebouria	Litanthus has disappeared into Drimia
	Massonia	Neobakeria has disappeared into Daubenia
	Ornithogalum	Pseudogaltonia
	Schizobasis	Scilla
	Tenicroa has disappeared into	Drimia
	Thuranthus	Urginea has disappeared into Drimia
	Veltheimia	Whiteheadia
Smilacaceae	Smilax	

And then there are a few problems.

	Family as in Strelitzia 9	Family as in Strelitzia 10
Behnia	Behniaceae	Luzuriagaceae
Caesia	Hemerocallideaceae	Anthericaceae
Dracaena	Convallariaceae	Dracaenaceae
Eriospermum	Convallariaceae	Eriospermeaceae
Sansevieria	Convallariaceae	Dracaenaceae

Both Strelitzia 9 and 10 were published in the year 2000, and the information is certainly not consistent, perhaps reflecting the state of taxonomy! ❁

Stutterheim's *Grandiflora Moraeas*

Rhoda McMaster

The northern end of the Amatola Mountains (alt. 1200-2000m) is like a garden wall on one side of Stutterheim (alt. 850-950 m), easily accessible for a hike of anything from an hour to a full day, and a place to revive your soul. The indigenous forests are magical, while the montane grassland above them is a treasure trove of a great many plant species.

From early spring to late autumn there are usually some large yellow *Moraea* flowers to be seen, any one of five species depending on the season - *M. huttonii*, *muddii*, *spatulata*, *graminicola* and *reticulata*. They belong to the *Moraea* subgenus *Grandiflora*, which includes 15 species (Goldblatt 1986) mostly with large yellow flowers, from the summer rainfall region. The subgenus *Grandiflora* is characterized by having a single leaf, usually channelled, fairly leathery and often very long, mostly evergreen, but *M. muddii* and *M. graminicola* are deciduous. The flowers are longer lived than the Western Cape species, often lasting three days, and flowering takes place over a number of weeks as many flowers are produced from the single stem.

Moraea is an African genus found south of the Sahara, with a concentration in the Western Cape where they are winter growing, mostly with colourful flowers. The name *Moraea* commemorates Dr Moraeus, the father-in-law of Linnaeus. There is a cluster of the summer growing yellow *Grandiflora* group in the highland areas of the Eastern Cape, mostly at altitudes ranging from 1000-2500 metres. The rainfall is mainly from spring to mid-autumn, averaging 900mm on our Stutterheim property. In winter there may be a little light rain, or snow on the higher mountains.

There are several common names for *Moraea* in South Africa. 'Peacock Flower' refers mainly to the Western Cape species with 'eyes' on the tepals, while the yellows are often referred to as 'flappies' when the connotation is 'iris-like', 'uintjie' for the edible ones especially of the Western Cape, and 'tulp' which implies it is poisonous to stock. The *Grandiflora* group are mostly poisonous to stock and so should not be planted where grazing animals could get to them. However, Pearse (1978) reports that moles and porcupines seem to be immune to the poison, and the plant called 'ihlamvu elincane' (*M. spatulata*) is used as a traditional medicinal remedy for women who fail to conceive – one corm is ground up and mixed with some maize, and three small cakes are made, two for the woman to eat and one for the man – and "it isn't long before the patter of little feet is heard".

For us mere mortals who are not botanists and who need to distinguish between the five species, the simpler characteristics to look for are in the combination of: flowering time, (un)branched stem, clump-forming or solitary plants, leaf width, and for final confirmation if necessary, tepal shape and colouring. In case the plant is found in seed, the shape of the capsule can also help to identify the species.

Description of the species

The first flowers to be seen in early spring are of *M. huttonii*, most often growing in prolific clumps on the banks of mountain streams. An earlier rather apt name for this species in KwaZulu-Natal was *M. rivularis*. When it was first described by Baker in 1875, it was named *Dietes huttonii*, because the plants sent to Kew (by Henry Hutton) seemed to him to have a woody rootstock. What a pity the 'rivularis' name wasn't first. The plants occur in a broad band from the Amatola Mountains in the south, along the Drakensberg Mountains and into southern Mpumalanga.

It is easy to distinguish *M. huttonii* from the others by the branched stem, often hidden in the sheathing bracts. The other four species have unbranched stems. The flowering stem is about 80cm tall and the leaf, up to 2.5cm wide, can reach 150cm in length. The scented flowers are a clear bright yellow with yellow-brown nectar guides that are edged with darker veins on the outer tepals, which are up to 5.5cm long. A constant succession of flowers ensures a bright show for many weeks when the surroundings are often still clad in shades of brown from the dry winter cold.

From the end of September to October, the locally rare *M. muddii* can occasionally be seen. There are unfortunately some stray cattle that like eating off the flowers, so seeds are scarce. And then when seed does get a chance to form, the porcupines ignore the tops and go for the corms, despite the name *muddii*! It appears that the plants are much less toxic later in the growing season. The name is in honour of Christopher Mudd who collected plants in 1877.

M. muddii occurs in the higher grassland parts of the Amatola Mountains, and then there is a puzzling gap until it is again found in the northern parts of KwaZulu-Natal and up into Mozambique and eastern Zimbabwe. It is smaller than the other four species, being seldom taller than 40cm, does not form clumps and has a narrow leaf 3-6cm wide, so channelled that it appears cylindrical. The flowers are pale yellow marked with darker yellow nectar guides and a few darker veins on the outer tepals, which are up to 5cm long.

M. spathulata is very sparsely distributed here, but in the Drakensberg, Pearse (1978) notes "it is not unusual to find great masses of yellow colour against the dark grey of the basalt". They occur from the edge of the winter rainfall area near Port Elizabeth all the way up the eastern parts of South Africa, and far into Mozambique and eastern Zimbabwe, at altitudes ranging from low coastal regions to mountains over 2000 m. The flowers appear at different times of the year, depending on the locality. In the south with some winter rain, or along the coast where there is no frost, flowering can be any time during winter and spring. Here in the mountain grasslands of the Stutterheim district, it flowers around October and November; in the Drakensberg in midsummer; further north the flowers appear in late summer. A variable and adaptable species indeed!

The inner tepals are spatula-shaped - broadest towards the ends - hence the name *M. spathulata*. It has also been known under the names *Iris spathulata* (when first described by Linnaeus the younger in 1782), *Iris spathacea*, and *M. spathacea*. *M. longispatha*, described by Klatt in 1866, now also falls under *M. spathulata*.

The plants of *M. spathulata* are usually in clumps, about 80cm tall, each plant having a very long leaf, 1.5+ cm wide and easily up to 2m, or even longer in cultivation. The leaf is persistent, i.e. the same leaf continues to grow each season, with the end drying off. These long tough leaves are used by the local people for making ropes, and the corms for the traditional remedy mentioned above. The flowers are a good yellow with deep yellow nectar guides on the outer tepals, which are up to 5cm long.

As the season progresses, the next to be seen in this area is *M. graminicola* subsp. *notata*, flowering in a few localities from November to January. According to Goldblatt (1986) the distribution is “along the coast and near interior Transkei between Port St Johns in the north and East London in the south”. The specimens we have found in the Amatola Mountains are therefore an extension of the range by about 100 km, and at higher altitudes – to about 1600 m. ‘Graminicola’ refers to the grassland habitat, and ‘notata’ means ‘southern’ – the more northerly species in Kwazulu-Natal is *M. graminicola* subsp. *graminicola*. Apart from the north-south division, the main differences between the two subspecies are: 3 sheathing bracts and dark blotches at the base of the crests in subsp. *notata*, and only 1-2 sheathing bracts and no blotches on the crests in subsp. *graminicola*.

M. graminicola subsp. *notata* flowers are dramatic, having unusual grey-yellow tones with deep yellow nectar guides surrounded by a dark mauve band from which mauve veins radiate out. These outer tepals are about 7cm long. The leaf is stiff and relatively broad, usually about 1cm wide and 50cm long. The tip is folded into a point. Obermeyer (1968) notes that a new leaf is formed each year, in contrast to the persistent leaf of *M. spathulata*. Apparently there may be branching in the stem, but it is rare – we haven’t seen branching yet. The plants are sometimes up to 60cm tall, but often as short as 30cm.

The last to flower is *M. reticulata*, from February to May. The name is derived from the fibrous network (reticulate) like a fishnet enclosing the base of the stem and bracts for 10-20 cm. It is separated from *M. spathulata* by its solitary habit (not clump-forming as in the latter), by the pronounced fibrous network (sometimes there is a weakly developed network in *M. spathulata*), and by the different flowering time in this region. *M. reticulata* occurs only here, from Bedford to Queenstown on steep grassy slopes, with the Amatola Mountains as its centre point. It seems to have been missed by early collectors – it was described only in 1973.

M. reticulata is about 60cm tall, with a long leaf, 1.5+ m in length and 1.5cm wide. The flowers are bright yellow with orange nectar guides and a few darker veins on the outer tepals, which are about 7 cm long.

In the garden I would classify these *Moraea* species as easy-care, low-maintenance garden plants. The flowers are always beautiful and eye-catching, and the extra-long leaves of some species are a curiosity. They survive in our garden with -5C during some winter nights, and like to remain undisturbed for a number of years.

They are planted in the same general soil mix we use for most of our bulbs – a mixture of good loam, a bit of milled composted pine bark, well-matured garden compost and a bit of coarse river sand. To this we add general fertilizer (2:3:2) and bone meal. The main soil requirement for these plants is excellent drainage - most are grown in slightly raised beds.

We have almost-dry winters, with good rains in summer, about 900 mm per year. They like full sun and breezy conditions. Although in nature *M. huttonii* grows on stream banks (in full sun), in our garden they are not given extra water more than the other species (all rely on natural rainfall) and thrive in semi-shade. I doubt that they would grow well in a greenhouse – any comments from the readers?

If they are to be grown in containers, these species will need to be in 25-35cm pots, the larger size especially for the clump-forming ones. And remember to keep the containers cool by shading them from the sun – in nature the corms are in permanently cool to cold mountain soil. They need to be well watered from spring to autumn, and not allowed to dry out in winter.

Seeds germinate readily, any time from spring to late summer. Seedlings stay evergreen during their first year or two (in a seed tray out of the frost), and in the garden thereafter they are usually evergreen except for *M. graminicola* and *M. muddii*, which are deciduous. They don't seem to be particularly susceptible to pests and diseases – so far we haven't needed to treat them for any ailments.

A quick guide to the Stutterheim yellow *Moraea* species

Moraea	Flower time	solitary plant	Branched stem	Leaf width	other features
<i>huttonii</i>	Aug – Sep	clump forming	Mostly branched	10-25 mm	Stream banks
<i>muddii</i>	Sep – Oct	yes	No	3-6 mm	40 cm tall rare
<i>spathulata</i>	Oct – Nov	clump forming	No	1.5 cm (w) 2+ m long	Rare
<i>graminicola</i> <i>ssp. notata</i>	Nov – Jan	yes	Very rarely	10-12 mm	Greyish flw rare
<i>reticulata</i>	Feb - May	yes, with basal net	No	1.5 cm (w) 2+ m long	Mt slopes, endemic

Moraea muddii

M. graminicola

M. huttonii

M. reticulata

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The Pacific Bulb Society

A new group, Pacific Bulb Society (PBS), was formed in 2002. It has a rather broad focus as it was organized to benefit people who garden with bulbs that will grow outdoors on the Pacific Rim. This includes both cold hardy and tender bulbs, and all the bulbs in between. This group is also interested in plants that can be companions to bulbs. An Internet discussion group has been established that is open to members and non-members alike, in short, anyone who wants to discuss bulbs. Many of the members of this discussion group grow South African bulbs and would be thrilled to have people from South Africa join and share their insights and knowledge about their native bulbs. To join the discussion send a message to request@lists.mcn.org and in the body write `subscribe pacificbulbsociety`. There is no charge to participate. For more information or help in joining, contact Mary Sue Ittner at msittner@mcn.org

Moving Amaryllids

The following is an extract from an e mail (by Dennis Wilson of the UK) sent to the International Bulb Society discussion group: "The practice of moving bulbs which are in active growth seems to be gathering momentum. *Galanthus* are almost always moved this way and are well-known for being difficult to establish as dormant bulbs. This method seems most effective for many bulbs with persistent fleshy roots, particularly Amaryllids. The ideal time is just as the leaves or stems are emerging and active roots are developing. Some root damage is inevitable but provided the bulbs are not allowed to desiccate, they rapidly recover, and often flowering is not affected. Carefully packed, moist bulbs can remain out of their growing medium for a week or two without any real harm. Years ago I stopped and bought some *Lilium* bulbs on a hot summers day. The owner picked up a fork and, to my amazement, immediately dug up a clump with three foot stems bearing small flower buds. I put the bare-rooted plants in the car where they baked until I got home hours later. I planted the bulbs in a hurry, convinced that they would be U-shaped by morning. The plants not only remained upright, but flowered beautifully that summer! Since then I always move *Nerines*, *Cyrtanthus*, *Hippeastrum* and other Amaryllids with persistent roots in full growth when possible. *Nerines* in particular will often shed their entire root system if disturbed whilst dormant. The bulbs will then need to use resources to regenerate roots before normal growth can be resumed - hence no flowers that year. Personally I have no doubt that those bulbs moved in the early stages of their growth period have performed far better than those planted as dormant bulbs."

There is always something new out of Africa

Rod Saunders

The South African flora is extremely well researched, particularly popular horticultural families such as Iridaceae and Amaryllidaceae. Many are the publications that cover the flora and the mere enumeration of the authors who have written on our flora fills an entire book! Despite the rugged terrain of the sub-continent, it has been exceptionally well collected, yet such is the diversity and profusion of the flora, there is always something new to be found. In the last three years we have seen described one *Brunsvigia*, three *Cyrtanthus*, one *Freesia*, one *Clivia*, an *Ixia*, one *Androcymbium*, several *Tritoniopsis* and two *Gladiolus* species, amongst others.

Two of the biggest surprises are the discovery and description of *Brunsvigia elandsmontana* (Bothalia (2001) vol 31, page 34) and *Clivia mirabilis* (Bothalia (2002) vol 32, page 1). Firstly, *Brunsvigia elandsmontana*. At present the only known plants are in a group of about 700 individuals in the Elandsberg Private Nature Reserve north east of Wellington. Judging from the description it is a showy and distinctive species. Its nearest relative is *Brunsvigia marginata* with which it shares the characteristic actinomorphic flowers (regular flowers not divided into 2 parts as in zygomorphic). The only other species that has this character is *Brunsvigia pulchra* from northern Namaqualand. It differs from *B. marginata* in its flower colour which is pink and not red. Now that this showy species has been described, I am reasonably sure that populations will be discovered elsewhere.

And then *Clivia mirabilis*. It is indeed miraculous that a large and showy species such as this could go undiscovered in an area as visited as Nieuwoudtville! In an article in this Bulletin, John Winter describes its discovery.

At the same time as Dr Snijman described the new *Brunsvigia*, she also described a new species of *Cyrtanthus* from the Outeniqua Mountains (Bothalia (2001) vol 31, page 31). *Cyrtanthus debilis* has been known for a number of years erroneously as *C. clavatus*, and it was only after a fire swept through the area that the plants flowered and herbarium material was obtained. It was then recognised as a distinctive species. *C. debilis* is distinguished by its pink trumpet shaped flowers and the characteristic position of the stamens which are well exerted from the throat of the flowers and clustered together against the lower tepals. The most obvious feature for the layman seeing it in the field is the flower colour and this allows it to be separated from *C. clavatus* which has white to cream flowers with included anthers.

Two years previously, in the same journal, Dr Snijman described a further two species of *Cyrtanthus* - *C. leptosiphon* and *C. wellandii* (Bothalia (1999) vol 29 page 259). *C. leptosiphon* is a distinctive species, and superficially from the illustration, it could be mistaken for a *Gladiolus*. It has large erect 60 - 90mm long pale salmon to cream flowers on 20 to 30cm stems, and it flowers from February to April. The locality of this particular species is well known botanically and is close to one of the country's busiest roads, the N2.

It is therefore amazing that this plant remained undiscovered until 1981 when Jan Vlok first collected it and brought it to the attention of science.

C. wellandii was found in 1996 by Welland Cowley, a nurseryman from Port Elizabeth. It comes from the eastern extremity of the Cape Floral Kingdom, near Steytlerville and is a showy species with scarlet flowers. The flowering of this species is not fire induced, and presumably the reason for its lack of discovery until a few years ago is its small locality. It is reported by Welland Cowley that the plant responds well to cultivation (Veld & Flora (2000) vol 86 (4)).

In the same volume of *Bothalia*, two new species of *Gladiolus* were described. These are *G. rhodanthus* from the Western Cape and *G. sekukuniensis* from the Northern province (now known as Limpopo Province). *G. rhodanthus* was first encountered by Ted and Inge Oliver (of Erica fame) on top of the Stettynsberg north of Villiersdorp. However it was only collected the following year by Colin Paterson-Jones who accompanied them to the site. On returning to Cape Town and comparing the specimen, it was obvious that this species was unlike any other known *Gladiolus*, and an expedition to collect further material was immediately organised. The late flowering (December/January) is probably the reason that this showy species has been overlooked for so long. Stettynsberg is a large mountain in a hot area, and few people venture onto it in the height of summer. *G. rhodanthus* with its hairy leaves, is in the same group as *G. hirsutus* and *G. caryophyllaceus*, but differs from them in its late flowering and by size, shape and markings on its flowers.

Gladiolus sekukuniensis was first reported by Sylvia Thompson of Haenertsberg from the Leolo Mountains. Subsequently it has been found at two other localities in the area of the Strydpoortberge. The species has white to cream to pale pink flowers in March or April, and the plants are about 1 meter high.

Freesia fucata is a new species in a much researched and recognized genus, again collected in an area right under our noses, this time in the Worcester area south of Villiersdorp in renosterveld (*Bothalia* (2001) vol 31, page 189). It has sub-erect narrow leaves and highly scented flowers, and is differentiated from other similar species by its tricuspidate outer bracts. From the same area comes a new *Ixia* species, *I. atrandra*, described on page 191 of the same publication as above. This species has pink flowers with a dark centre stain and three 1cm wide leaves.

As if this is not enough, another *Freesia* species has been discovered from the same area, and this is awaiting publication.

And so the list goes on and on. To this one can add the woody plants, the Ericas, the daisies, and even one new Cycad. So remember when you next go looking at flowers - "there is always something new out of Africa" and you are probably walking on it! ❁

An Essay on the Conservation of *Nerine gracilis* in Gauteng and Mpumalanga

Charles Craib

Nerine gracilis used to be locally abundant in eastern Gauteng and western Mpumalanga and was widely recorded in various localities. The decline of this species and comments on its status are discussed in my article in the September 2002 Veld and Flora. The remaining colonies of these plants largely exist in relatively disturbed short cold high altitude grassland. Methods for conserving the remaining populations are discussed below, with particular emphasis on methodological issues.

It is evident that in former times the largest populations of these plants were found along drainage lines associated with dolerite outcrops. These are often very extensive - in one case nearly 10 kilometres long. The dolerite outcrops funnel rainfall over extensive sheets of exposed rock into adjacent grassland and the moisture regimes created by these extensive low rock outcrops are very variable. The outcrops themselves house rock populations of bulbs and succulents despite their relatively degraded state. There is evidence that a number of these sites could be rehabilitated with minimum effort to conserve ecosystems as a whole. Apart from *N. gracilis* this specific habitat supports significant populations of other species some of which are declining at an alarming rate. One of them, *Nerine krigei*, probably warrants conservation interventions. The low ridge and outcrop habitat usually spans several farms, generally with quite a range of landowning status and also farming practices. This aspect will form part of an extensive study and the results will be published in *Herbertia*, the journal of the International Bulb Society. The sociology of private conservation initiatives needs to be explored in this context. It is hoped that the instrument developed as a basis for interviewing farmers can be modified and used in a number of projects focusing on ecological aspects.

The significance of ridges in ecosystems has been recognized in Gauteng's Nature Conservation Policy and some significant aspects have been discussed recently in popular literature (Pfab 2002). Definitions of ridges could be worded to incorporate the types of ecosystems inhabited by *N. gracilis*. If Mpumalanga were to decide to recognize similar habitats as worthy of special protection, there would be an over arching policy framework in which private conservation initiatives could be coordinated. Quite a lot of this will, ultimately, depend to some extent on the species diversity, in the broadest sense, encountered.

The factors which caused *N. gracilis* to decline to the point of extinction have been discussed in the September 2002 article in Veld and Flora. All of these can be checked with current types of land ownership. The exception is one depauperate colony (and possibly others) located on the fringes of an informal settlement.

It is possible for the entire ridge along which most *N. gracilis* were found to be rehabilitated with seeds collected from the remaining *N. gracilis* colonies. *N. gracilis* sets, probably, the

largest amount of seed in any *Nerine* species in years when it flowers prolifically, and this is likely to be the only reason that the species is not yet extinct.

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Lachenalias

A discussion on *Lachenalias* on a bulb discussion group in the USA centred around the size of bulbs and their propensity to produce "offspring". One grower started his seeds in 10cm pots, and then moved the largest bulbs into 15cm clay pots the next year. He then put all the smallest bulbs together in a large shallow pot, and found that the small bulbs grew and flowered as well as, or better, than the large bulbs. The size of *Lachenalia* bulbs seems to vary considerably, and it was generally agreed that 10cm pots were too small for most of the species. There is not enough soil in these small pots to maintain moderate temperature and moisture levels. Perhaps if the pots were plunged in gravel or coarse sand, the effect of the small pot size might be minimised. *Lachenalias* were described by one person as "gregarious" plants which like to be grown in groups rather than singly, and certainly the display achieved by semi-mass planting is enhanced.

The production of bulbils varies from species to species, with *Lachenalia aloides* and *L. unicolor* being mentioned by several people as great "dividers". *L. unicolor* divides when the bulb reaches a certain size and it seems to divide into bulbs of approximately equal size, resulting in the parent bulb being surrounded by an ordered army of bulbils.

There are several viruses which infect *Lachenalias*, including hyacinth mosaic virus and ornithogalum mosaic virus. Viruses may show symptoms such as blotches or streaking on the leaves, but may also show no clear symptoms, simply weakening the plants. This suggests that one's stock should be replenished regularly from seed.

Bulb Storage

Tony Palmer from New Zealand has a bulb mail order business, so he lifts and stores many of his bulbs/corms during their dormant period. He uses a large airy garage which doesn't get too hot, and stores them in old shoe boxes. He has found that most *Moraea* species, if stored properly, can survive out of the soil longer than almost any other genera without any obvious side effects. If they have been grown well in the previous season, they will flower happily in the next. He also has few problems with *Lachenalias* providing they are not out of the ground for too long. *Sparaxis*, *Freesias*, *Babianas*, *Ixias* and *Ferrarias* all seem to store well. Even if he is not selling the bulbs, he lifts all of them either every year or every second year. Those that he doesn't store dry, he re-pots straight away. He believes that it is important to look at them regularly to check for disease, overcrowding, and to renew the potting medium. Nutrients will be exhausted, and the "dwindles" set in with many bulbs that are left in the same pot and mix year after year. *Nerines* are left outside in their containers all year round and he relies on the natural rain they get from time to time in the summer to keep them slightly moist. If overcrowded he lifts and re-pots them just before they commence growth. If not overcrowded, he removes the soil mix from the top third to half of the container, without disturbing the roots, and replenishes it with new. This also works well for *Scilla natalensis*.

Bulbous Plants used Medicinally in Southern Africa

Rachel Saunders

Of Southern Africa's approximately 30 000 species of plants, about 1/10 or 3 000 species are used medicinally and about 350 of these are traded in the market place. As anyone who has visited a South African "muti market" knows, many bulbous plants feature prominently in the array of treatments offered. We also all know that due to over-harvesting, several of these species are threatened in the wild, and nurseries have been set up to propagate them specifically for the muti trade (with mixed results).

As is often the case with medicines of all origins, those that are most toxic are often the ones used the most extensively. A good example is *Gloriosa superba*. All parts of the plant contain the chemical colchicine as well as several other alkaloides. Colchicine is extremely poisonous to all warm blooded animals - it accumulates in the body and affects the central nervous system, and yet the plant is used widely in traditional medicine in all parts of the world where it occurs. Powdered tubers are used for barrenness and impotency as well as for skin eruptions, aching teeth, malaria, leprosy and against parasites. Sap is used to disinfect wounds, and a paste from the tubers is applied for rheumatism and gout. If one has pet gerbils which breed too quickly, plant extracts of *Gloriosa* have been shown to have anti-sperm activity! The line between cure and death is obviously a thin and narrow one, as human deaths have been reported after use of the plant for rheumatism and gout.

Another very toxic bulb is *Bowiea volubilis* which causes cardiac failure, vomiting and affects red blood cells. However, the list of ailments treated includes fresh bulb for dropsy and infertility, juice for sore eyes, hot water extracts of bulb scales for bladder pains, skin diseases and to procure abortions. The bulbs are also used as love charm emetics.

The entire Amaryllid family contains a number of toxic alkaloids which can result in diarrhoea and excessive salivation at low doses, and central nervous system collapse at high doses. However, these same compounds show anti-cancer and anti-viral properties. Probably the best known "medicinal" Amaryllid is *Boophone disticha* which is used for headaches, chest and bladder pains, for dressing circumcision wounds, boils and abscesses, for skin diseases and for hysteria and sleeplessness! It is not a good idea to use this plant as a cut flower, as the scent of fresh flowers as well as inhalation of the pollen can cause headaches, sore eyes and drowsiness, hence the Afrikaans common name of "seeroogblom" (sore eye flower) or "kopseerblom" (headache flower). *Boophone* was also used as a source of arrow poison in times gone by.

Other Amaryllids used medicinally include

- *Clivia* rhizomes for fever & as a snake bite remedy, & leaf extracts as anti-viral agents
- *Scadoxus* and *Haemanthus* used for coughs, colds, asthma, wound therapy
- Roasted bulbs of *Crinum* used for aching joints and rheumatism, and leaves are used for binding swollen joints.
- *Ammocharis coranica* is used for serious afflictions thought to be caused by witchcraft.

- *Cyrtanthus* species are mainly used as charms against storms & evil, & as love charms.

In the family Hyacinthaceae, *Scilla* and *Drimia* species are widely used. *Drimias* are used as emetics and diuretics used to clean the bladder and the bulbs are used as poultices for swollen joints. *Scillas* are also used as emetics and purgatives, and can be used to produce strife in the family! Various *Dipcadi* species such as *D. marlothii* and *D. glaucum*, are eaten - bulbs are either eaten raw or roasted in the ashes of a fire. An enema of the bulb of *Eucomis autumnalis* is used to treat low backache and after operations to assist in recovery. A decoction of the bulb is used for fevers, colic, flatulence, coughs, blood disorders, urinary diseases, and hangovers!

Hypoxis species, in the family Hypoxidaceae, are taken as emetics to treat dizziness, bladder disorders and insanity. Juice of the bulb is placed on burns, and bulbs are used for headaches and internal parasites. The corms of *Empodium plicatum* are pounded and decoctions are taken for chest trouble caused by evil charms or poison. The chest then loosens and emetics of *Gladiolus dalenii* are given to dispel the evil.

Tulbaghia violacea is probably the most widely used of the Alliaceae, with similar effects as real garlic. It can be used to treat fever and colds, TB and asthma. Enemas are used for stomach problems, and leaves for cancer of the oesophagus. Leaves are also rubbed on the head for sinus headaches. Freshly harvested bulbs are boiled in water and the water is then taken orally or as an enema. Swazi people regard the cooked leaves as providing one of their green foods, similar to a spinach. Plants are often cultivated close to the house to keep snakes away.

All plant parts of *Zantedeschia aethiopica* contain needle-shaped crystals of calcium oxalate which cause mechanical irritation if eaten - hence, treat this plant with caution. Leaves are used to treat wounds, sores, boils, rheumatism and gout, and boiled rhizomes for bronchitis, asthma and heartburn.

And finally, the Iridaceae. This family is not used extensively, but this is perhaps because most of the traditional healers and indigenous peoples come from the summer rainfall areas where Iridaceae are relatively poorly represented. *Moraea spathulata* is used to treat dysentery, as is *Diets iridioides*. Hot leaf infusions of *Aristea* species are used for sprains, fevers and coughs. Crushed corms of *Hesperantha* are taken for stomach disorders, and corms of *Hesperantha baurii* are placed in seed gourds as a fertility charm to ensure a good harvest. Root decoctions of *Gladiolus dalenii* are administered to sterile women, corm infusions for chest ailments, colds and dysentery, and smoke from burning corms is inhaled for colds. *Watsonia* corms are used for treatment of diarrhoea and the flower stalks are used for smoking dagga! Surprisingly, *Sparaxis grandiflora* is used by the Zulus as an antidote against suspected sorcery. This is a SW Cape plant, so it is interesting that it features in Zulu medicine.

It is apparent that bulbous plants are not only useful horticulturally. For most of us, however, growing and enjoying the beauty of our bulb collections is preferable to eating them, particularly when one may land up dying from them!

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When to start watering winter growing bulbs

Two contributors to the Pacific Bulb Society discussion group (Lauw de Jager and Ken Kehl) wrote about this important topic. Lauw de Jager mentioned that a first general rule is to take note of the climate of the species in its natural habitat. There are several South African species which "give up hope" if they receive no rain before early autumn and they then remain dormant for the entire winter. Two species he mentioned in this category are *Freesia alba* and *Ferraria* species. Many corms and bulbs will actually shoot even when kept dry, suggesting that watering has been held back for too long. Some of the Mediterranean genera thrive on small amounts of summer rain - *Moraea polystachya* and *Amaryllis belladonna* for example., and some do well if they receive a heavy fall in late summer. An example of this is *Gladiolus splendens* which received heavy rain in early September (in the northern hemisphere) and by the 7th October was already 30cm tall! It is also important not to water too early, as one runs the risk of causing the corms to rot. If the corms have no roots and one waters frequently, they lie in the wet soil and rot.

Ken Kehl wrote more about Amaryllids. He suggests that if the bulb keeps persistent or perennial roots, it will appreciate a small amount of moisture at all times. Such a bulb growing in its natural habitat, would be able to find enough moisture at some soil depth to keep its system at a slow idle throughout the dry season. He has found that seedlings of winter growing *Brunsvigias*, *Boophones* and other Amaryllids will die if their pots are exposed to direct summer sun. The soil temperatures soar, particularly if the containers are black, and the potting mix will become bone dry. These Amaryllids are happiest if they can keep a cool root run, much as if they were growing in the ground. He gives them bottom water every once in a while by placing the pots in saucers full of water. This way the crown and basal plates, two prime spots where rot could get a foothold, are not wet, yet the roots remain damp. He also mentioned the importance of taking note of the climate in the bulb's habitat. *Amaryllis belladonna* for example grows in areas that do receive summer rain - in the SW Cape we generally do get some rain from November to January, and this suggests the watering regime for plants in pots.

The Origin of our Cormous Plants

Andries de Villiers

The essence of evolutionary taxonomy is the belief that from an original prototype, different specimens underwent adaptive mutation in different environments in order to become more competitive and successful, while retaining the basic character of the prototype. If the mutations are significantly different from each other they give rise to identifiable groups. In IBSA, the starting point of our interest is the GENUS and we do not normally look behind that to the earlier mutating prototypes. Even within a genus the process of division continues to take place so that every species can be identified to a sub-subgroup which we call a Series. Then that Series can be further identified to a larger, more basic group which we call a Section, and even the Section may be identified to a Sub-genus. This is basic knowledge that we all know, but, like many basic bits of knowledge, we tend to overlook it and concentrate on the Species. This is a pity because if we keep it in mind, not only does it make identification easier, but it also helps to explain what may otherwise seem mysterious. As this process of genetic division takes place, the range of the genus continues to expand as fresh mutations adapt into new areas. However, there is another set of changes taking place which may nullify the continual expansion of the Genus. The world is not static - it is changing all the time but at a much slower pace. Tectonic plates clash and separate. Hot and, more often, cold waters well up in the seas affecting the temperature of the air and thus the pattern of the winds which, in turn, change the pattern of rainfall. Mountains rise and sink and are eroding all the time, spreading soils which are the eroded particles of rocks. Volcanoes erupt and great rifts split the land. Deserts and forests and savannahs are formed by this continual movement. Africa was formerly, hundreds of millions of years ago, a great basin with a rim of massive mountains. As the basin filled with eroded and tumbled rocks it became a great plain and the mountain rim wore down to what we see today.

If we apply this scenario to the Genus *Romulea*, we are faced with a curious phenomenon: there are more than seventy species in the Cape, but only three in Tropical Africa and almost a dozen in the lands of the Mediterranean. *Romulea* is not a true montane plant, and is found on rising ground but not normally at any significantly high altitude. It is not a forest plant but it should have grown more readily in the savannah. Savannah was ideal for grass and there was an explosion of grasses over the plain of Africa. An explosion of grass caused an explosion of herbivores to crop it. *Romulea* could not compete. It needs a cycle of generation, flowering, seeding and dormancy, geared to the rain pattern. But in the leafing, flowering and seeding times it was cropped out of existence by the herbivores whose migrations follow the rain cycle, so *Romulea* expanded (migrated or, as botanists call it, radiated) into safer areas of which the Cape was the most favourable.

By what routes did it radiate? There are three entry points to the Cape. There is a corridor between the mountains and the sea down the east coast – The Eastern Cape. There was a similar corridor down the west coast, but that has been closed by the desert, comparatively recently in cosmic terms. Between the corridors the mountain rim crumbled and folded into three escarpments. The most northerly is what we call the Great Escarpment. Behind it is

the Karoo, reduced to a desert by the wind/rain pattern and the cyclical migration of millions of Springbok. Below the Karoo is the second escarpment backed by the Klein Karoo, also, but less drastically, a desert. Finally the Roggeveld escarpment and the Cape fold mountains which delimit the Cape Floral Kingdom. Through these mountains is the route I have called "The Passes" (figure 1). There is strong evidence that the most successful radiation route was the Eastern corridor. Near Rhodes we find one of the Tropical African species, *R. camerooniana* and its close relative *R. autumnalis*. Every indication is that the prototypes of Sub-genus Romulea entered here and radiated westward across the Cape. But there is a second Sub-genus, Spatalanthus, with its epicentre at Nieuwoudtville and the Roggeveld. The prototype of that Sub-genus must have entered through the Passes in the crumbled and folded mountains. This means that the division of the two sub-genera existed in tropical Africa before the great radiation.

Figure 1

If you study the schematic in figure 2, the force of this argument becomes very clear. There appears to be no correlation between existing *Romulea* species and the Western corridor. If there was an attempt to use that route (bearing in mind that *R. camerooniana* does exist, albeit sparingly, in West Africa) it was frustrated by the desert.

Figure 2



This is a schematic, not a cladogram, & there is no significance in the order in which the series are placed within each section.

The whole speculation cannot be left to rest on the one Genus *Romulea* and it is strongly supported by the Genus *Gladiolus*. There are thirteen species in the Eastern corridor common to both the Winter Rainfall Region (Cape Floral Kingdom) and the Summer Rainfall Region (essentially Tropical Africa). *Gladiolus* is not classified into Sub-genera but into seven Sections which in the Goldblatt & Manning monograph are not connected to each other. There is however a very significant group, viz. Section Heterocolon, in three Series, which is essentially a Tropical African Section. In one Series, Vernus, there are five species, two of which are definitely not Cape plants. Of the other three the official botanical line is that one only, *G. mostertiae*, qualifies. Some of us in IBSA who are not convinced by the official demarcation of the Cape Floral Kingdom, consider all three to be Cape species. *G. mostertiae*, at Nieuwoudtville, is literally only a few meters within the official (botanical) Cape, while the second, *G. marlothii* at Gannaga Pass, is (officially) excluded by the same slim margin. The third, *G. kamiesbergensis* is similarly borderline. The prototypes of these must also have entered by the Passes.

There are some genera, mainly the smaller Irids such as *Babiana*, which are considered to be solely Cape plants not resulting in radiation from elsewhere. This is a convenient 'cop out' which does not impress us very much. Indeed in IBSA Bulletin number 44 (19) p 34 there is an official cladogram of some of these genera using the non-Cape *Radinosisiphon* as the out-group. Of more credibility is the theory that where a species crosses the border it is a case of counter-radiation. This may be correct in some instances but is certainly not so with *G. longicollis* as its northern distribution makes it clear, nor does it apply to *G. gueinzii*, a warm water species which gave up abruptly when it met the cold Antarctic current at Arniston. As to the Western corridor, a strong piece of evidence is the Genus *Ferraria* of which the most primitive species is in Namibia and Botswana.

Having noted earlier that *Romulea* (and *Gladiolus*) are in the Mediterranean, it should be remembered that the corn supply for Rome was imported from Egypt. At that time, the productive area was not the narrow strip of agriculture along the banks of the Nile but a great productive province destroyed in historical times by over-cropping, over-grazing and slash-and-burn. As you fly over the Sahara you can make out the buried skeletons of river systems. The world is in a state of continual change not least through the activities of man.

This paper has no official botanical authority. It is merely the result of observation during several years of IBSA excursions. An eminent botanist who saw an early draft of it described it as pure speculation. Sobeit! ❁

The genus *Gladiolus*

The word *gladiolus*, Latin for "little sword", was used by the Romans in classical times, and the plants were treasured wild flowers in the Mediterranean and Middle East for thousands of years. In 1753 Carl Linnaeus included 6 species in his work *Species Plantarum* in which he laid the foundations of the modern system of naming plants. Two species were from Europe and the other 4 from the Cape. Of the four, only one remains in the genus *Gladiolus*, viz. *G. angustus*. The first South African *Gladioli* were recorded in 1685 by Simon van der Stel and Claudius on their expedition to Namaqualand.

Re-doing a Raised Bed

Mary Sue Ittner with help from Alberto Castillo

In last year's bulletin Rachel Saunders wrote an article on planting bulbs in raised beds using information that had been shared on the International Bulb Society's Internet forum. This is an update on my experience and a description of my current project to redo two of my beds. I have received inspiration and considerable help in this endeavor from Alberto Castillo who grows a large number of bulbs in his botanical garden in Argentina. He has agreed to allow me to share his wonderful ideas.

Last year Rachel raised the question of what to do if disease strikes a raised bed. My beds were planted 10-12 years earlier and I had never changed the soil although I had added some soil and mulch to the top over the years. Surprisingly, things continued to bloom each year although some more successfully than others. Some things I had planted were long gone and others had increased in alarming numbers. In the last growing season some of the *Lachenalia* began to look virused. They still bloomed, but I began to worry about them and eventually removed them. Since I did not know which other bulbs might be affected, I decided the only safe thing was to start over. I gave some thought to trying to salvage some of my favorites, but finally just got rid of everything. A smaller bed was looking too crowded so I decided to replant it as well. I saved some of the bulbs from that bed which was not as hard as I expected as the mix I had used was very sandy and easy to dig in.

I discovered that some species had increased in numbers, but were found clustered for the most part in the same spot (eg. *Tritonia crocata*). Others like *Freesia sparrmannii* had not increased much at all. On the other hand, *Ferraria uncinata* had spread through the bed. I found it everywhere and even when I was sure that I had found the last one, another would turn up. I had planted quite a few different *Moraea* species in that bed. *M. aristata* and *M. gigandra* always bloomed well and sometimes I would have blooms from *M. loubseri*, *M. bellendenii*, *M. polystachya*, and *M. tricuspidata*. Once in that bed I also had *M. setifolia* and *M. saxicola*, but they had been overshadowed or lost. There were hundreds and hundreds of *Moraea* corms. The tags were long gone and besides, they had produced offsets in all directions. I read the descriptions of the corms in the *Moraea* book and studied the pictures, but finally gave up trying to decide which was which.

It was obvious that I needed a different approach this second time around. I was intrigued with the idea of a plunge bed that alpine growers use where bulbs are planted in mesh pots and then submerged in sand. Generally these beds are protected from the elements and my beds are in the open, but I thought I still might be able to use that idea as my foundation. If the bulbs were planted in a container, they wouldn't be able to wander (as much) and it would be easier to attend to plants that needed dividing or to dig out extras to share. It was at this point in my deliberation that I asked a question on the Pacific Bulb Society's Internet forum about plunge beds and mesh pots and Alberto responded.

Alberto has fine-tuned an excellent way to grow bulbs in raised beds in Argentina. He has 11 beds constructed of brick walls that are lined with styrofoam sheets for insulation. His beds are a meter wide so that even small flowers can be seen from the aisles between the beds. The important dimension is about twice the length of your arm so you can weed from either side and each bed is about 9 meters long. Each contains about 136 pots. He advised me to line the bottom of the bed with galvanized wire to keep out the rodents and suggested plastic pots would be a lot cheaper than mesh. The important factor in using plastic pots was to be sure that the pot would drain properly and there would not be water trapped in the bottom of the pots where the roots were. He had learned that water needed to drain out of the sides of the pot, not the bottom, so each of his pots was prepared with an 8cm vertical cut made close to the bottom of the pot. These are slits, not holes, as you do not want the soil mix to be washed out with the water. Holes are more likely to get clogged with soil than slits and two slits are better than one. The pots to be used needed to be deep as most bulbs appreciate the extra depth for their root run. He suggested containers at least 20 cm deep would be a good size for the majority of bulbs that are grown in cultivation.

My beds were already built of redwood and lined by my husband years ago. His design was an octagon, which was attractive, but problematic since I couldn't reach to the center of the larger bed to weed. It is about 2.2 meters across whereas the smaller one is 1.3 meters. No way were they going to be redone however. Alberto suggested I spray the wooden sides with formaline or a chlorine and hot water solution as a protection from disease that might be in the wood. Our galvanized wire was mostly intact and we planned to lay gravel since we do not have a ready source of the "grit" he suggested on top of the wire to even out the surface so all the pots would be on the same level. I was convinced no rodent would make it through both the wire and the gravel. The sides of the pots would also serve as protection and mesh could be added to the top of the beds as well so that everything would be enclosed.

Alberto plants his bulbs in a mix of compost, grit, and really coarse sand. After several years this mix is discarded and sterilized and then used for the plunge material. He finds that once it is watered, it retains its shape so when a pot is removed there is a space left for the same sized pot. It would be crucial that all the pots were the same size so they would be interchangeable. Alberto often plants more than one species in each pot. He just makes sure the storage organs are different so you can tell them apart when you are unpotting. In the Cape beds he plants up to three species per pot, like *Ferraria* with *Ixia* and *Hesperantha*, or *Lachenalia* with *Bulbinella* and *Tritonia*. He even uses the beds for sowing seeds as he finds the seedlings like to be surrounded by adults. He just sows the seed directly in the pots of the same species. He only changes the mix once every two or three years, but does lift pots each year to remove dead roots and foliage. If there are seedlings in the main pot however, he waits until the second year to empty the contents. He also sows seeds of new species in his community pots; again he takes care that the organs of the new species he has sown will be different from the other things growing in the pot.

I was able to purchase plastic pots about 23cm wide and more than 20cm deep. They were cheap nursery grade and a fraction of the cost of mesh pots. After trying more fancy ways

of making the slits using a drill and a hot nail, my husband decided it was easier just to cut them with garden shears. I planned to use coarse sand and gravel as my plunge mix. Alberto explained that two different mediums would be better than one as they would be different sizes and therefore less likely to compact. Since I doubted my plunge material would retain its shape if I removed a pot, I decided to use two and nest them. One would remain permanently in the bed and I could pull the other out if the bulbs needed attention. But that meant that both pots needed vertical slits and I needed to be able to line them up so the slits would match. My husband discovered that if he started cutting from the pre-cut holes in the bottom there was only one way the slits would line up. He made a notch in each pot on the top where they were lined up so all I would have to do was to match the notches. For the first planting he did two at a time and it was easy to see once they were filled with soil if the slits were aligned. Once the pots were in the beds however the notches would be crucial.

Alberto suggested the containers be arranged precisely like soldiers to maximize the space, but leaving enough space to be able to remove the pots easily. There was still the problem of how I was going to get into my larger bed to change the containers, to weed, and to photograph. I decided to place three larger containers of plants in the middle. If I chose plants that preferred a more permanent planting I would not have to redo them as often. And if I chose fall blooming plants many of the other plants would not be in the way when they were in bloom as they would either not have broken dormancy or would not yet be very tall. I decided to try *Brunsvigia orientalis*, *Cyrtanetes longifolia* and *Moraea polystachya* for the center. Surrounding them I arranged three rows of pots: 22 in the first row, 16 in the second row, and 10 in the third row. My plan was to plant the taller plants closer to the center and the shorter ones closer to the edge. On two sides of the bed I left an open space wide enough for me to stand on in the first two rows so I could walk on it to reach any container in the bed without crushing any plants. Using Alberto's suggestion I planted two different genera in each of the pot and occasionally three, especially when I had only a few of one thing.

Although I had started many *Lachenalias* from seed and was growing them in a covered structure away from the bed, I decided not to add any of them to the bed until another season had passed with healthy leaves. Alberto stressed repeatedly not to add anything to a bed that could be virused. I had a large number of unknown *Moraeas* from the small bed. Choosing which to keep and plant in the bed was a challenge. I hope I will end up with most of the species I had, but when they bloom I may find out they are all the same species! Finally I made a diagram so I will also have on paper what I plant where. Sometimes I had two pots of the same species and then placed them on opposite sides of the octagon. I have made tags out of old blinds that are heavier than plastic tags and thus a bit harder for the birds to remove. I also wrote on plastic tags in pencil and slipped them between the two pots so I will know what I have if the other tags are lost. I still need to add gravel up to the top of the slits, then the plunge material and finally mulch over all to make it look like a bed instead of a collection of pots.

Alberto has advised that it would be helpful to create an arc over the bed so that if there is cold or very wet weather I can protect the plants by adding plastic (or frost cloth). This

would be easily done with a rectangular bed. In planting such a bed it is important to group all the plants together that need the same conditions. I have found my South African plants come into growth a couple of months before my native California plants and the latter are blooming late spring and summer after most of the former have started to die back. Having a bed of each would allow me to water them differently according to their needs.

If this new system works as well as I expect, it is my plan to convert my other beds as well, probably one each year. The rectangular ones should be much easier to do. Although I am finding the conversion process extremely labour intensive, in the future I expect any changes will be much less work. And watering, fertilizing, and spraying a bed will be much easier than doing the same for 51 individual pots. I think the plants will be much happier as well and fare much better than they did under my previous system. 🌱

Hybridisation for Beginners

Andries de Villiers

It has become apparent that hybridisation and hybrids have become interesting to many members who are not commercially involved. Among such amateurs, terms are often incorrectly used, which may lead to confusion. It is as well to define clearly the terms used about hybrids and cross-breeding (used to produce stronger specimens, but not hybrids).

Cross-breeding is the normal application of pollen of one specimen to the stigma of a different specimen of the same species. It is, in fact, the normal sexual behaviour of most of our plants.

In-breeding is the mating of two specimens closely related genetically, such as **selfing** (same specimen), **sibling breeding** (two specimens from the same parents or parent seedlings) and **back-breeding** (parent/offspring or offspring/parent). In-breeding of species which normally cross-breed often results in weak or infertile progeny because adverse characteristics tend to become fixed or dominant. This is called **inbreeding depression**. On the other hand cross-breeding of species which normally in-breed usually results in stronger offspring (**hybrid vigour**). Thus if you cross-breed between a specimen from one colony with a specimen of the same species from a distant colony, you usually get more vigorous progeny and the seed of the cross is likely to germinate better. Developments, such as residential and industrial, tend to isolate colonies and this leads to inbreeding depression. It is most important to know the origin of the plants used for breeding seed.

Natural hybridisation is that which occurs in nature. **Artificial hybridisation** is that which is purposely undertaken by the grower, or which results from different species grown next to one another on the potting bench. Natural hybridisation requires the presence in both space and time of the two parents and the pollinator. Such an area, which is prone to hybridisation, is called a **hybrid zone**.

Hybrid swarm is a population in which the specimens are solely or predominantly hybrids. It is advisable to use the term **colony** for a population of the same species, because the term **community** is generally reserved for a defined area supporting many families and genera.

Interspecific hybrids are hybrids between two species of the same genus.

Intergeneric hybrids are hybrids between two species of different genera.

Once you master these terms, it will help you to select the parents from which you want to grow seed. Incidentally, the risk of inbreeding depression is the reason why it is normally unwise to insist that only progeny from a particular colony should be re-introduced to that colony. If you have the time (in years), you can improve a weak strain by an interspecific hybridisation followed by back-breeding to the weak species which you want to improve. By doing this you may hope to introduce hybrid vigour and gradually eliminate the characteristics of the extraneous species. This is the expedient commonly used in, for instance, breeding budgerigars for colour. This expedient might be usefully applied to species on the brink of extinction such as *Moraea insolens*.

In IBSA we are committed to the conservation of indigenous species. It could be argued that a process of interspecific hybridisation and back-breeding (until the extraneous species is eliminated) is true conservation by cultivation. ☸

Hardiness of South African bulbs and corms in Britain

Dave Fenwick of the Pacific Bulb Society

I have struggled with the maritime/continental dithering of the climate in the UK, but I think that I have a remedy for the problem. I grow a wide range of South African bulbs, about 800 species in all, in a garden that is 17m x 15m. I concentrate on growing *Crocasmia*, *Chasmanthe* and *Tulbaghia*, and am also passionate about *Kniphofia*, *Eucomis*, *Amaryllis belladonna*, *Crinum*, *Gladioli* and *Freesias*.

My aim with many species is to grow them successfully in the UK climate and get the best display from my garden which I open for charity in summer. Here in the south west of the UK, we have a warmer climate and we are wetter, but our specific problem is that we can have -5°C by night and 18°C by day and within just 12 hours. If you then add rain and ice to the equation, then it can be very detrimental to many species, especially those grown in pots. During some winters frost penetrates to about 8cm, so all but the hardiest bulbs have to be planted below 10cm. Indeed, I plant *Watsonias* at 30cm and have planted *Crinum moorei* at over 60cm.

I have learnt to place the bulbs deeper than what many books describe and by talking to many South Africa bulb specialists, have found that bulbs in habitat are found very deep. This is not because of the cold, but because of predation by baboons and porcupines. Of course the deeper you plant a bulb, the more stable the soil temperature which is why mulches are so beneficial whether they be organic, inorganic or living, and why I can get away with growing such a wide range of species here. I am also very fond of the word "microhabitat" and completely believe that "thought and placement" are the key words to growing anything successfully.

Germination times of seeds of various bulbous and cormous plants

Sandra Stowell

The following germination times have been recorded over a period of years (in New Zealand).

Androcymbium capensis and ciliolatum

30 days

Babiana - these fall into two groups:

Gladiolus - these fall into 3 groups:

Group 1: 15 to 30 days

Group 1: less than 20 days

fimbriata
framesii
klaverensis
patula
purpurea
pygmaea
rubrocyanea
scabrifolia
scariosa
sinuata

splendens
viridiflora

Group 2: 20 to 30 days

Group 2: 30 to 45 days

ambigua
angustifolia
attenuata
curviscapa
disticha
ecklonii
leipoldtii
mucronata
nana
patersoniae
spathacea
stricta
thunbergii
truncata
tubulosa
vanzyliae
villosa
villosula

aureus
cardinalis
carinatus
carneus
dalenii
guthrei
hirsutus
liliaceus
martleyi
ochroleucus
orchidiflorus
patersoniae
rogersii
tristis
vaginatus
venustus
virescens
watermeyerii
watsonius

Group 3: 30 to 40 days

alatus
ceresianus
geardii
gracilis
griseus
hyalinus
meliusculus
quadrangulus
recurvus
trichonemifolius

Lachenalia - these fall into 3 groups:

Group 1: less than 20 days

bachmanii
 barkeriana
 concordiana
 congesta
 doloritica
 elegans
 framesii
 gillettii
 haarlemensis
 juncifolia
 liliflora
 maximiliani
 patula
 pustulata
 rosea
 undulata
 unicolor
 unifolia
 zeyheri

Group 2: 20 to 30 days

alba
 algoensis
 aloides var aurea
 arbutnotiae
 bulbifera
 comptonii
 contaminata
 elegans var flava
 elegans var membranacea
 elegans var suaveolens
 fistulosa
 hirta
 kliprandensis
 latifolia
 marginata
 mediana
 mutabilis
 namibiensis
 obscura
 orchioides var glaucina
 polyphylla
 purpureo-caerulea

Group 2 cont.:

reflexa
 rubida
 stayneri
 thomasiae
 violacea
 viridiflora
 zebrina

Group 3: 30 to 40 days

aloides var quadricolor
 aloides var vanzyliae
 attenuata
 carnosa
 longibracteata
 namaquensis
 neilii
 orchioides var orchioides
 pusilla
 splendida
 variegata

Moraea - all species below took 30 to 50 days to germinate:

aristata
 atropunctata
 calcicola
 falcifolia
 fugax
 gawleri
 lurida
 macrocarpa
 macronyx
 neopavonia
 papilionaceae
 tricolor
 tricuspidata
 tulbaghensis
 vegeta
 villosa



The Man behind the Name *Romulea schlechteri*

Rachel Saunders

On the cover of this Bulletin is a photograph of *Romulea schlechteri* which grows from Clanwilliam and Vredendal in the north to Caledon in the east. This plant was named after Friedrich Richard Rudolf Schlechter, a German botanist and traveller. He was born in 1872 in Berlin, and he worked in the Berlin University Botanic Garden before coming to the Cape in 1891. He first worked in the Department of Agriculture as a plant pathologist and then as a gardener for H.M. Arderne, before being employed by Harry Bolus as a herbarium and library assistant. It appears as though Bolus gave him a fairly free hand in making local collecting trips, and he collected over 12 000 specimens.

In the early 1890s, he collected in the south western Cape, from Cape Town northwards and eastwards towards Grahamstown, and then made a trip to Durban, presumably by boat. He travelled extensively in Natal and the Transvaal, returning to Cape Town by train in 1894. Over the next 3 years he collected both locally and further afield, even going as far as Mozambique in 1898. For a short time he was accompanied by his younger brother Max, and together they explored the Vanrhynsdorp and Namaqualand areas.


The specimens that Schlechter collected were sold to herbaria all over the world. Many went to European herbaria such as Zurich and Berlin, as well as to many local institutions - for example Selmar Schonland, the curator of the Albany Museum in Grahamstown, took as many as were offered to him. It is thought that Schlechter collected up to 100 duplicates on occasions, and these sheets were distributed far and wide.

In 1898 Schlechter returned to Germany and began studying again, finally receiving his doctoral degree in 1904. While studying, he was offered a job by Otto Warburg who was looking for an experienced explorer to investigate rubber-producing plants in the German colonies. Schlechter worked for this company for 14 years, visiting Africa (including the Cameroons) and New Guinea. In 1910 he married the daughter of a Russian tea merchant and his overseas travels came to an end.

His final post was at the Berlin-Dahlemp Botanical Museum, and in his later years he aimed at describing one new species every day! He died in Germany at the age of 53 in 1925.

And in case you are wondering when he collected *Romulea schlechteri*, this specimen was numbered 8648!

References:

Gunn, M & L. Codd. 1981 Botanical exploration of Southern Africa. AA Balkema, Cape Town. 

From the Archives Oxalis

In the book "Seed plants of southern Africa: families and genera", edited by O Leistner in 2000, the genus *Oxalis* is described as follows: Annual or perennial herbs, often with corms, tubers or tuberous roots, sometimes caulescent. Leaves alternate or basal, digitately three to many foliolate or pinnately tri-foliolate, flowers single or sub-umbellate and regular, stamens 10 in 2 series. About 500 species world wide, with about 250 species in southern Africa, mainly in the western and eastern Cape and Namibia. Many of the other species come from South America. The most recent taxonomic work on the southern African species was done by Captain Salter and was published in Journal of South African Botany in 1944. This publication is virtually unobtainable. In "Cape Plants" (Goldblatt and Manning, 2000) 120 species are listed with short basic descriptions, and in some of the Botanical Society Field Guides there are illustrations of a few species. On the whole, the species of this genus are difficult to identify, and I think that we all have innumerable pots labelled simply "Oxalis"! Many of the species are extremely worthwhile to grow, and it becomes very frustrating when no names are available.

In Bulletin No. 35 (1985) Stan Farwig wrote an article on growing *Oxalis* in pots, and on the weediness of some species.

A Lesson from *Oxalis* Stan Farwig

I am one of those who have questioned Mr Loubser on the paucity of *Oxalis* species from the rich storehouse of South Africa, for I too share a weakness for the genus. This in spite of having faced, along with many Californians, the onslaught of *O. pes-caprae* and, at a more innocent time, having planted out a cultivar readily available from numerous nurseries here, *O. purpurea* "Grand Duchess". I would in no way wish to minimise the seriousness of exporting weedy plants that interfere with the normal development of native flora.

Oxalis does, however, contain a number of species that possess, to use a horticultural term borrowed from human behaviour, "refinement", although it is far from certain that the present horticultural application.....curbing the urge to reproduce.....is necessarily parallel. So it may be urged that just as in human affairs, where tragedy adheres to characterising entire families, ethnic groups, races or nations by the repugnant behaviour of certain of their members, it may be beneficial to adopt an attitude of critical evaluation rather than stereotyping whole genera. Particularly since one member, it seems to me, is a choice adornment for any collection.

This is the narrow endemic from the summit of Van Rhyn's Pass, *O. massoniana*. Its dark red stems, its filligree of tiny leaves, and especially its orange flowers, luminous with a metallic sheen, make it difficult to disagree with Paymaster-Captain Salter's assessment, "This species is perhaps the most strikingly handsome of all the South African *Oxalis*..." (J.

SA Bot (1944) Supplementary volume 1). We wish we could induce a bit more weediness in ours in order to comply with the requests for it.

O. luteola is another species which has remained compact in its container, as have others that we received nameless and have remained so, because we have been unable to penetrate very deeply into the Paymaster-Captain's key for the genus.

Oxalis were popular with the Victorians as house plants and consequently were grown in pots. Herein may lie a method for restraining their rowdy excesses. *O. hirta*, with its brilliant magenta flower, makes a lascivious display of fecundity in its own bed, and the bed of others at the University of California Botanical Garden at Berkeley. This is evidently a reflection of the depths to which some species can sink left to their own devices, a subject discussed by Salter. But in its box at our house, *O. hirta* has remained properly chaste and even perhaps a trifle too demure.

We have sought in vain for seed of these species. It seems that many *Oxalis* eschew the simple homely acts that insure fertility throughout the plant kingdom. They are, not to mince words, blatant heterostylists and, as is so often the case when kinky practices are involved, their needs are not easily satisfied. Such wayward habits have been investigated and reported upon in articles by Dr Robert Ornduff, and it is his interest in problems of seed production that has resulted in our collection.

So *Oxalis* has been, in our experience, a well-behaved genus aside from the exceptions mentioned earlier. They are not to be compared to certain other emigrés, such as *Moraea polystachya*, which displays a boundless ingenuity in discovering new and far-flung locations to colonise. *Chasmanthe* yawn openly from new stands yearly. And the denizens of the small raised rock garden that is the domicile of our first South African natives have been restless since their arrival. Heedless of their need for excellent drainage and friable soil, they long ago began a trek across the dense and soggy clay veld of our backyard. *Babiana* crouch beneath plant tables, making dark corners bright. *Lachenalia* turn flagstones into paths for the fleet of foot only. *Tritonia* and *Ixia* romp across the wide expanse of *Calochortus* boxes, while for their part, *Calochortus* extend this lesson in international coexistence by settling in boxes of *Lachenalia* and *Moraea*. Weeds? Perhaps. But of a benign and lovely character.

There may be more than one lesson to be learned from these genera as well as *Oxalis*, although the wisdom gained may only have the force of truism:

- that individual species are to be judged by individual traits, and their fullest capacities may not be apparent from a casual acquaintance;
- that the desires and designs of men often flounder on the operations of nature;
- that, regardless of the species involved, there is always a potential for disaster when natives are relocated to distant homelands, for they may perish and remain a perpetual recrimination or be stimulated to aggression, eluding the barriers we contrive, and making a havoc of the tiny gardens we intend for ourselves. ❁

Book Review

South African Botanical Art

Edited by Marion Arnold

Published by Fernwood Press 2001

216 pages lavishly illustrated

This is a curious book: unique and important. It examines the relationship between Art and Botany. As far as I know this has never been attempted before. It is important because it applies a holistic approach to the relationship between Botanical Painting, and thus botany, and Painting as a mainstream Art. It concerns itself with the artistry of South African plants, and just how wide is even this limitation can be gauged from the size of the appendix. This consists of 21 pages listing 226 artists giving their dates, studies, careers, published artwork and where the art can be found. It covers artwork from the 17th century to the end of the 20th century.

Essentially the book comprises five long illustrated essays and a postscript. In the first essay, Marion Arnold discusses the relationship between botanical paintings and floral paintings. The difference lies in the purpose, not in the excellence of execution and technique, nor necessarily in the accuracy and beauty. Indeed, some floral paintings qualify also as botanical art sufficient to be iconotypes. For instance Emily Thwaites, to whom I will return later, never painted on commission from a botanist, although she was in the circle of artists which included Ethel May Dixie, Marloth's principal illustrator. Arnold defines plant portraiture as "a hybrid art located within two theoretical discourses - the science of botany and the visual arts". Such a hybridisation generates a very wide spectrum of both intellectual and perceptive response. It takes a person of innate culture to span this spectrum. "Under researched by art historians, undervalued by art theorists and critics, uncollected by art institutions and seldom exhibited in art galleries". It is a tragedy that so many people are conditioned from an early age to ignore botanical portraiture, and herein lies the importance of this book - it could open the eyes of thousands to an enormous body of fine art.

In the second essay, John Rourke traced the development of botanical and floral painting from Justus Heurnius (1587 - 1653) up to today and, in so doing, the history of South African botany. He introduces this with a quotation from Martyn Rix - "...the country which has produced the largest number of well illustrated botanical booksis South Africa which has.....a uniquely rich native flora anda clientele able to afford the books". With the rand falling out of sight he might have added "the willingness to make the necessary sacrifices"! Towards the end of the essay he touches, I think a little unfairly, on photography. "The emphasis of the photographer and botanical artist are usually different. As an aid to science the image created by a competent botanical artist is an illusion of depth, focus and emphasissomething that is beyond the optical limitations of lenses or even the human eye". This may be generally true, but the contemporary work of such photographers as Colin Paterson-Jones has as much botanical exactitude as artistry. Rourke

also discusses printing processes, a subject of major importance in a country which produces so many books about flowers.

Dee Snijman, in the third essay, traces the development of plant taxonomy and the interaction between scientist and artist. She starts her review with Carolus Clusius (1526 - 1609) and makes the point that paintings (even San rock paintings) may have been made after the first written records. Much of the essay describes the development of the technique of written species descriptions and as this has become more formalised, more constrained by convention, the need for visual images to supplement the written word has become more necessary, either in full colour or in line drawings or both. Both botanical writing and botanical art grew in the realisation that a plant, to be properly described and painted, needed to be seen in its natural environment, not just from horticultural or dried herbarium specimens. So both scientists and artists became explorers. Often recent plant portraits have been painted or drawn against a natural background or in combination with other plant specimens with which they grow in the wild. Snijman explains why there are competing theories about what constitutes a species and the importance to the scientist of features which define any particular species. "The artist brings expertise on space, colour and texture whereas the systematist (taxonomist) contributes a knowledge of the features that delimit the species." This calls for a close accord of scientist and artist which is not always achieved. It has led some artists to become notable botanists, and vice versa. She also explains why names are so often changed as advancing technology provides new insights into relationships between individual plants. "Evolution is an ongoing dynamic process, with populations of plants splitting and coalescing over time and, because of this, not all plants can be attributed to neatly defined concepts with stable names".

In the fourth essay John Manning and Peter Goldblatt tackle the relationship between form and function. Every flower is a severely practical structure for a single imperative: the survival of the species by the production of seed. Colour, shape, scent, nectar are all weapons in this war of survival. The vegetative features of a plant evolve to enable it to exist in its habitat, but the floral characteristics develop to compete with other flowers for the attention of pollinators. Form adapts to provide the function. The fantastic variety of flower forms reflects this. It also led to early taxonomic confusion when two species, not even distantly related, adopted a flower form which was similar because they sought to attract the same pollinator. The authors explore the principal pollinators and adaptations of form. The artist may, and increasingly nowadays does, include the pollinator in the picture. This is a situation in which a high speed camera is often the only feasible tool, so photographs begin to be found instead of, or in addition to, paintings, but they are an uneasy substitute for reasons given by Rourke. They are best employed in mass produced field guides and the like, where hundreds of illustrations are needed in a small compass and at a reasonable price. The authors explain how species of different genera adopt a remarkably common form of colour and markings in a single area in order to keep the desired pollinator from straying away. This puts whole "guilds" of plants at risk if the pollinator is exterminated by crop spraying with insecticides. "It is only because natural organisms change on a scale so much vaster than the life of the individual that species appear to be indifferent to time. Botanical portraits are, ultimately, snapshots in the life of a

species.....botanical art is therefore imbued with a timelessness reminiscent of the species itself".

Arnold then gathers together the threads of the other essays in the fifth one. She starts by explaining how botanical art came into being, how the sexuality of flowers stigmatized botanical portraiture and how the anthropomorphic focus of 17th and 18th century art downgraded flower paintings, as a sub-division of still-life, to the lowest rung of the ladder of High Art. Most such flower still-life paintings were intended to present opulence and social standing. Flowers which could not bloom at the same time and place were regularly combined, and as modernism grew, became less and less real. "Flower painting has come to epitomise popular light-weight, purely decorative art". This was perhaps less the case in South Africa than elsewhere, partly because the vast country was being explored throughout the 19th century and it would be difficult to portray the landscape without plants. And partly because there was a strong circle of young woman artists in Cape Town all of whom painted flowers, a gender and subject preponderance which has grown in the 20th century. Parallel with this growth has been a sharp rise in the cost of producing a major book of paintings, and an equally sharp rise in photographic skills. It is, after all, quicker and cheaper to put together a "coffee table" book of photographs than of paintings. Arnold warns that we expect to see "art" in art galleries, "botanical art" in herbaria and "illustrations" in books. However, if for instance Mary Page's work, resting on herbarium sheets in the Bolus Herbarium "was mounted, framed and presented in an art gallery, art lovers would be astounded to discover an unknown watercolour painter". Arnold ends the essay by discussing the most elusive character: style. On six pages are six very different paintings of *Strelitzia reginae* by Frans Bauer (1818), either Edwards or Sowerby (Curtis Magazine 1790), Pierre-Joseph Redoute (1802), Ethel Dixie (1915), Thalia Lincoln (1974), Auriol Batten (1986) and then the imaginary and metaphysical "Burning Bush" by Helmut Starke (1983).

The postscript is a short page urging us to "allow images of art and science to saturate our senses and stimulate our minds".

The book is well designed, cleanly printed and bound, the reproductions of paintings excellent with one exception. Emily Thwaites, like some other Victorian painteresses, enhanced her paintings with background shadows which gave depth and form to the flowers. They were an integral part of her technique. They have been eliminated, which is unfair and impertinent. What would Auriol Batten say if her pencil backgrounds were arbitrarily omitted? But, of course, Emily cannot complain - she has been dead for 95 years!

This is a good book, a recommended book, a unique book and an important book.

Andries de Villiers

