



The Cactus Explorer

The first free on-line Journal for Cactus and Succulent Enthusiasts

Number 19

ISSN 2048-0482

September 2017

1 In the shadow of Illumani

2 Matucana aurantiaca

3 *Cylindropuntia* × *anasaziensis*

4 *Opuntia orbiculata*

5 *Arthrocerus* hybrids

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Cover Picture: *Oreocereus pseudofossulatus* flowering in Bolivia. See Martin Lowry's article on [Page 34](#) about his exploration in the shadow of Illumani. Photograph by Martin Lowry.

The No.1 source for on-line information about cacti and succulents is <http://www.cactus-mall.com>
The best on-line library of succulent literature can be found at:
<https://www.cactuspro.com/biblio/en:accueil>

Invitation to Contributors

Please consider the Cactus Explorer as the place to publish your articles. We welcome contributions for any of the regular features or a longer article with pictures on any aspect of cacti and succulents. The editorial team is happy to help you with preparing your work. Please send your submissions as plain text in a 'Word' document together with jpeg or tiff images with the maximum resolution available.

A major advantage of this on-line format is the possibility of publishing contributions quickly and any issue is never full! We aim to publish your article quickly and the copy deadline is just a few days before the publication date. There will usually be three issues per year, published when sufficient material is available. Please note that **advertising and links are free** and provided for the benefit of readers. Adverts are placed at the discretion of the editorial team, based on their relevance to the readership.

Publisher: The Cactus Explorers Club, Briars Bank, Fosters Bridge, Ketton, Stamford, PE9 3BF U.K.

The Cactus Explorer is available as a PDF file downloadable from www.cactusexplorers.org.uk

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This issue published on
22nd September 2017

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INTRODUCTION

Another Busy Season

I should not be surprised that, as the growing season here in the UK draws to a close, I have not finished half the things in my glasshouse I promised myself I would get done this year.

But the summer has been very enjoyable. I made my first ever visit to Prague, a really beautiful city. I was the guest of the local cactus group who invited me to speak at their symposium, a well-attended meeting with many enthusiastic growers.



This year was also the 125th birthday of the German Cactus Society, the Deutsche Kakteen Gesellschaft. I was invited to speak at their celebratory meeting at Berlin Botanical Garden, a splendid event in a beautiful setting (picture above).

It had been a few years since I had visited the USA so it was a treat to be invited to speak at the CSSA Convention in Tempe, Arizona. This nice town is near to Phoenix and very near the Desert Botanical Garden which has undergone major improvements since I was last there. I can enthusiastically recommend that you visit the DBG if you get a chance. It was good to meet old friends again and I very much appreciated the hospitality I received during my visit.

If you have not already told me and would like to be advised when the next issue of the **Cactus Explorer** is available for download, please send [me](#) your E-mail address to be added to the distribution list.



The event was excellent and well-attended but one of the best memories was visiting the hill behind the Convention hotel where recent rains had prompted the many *Mammillaria grahamii* to flower in amazing profusion. I cannot recall ever having seen such a spectacular flower display in habitat before (picture above).

My busy year of meetings has just ended with the Cactus Explorers Weekend, a relaxed and fun event with many splendid presentations. This year we heard from Elisabeth Sarnes about her research of Patagonian cacti with her husband Norbert. Our other visiting speaker was Rodrigo Pontes, a young and very accomplished botanist from Rio Grande do Sul in Brazil. My interest in *Notocactus* and other plants from there has been rekindled by his spectacular talks and I predict that he will become a rising star in the cactus world.

On-line journals come and go. It takes a lot of time and effort to produce them so, as initial enthusiasm wears off, it can be difficult to maintain the publication. A welcome newcomer is the *Essex Succulent Review*, originating in the south-east of England but deserving a wider readership. I suggest you download the [latest issue](#) and I am sure you will want to become a regular reader.

I regret that lack of time has meant that I have had to leave out a few regular features in this edition in order to publish it before my imminent trip to Peru but I will try to revive them for the next one.

Graham Charles

NEWS AND EVENTS



The poster features a large pink cactus flower in the foreground. Text on the poster includes: 'plant sale lectures', 'admission free', 'corsendonk duinse polders blankenberge / belgium', '7-8-9 september', 'ELK 2018', 'www.elkcactus.eu', and 'info@elkcactus.eu'. A small logo in the top left corner shows a cactus and the letters 'AK'. At the bottom, there is a small credit line: 'K. Neitrick: layout & photo Anthrocentrum campos-portoi x Tricho hybride Siegersdorf (Nollers Orion)'.

A. Castellanos & H. Lelong

Publications devoted to cacti

This, the second e-book (416 pages) published by Au Cactus Francophone is devoted to articles by Castellanos and Lelong. The introduction presents the life of both authors who were husband and wife. After the series of articles, some original pictures by Castellanos are reproduced.

This very useful reference for Argentinian cacti can be downloaded (76Mbyte) from https://www.cactuspro.com/biblio_fichiers/pdf/KieslingRoberto/CastellanosLelong.pdf

Friedrich Ritter's Diaries

The German Cactus Society, the DKG, has scanned Ritter's diaries and made them available for download from:

http://www.dkg.eu/cs/index.pl?navid=Ritter_Tagebuecher_1322&sid=c

They are full of fascinating information but reading his hand writing in German is a challenge so the DKG hopes to eventually publish transcripts.



The Naturalist's Travel Page

<https://thetravelingnaturalist.org>

Our website has free-to-use online talks for your succulent society's meetings - from many locations around the world. We also have illustrated trip reports and summaries of South African succulent-rich guest farms. Also, a short course on field photography. We are available to help in natural history travel and tour planning.

Zone 3 Rally

Saturday 28th October 2017

Carlton Village W.M.C.

WF3 3RW, between Leeds and Wakefield

A popular meeting with 3 speakers:

Hazel Taylor: Cacti in N.E. Mexico

Petr Pavelka: Succulents of Southern Angola

Roger Ferryman: Chile in a Flowering Year

Book, Plant and Sundry Sales

Mini-Show

Tickets from [Judith Wardell](#)

Zone 6

International Convention

Saturday 14 October 2017

Capel Manor College, Bullsmoor
Lane, Enfield, EN1 4RQ

Speakers

Ernst van Jaarsveld: Succulents of
Southern Africa. Expeditions
from Cape Agulhas to Angola

Ian Woolnough: Some Mexican
highlights

**Plant sales from Doug Sizmur,
Terry Smale and Harrow Branch**

Book sales from Keith Larkin

**Tickets, £15 including
refreshments, are available
from Chris Backhouse.**

**Full details on the Zone 6
website: www.zone6.bcsc.org.uk**

The venue is close to the junction
of the A10 and the M25 and there
is ample free parking

The BCSS

International Convention 2018

Friday 13th – Sunday 15th July

Stamford Court Conference Suite at the University of Leicester

SPEAKERS

Aymeric de Barmon (France)

Philippe Corman (France)

John Ellis (UK)

Adam Harrower (South Africa)

Wolter ten Hove (Netherlands)

Joël Lodé (Spain)

Ricarda Riina (Venezuela/Spain)

Plant Sales and Displays

Full Residential Package **£260**

Non-Residential Package **£160**

Book on-line at

www.bcsc.org.uk/convention.php

with a £50 deposit per person

South East Cactus Mart

**Swalecliffe and Chestfield
Community Centre**

**19, St Johns Road, Whitstable
Kent CT6 2QU.**

7th April 2018

Open 10.00 till 15.00.

More information from

davejappleton@hotmail.com

Bradleya 35



Yearbook of the British Cactus & Succulent Society

The 2017 issue of **Bradleya** is now on sale.

27 well-illustrated articles to enjoy including 3 about cacti. 256 pages.

For your copy of **Bradleya 35**, please send payment of £21 (£23 overseas) including post & packing (payable to BCSS) to the BCSS Publications Manager, Brenfield, Bolney Road, Ansty, West Sussex, RH17 5AW, UK. Payment accepted by:

- £ sterling cheques drawn on a UK bank,
- PayPal (paypal@BCSS.org.uk) or
- credit/debit card (Visa, Mastercard or Maestro only).

Bradleya 35 includes:

- The taxonomy of *Kalanchoe brachyloba*
- Producing organic alcohol and a tequila-like liquor from *Agave americana* in South Africa (SA)
- Notes on *Agave panamana* from Panama, with reference to morphological variation in *Agave angustifolia*
- Notes on morphological variation in, and the biogeography of, *Tulista kingiana* from SA
- New records of naturalised and invasive cacti from Gran Canaria and Tenerife
- *Kalanchoe fedtschenkoi* is spreading in South Africa's Klein Karoo
- Taxonomy of the three arborescent SA crassulas
- Notes on the discovery and type of *Kalanchoe rotundifolia*
- Hypothesis on evolutionary origin and adaptive value of polymorphism in *Lithops*
- The taxonomy of *Kalanchoe longiflora*, an endemic of Maputaland-Pondoland, SA
- New records for the flora of Mount Mulanje, Malawi: *Sansevieria sinus-simiorum*, *Crassula swaziensis* and *Crassula setulosa*
- *Astroloba tenax*, a new species from the Groot Swartberg Mountain, SA
- *Roosia*: a new genus in the Aizoaceae from the Western Cape, SA
- A new pubescent variety of *Conophytum* from the southern Richtersveld: *Conophytum flavum* subsp. *novicium* var. *kosiesense*
- *Kalanchoe waterbergensis*, a new *Kalanchoe* species from Limpopo Province, SA
- *Tylecodon celatus*, a new cryptic succulent from Nuwerus, Namaqualand
- *Sempervivum gurgendizeae* – an overlooked name from the Great Caucasus of Georgia
- *Cotyledon egglii*, a new species from the Barberton region, Mpumalanga, SA
- Notes on António de Figueiredo Gomes e Sousa, succulent plant collector in Mozambique
- ×*Astrolista*: a new name for the SA endemic nothogenus ×*Astroworthia*
- *Astroloba robusta*, a new species from SA
- *Crassula zombensis* – a hardly known species from Malawi and Mozambique
- Leaf epidermal structure in the dwarf succulent genus *Conophytum*
- *Astroloba tenax* var. *moltenoi*, a new variety in *Astroloba tenax* from Groot Karoo, SA
- Feeding by *Leucaloe eugraphica* (Walker, 1865) on cultivated *Agave* in South Africa
- *Rhipsalis agudoensis* – a mystery solved
- *Cremnocereus albipilosus*: an incredible new columnar cactus from Bolivia

RESOURCES IN THE CSSA ARCHIVES

The Cactus and Succulent Society of America has a long and distinguished history. Chuck Staples, CSSA Historian, describes the valuable contents of the Society's archives.

The archives is a web page designed initially in 2012 by Gunnar Eisel, CSSA General Manager, for historical material compiled by Chuck Staples, CSSA Historian. The web page was updated with a new look in February 2017 with the help of computer guru Bob Jewett. To view the updated web page you need visit www.cssainc.org then click on Archives which will take you to the home page of the archives. Here is an explanation of each item shown on the archives face page as you click your way through the item(s) you wish to look at.

CSSA HISTORIES

BOARD MEMBERS & OTHER POSITIONS: A historical listing of board members and other positions appointed by the board of directors — from the current year and each year all the way back to 1929 (beginning of CSSA).

PRESIDENTS: A choice of (a) CSSA Presidents in alphabetical order with year(s) of presidency and awards, or (b) images of presidents from the current year back to 1929.

EDITORS: A choice of (a) CSSA Editors in alphabetical order with year(s) as an editor and the periodical they were editor of or (b) images of editors from the current year back to 1929, along with the periodical they were involved with.

CONVENTIONS: A listing of biennial conventions with locations, speakers, etc., from the most current odd year and each odd year back to the first in 1941.

HONOUR AWARDS: Choices of CSSA awards for (a) Fellow, (b) Special Service, (c) Superior Service, (d) Friend, (e) Myron Kimnach Lifetime Achievement or (f) Conservation. Click on the special award you wish to look at, then click for a choice of (i) awards in alphabetical order which gives you names and year of awards or (ii) reasons for awards with images of awardees from current all the way back to the first award of each award type.

JOURNAL: Choice of (a) all articles and authors from each issue, (b) publication date of each

issue for research purposes by botanists, taxonomists or other interested parties or (c) art works from various issues — all back to 1929.

HASELTONIA: Choice of (a) all articles and authors from each issue or (b) publication date of each issue for research purposes by botanists, taxonomists or other interested parties — all back to its inception in 1993.

AFFILIATES: Choice of (a) a listing of various regional conferences with locations, speakers, etc., from the most current even year and each even year back to the first year for each region or (b) histories of various societies.

MISCELLANEOUS 1: Choice of (a) time line of CSSA firsts or (b) newsletter archives.

OTHER HISTORIES

IMPORTANT SUCCULENTISTS: Choice of (a) short biographical sketches of some of the people (25 so far) that have dedicated much of their lives to the cactus and succulent plant world or (b) images related to those people.

MOVERS AND SHAKERS OF THE CACTUS & SUCCULENT PLANT WORLD: This is a list of people and where you can find biographical data about them in various English language publications.

PLANTS: History of cactus and succulent plant species.

MISCELLANEOUS 2: Choice of:

- (a) Cactus and Succulent Society or club founding dates.
- (b) Cactus and Succulent people calendar birthdays.
- (c) Ed and Betty Gay guest book of signatures.
- (d) Some deceased authors.
- (e) Etymology of Succulent Genera erected by Carolus Linnaeus.
- (f) Larry Mitich 3x5" card file.
- (g) Succulentists and their transportations.

[Charles J. Staples](#)

IN THE GLASSHOUSE

Brazilian hybrids

Kamiel Neirinck introduces us to some spectacular hybrids of Brazilian cacti.

Photographs by the author



Arthrocereus campos-portoi x *Trichocereus* hybrid
Siegeldorf: Nollers Orion.



Arthrocereus spinosissimus x 'Siegeldorf': Nollers
Sirius A



Arthrocereus rondonianus x *Tricho* G1: Nollers Antares

Hybridization of plants from the Cactaceae family is one of the many aspects of the cactus and succulent hobby. Usually we are dealing with hybrids between species from the same genus, e.g. *Echinopsis* or *Trichocereus*, but cross-pollination between cacti of different genera is also possible, e.g. between *Echinopsis* and *Trichocereus*. These are called multi-hybrids* or intergeneric hybrids.

The ultimate aim of these artificial creations is achieving plants with the best characteristics of two species, with still larger and more colourful flowers. Certainly we also know cacti that are the result of a more natural "love affair" such as *Arrojadoa albiflora* or *Melocactus albicephalus*. Depending on their personal mentality, some cactus enthusiasts regard hybrids as completely worthless. In their eyes these plants are unreliable and the plant is not genuine.

On the contrary, others are wildly enthusiastic about their creations and use all the tricks and cleverness to cultivate sensational novelties. Since man is by nature a social being, it is not surprising that like-minded spirits look each other up. It is well known that enthusiasts of *Echinopsis* and *Trichocereus* hybrids regularly meet in Germany. In the body of the German Deutsche Kakteen Gesellschaft exists a working group; AG *Echinopsis*-Hybriden for growers of hybrids from the genera *Echinopsis*, *Helianthocereus*, *Hildewintera*, *Trichocereus* and others. This working group publishes a nice periodical for its members. To my knowledge this aspect of our hobby is especially popular in Germany and Austria. Almost every cactus enthusiast has a few specimens in his collection. Well known are the hybrids by Gräser, Haugg, Noller, Humke, Wessner, Rheingold, Lieske and Hellm.

Less known are the hybrids arising from cross-pollination between or with Brazilian cacti. This is most likely connected with the high temperatures to be maintained in the winter and the attendant heating costs. Pioneering work was mainly done by Gunther Noller, of whom we know particularly hybrids with the species *Arthrocerus rondonianus*, *Arthrocerus campos-portoi* and *Arthrocerus spinosissimus*. Some of his hybrids are depicted in this article. 'Nollers Orion' is a cross-breeding between *Arthrocerus campos-portoi* (now *glaziovii*) with the hybrid *Trichocereus* 'Siegeldorf'. 'Nollers Sirius A', is the crossbreeding *Arthrocerus spinosissimus* × Trichohybrid 'Siegeldorf'

These magnificent blooming plants can be propagated by taking cuttings. Before these plants were created, the designers may have been busy for years pollinating flowers and collecting pollen. This is an intense activity for which not everybody can muster enough patience.

Some magnificent Brazilian creations by Gunther Noller:

Arthrocerus rondonianus × *Echinopsis ayopayana* = Nollers Wega

Arthrocerus spinosissimus × Siegeldorf = Nollers Sirius clone A, clone B & clone C

Arthrocerus rondonianus × *Trichocereus thelogonus* = Nollers Rigel

Arthrocerus campos-portoi (*glaziovii*) × Siegeldorf = Nollers Orion

Arthrocerus rondonianus × *Hildewintera aureispina* = Nollers Mira

Arthrocerus rondonianus × Tricho G1 = Nollers Antares (G1 = Gräser Tricho hybrid)

Multi-hybrids*

In general, multi-hybrids are hybrids between different genera, or in which different genera are involved. This is not always clearly defined. In the book on hybrids published by AG Echinopsis-Hybriden of the DKG, the photographs have been classified in categories such as *Lobivia* hybrids (the mother is *Lobivia*), *Echinopsis* hybrids (the mother is *Echinopsis* or *Pseudolobivia*), *Trichocereus* hybrids (the parents are *Trichocereus* or look like *Trichocereus*) and also multi-hybrids. The



Arthrocerus rondonianus × *Trichocereus thelogonus*: Nollers Rigel



Arthrocerus aureispinus (*rondonianus*) × *Hildewintera aureispina*: Nollers Mira

explanation for the latter group reads: hybrids that contain genes from several cactus genera (sometimes up to 4 or 5).

A hybrid is a cross pollination between two (botanical) species or a further crossing between hybrids or between hybrids and a botanical species.

*Text: Marc Dumon

RECENT NEW DESCRIPTIONS

Cremnocereus, a remarkable new cactus genus from Bolivia

Readers of this year's *Bradleya* will have seen the first description of a remarkable new columnar cactus from Bolivia. It was discovered by Martin Lowry and John Carr then described by Martin Lowry and Mats Winberg.

It is rare for a newly discovered cactus not to belong to an existing genus. This plant looks superficially like an *Oreocereus* but has a different flower, probably pollinated by bats rather than humming birds.

The plant was discovered by Martin Lowry when he was travelling with John Carr in November 2014. At the time, the identity of the plant was not determined, but intrigued by what it might be, Martin returned to the location the following year with Mats Winberg from Sweden.

While admiring the view, Martin caught sight of the stem tops of a hairy cereoid cactus amongst the bushes. Having got near to it, Martin and Mats realised that it was not a known species. These moments are extremely exciting for cactus enthusiasts, made even more special in this case by the realisation that the discovery is significantly different from anything else and could be a new genus.

It was not until they saw the flower (Figures 2 & 3) that they realised the full significance of their discovery. Although the plant body looks



Figure 1. A colony of mature *Cremnocereus albipilosus* on steep cliffs above the Rio Grande in Bolivia.

Photograph by Mats Winberg.



Figure 2. The flower of *Cremnocereus albipilosus* which arises almost apically. Photograph by Martin Lowry

like an *Oreocereus*, the flower suggests pollination by bats, very different from the red, tubular, zygomorphic flowers of *Oreocereus* (see the example on the front cover of this edition).

Although columnar cacti are not the most popular cacti in cultivation, this is a good-looking plant with its dense covering of hair and should prove to be popular once seedlings become available. Martin generously gave me some seeds and these germinated well. The resulting seedlings after two years can be seen in Figure 4. The altitude and location suggest that this species will be content in the average cactus glasshouse with a minimum winter temperature of 5°C.

You can read the full story in this year's *Bradleya* 35: pp.252–256 (2017).

Graham Charles



Figure 4. Seedlings of *Cremnocereus albipilosus* at two years old. Photograph by Graham Charles



Figure 3. A flowering stem of *Cremnocereus albipilosus* in cultivation. Photograph by Martin Lowry

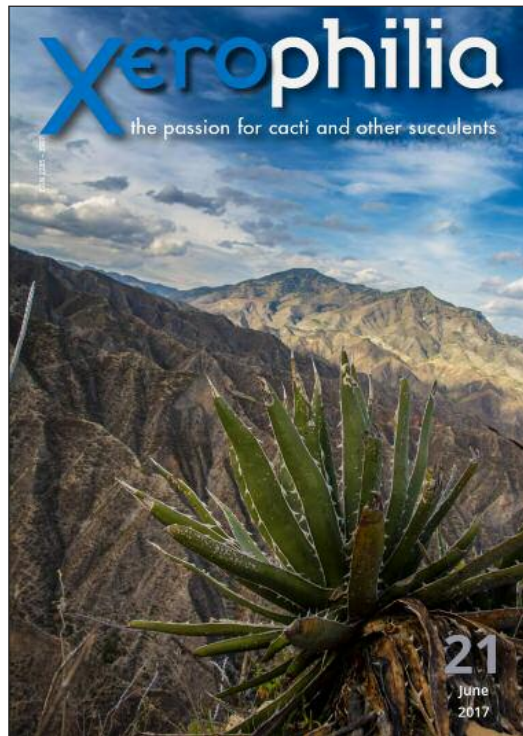


Figure 5. A seedling of *Cremnocereus albipilosus* grafted onto *Pereskia*. Photograph by Graham Charles

ON-LINE JOURNALS

On-line Journals for you to download free

Publishing journals on the web is now very popular. Creating them is a lot of work so perhaps that is why some have ceased publication. Here are some links for you to download and enjoy.



Xerophilia

Issue 20 of *Xerophilia* appeared in June 2017. It is published in English as well as the language of the original article. The quality of the contents is varied and impressive. There is lots to read in its 140 pages.

Contents include: *Thelocactus rinconensis* complex; *Navajoa peeblesiana*; *Mammillaria bombycina*; *Mammillaria* aff. *candida*; *Leuchtenbergia principis*; Mexican Wilderness; Air-plants

The magazine may be downloaded free as a pdf from

<http://xerophilia.ro>

Contact: xerophilia@xerophilia.ro

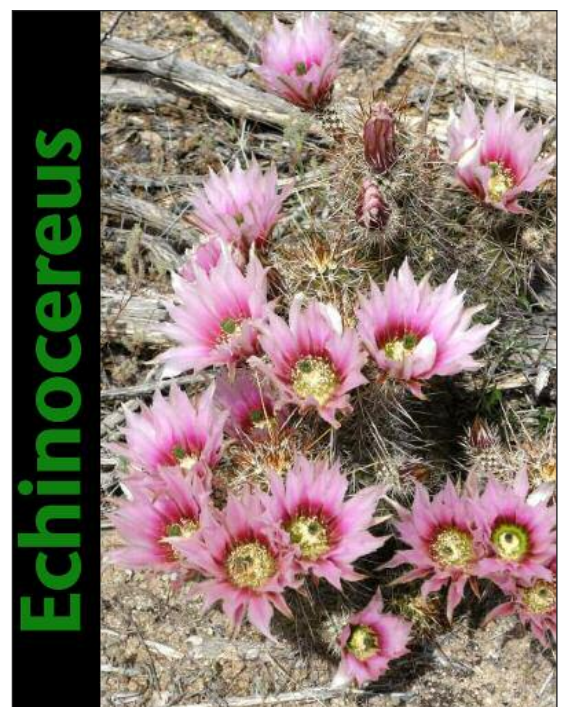
ECHINOCEREUS Online-Journal

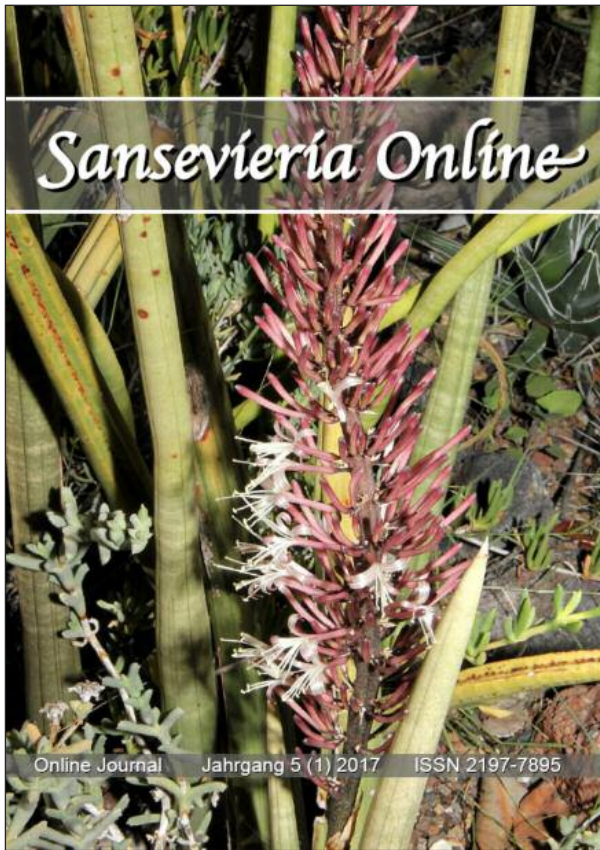
The German language on-line journal for Echinocereus lovers. The goals of this journal are to study the genus *Echinocereus*, to publish articles about the continuous research on these plants (classification, morphology, evolution) as well as to protect the genus *Echinocereus* by reproduction from seeds and distribution of the seedlings.

This issue, published in July 2017, is 97 pages and dedicated to the plants of Sonora, Mexico. The pictures of flowering plants are truly spectacular!

The downloaded pdf file allows printing, but does not permit copying of the content. For those of us who do not understand German very well, the publishers also provide a downloadable MS Word document of the text making it possible to copy and paste it into a translation program. This is a major benefit of online journals and I thank them for this useful feature.

See website: www.echinocereus.eu





Sansevieria Online

The online journal for the growing number of enthusiasts for this genus. A small group of *Sansevieria* enthusiasts publish the first *Sansevieria* online journal in German. They welcome contributions on systematics, morphology, physiology, evolution etc.

This issue includes: Gran Canaria - a climatic paradise for our *Sansevierias*; The *Sansevieria* collection in the Botanical Garden of Halle; The popular *Sansevieria ballyi* and the true history of its discovery; My little *Sansevieria* collection; *Sansevierias* in front of the camera.

Download the PDF from www.sansevieria-online.de where you can also find a special issue containing field number lists and an index to the journal.

Schütziana

The latest issue of *Schütziana*, the specialist on-line journal for *Gymnocalycium* enthusiasts, was published in August 2017 and features:

Franz Strigl – 80 years and still young at heart.

On the Distribution of *Gymnocalycium platense* (Spegazzini) Britton & Rose (Cactaceae).

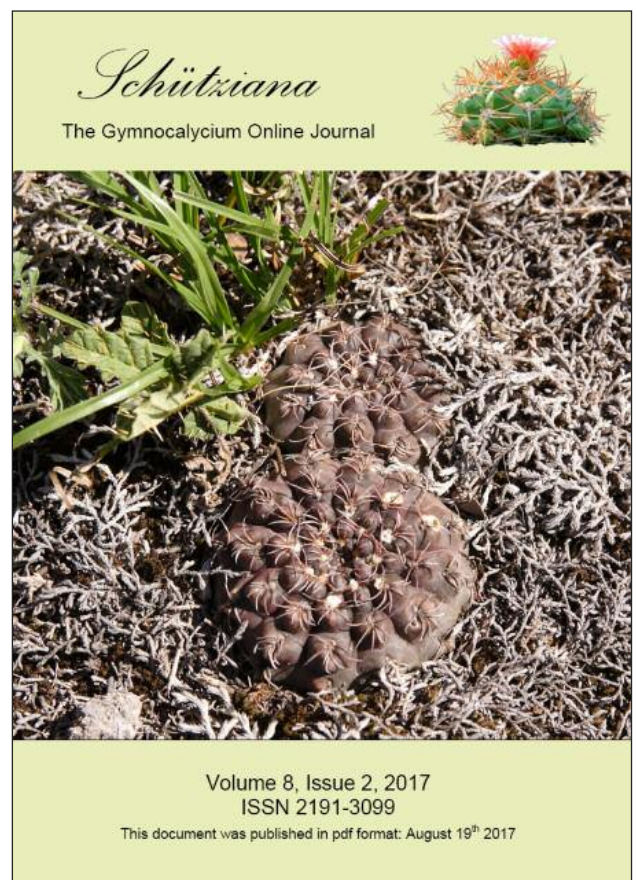
Gymnocalycium alenae Kulhánek, a new species from the northern part of province Córdoba.

The text of this valuable publication is available in English, German, Russian and Japanese.

The pictures and distribution maps give a clear insight into the plants found in habitat and culture.

You can download free all the issues from:

www.schuetziana.org



Sukkulenten (formerly Avonia News)

Free German language on-line newsletter of "Avonia", the quarterly journal of the German Society for other Succulents.

Since 2015, the monthly on-line newsletter has been called "Sukkulenten"

This issue, July-August 2017, has articles about Succulents in the Vegetable Garden and *Aloe tomentosa*.

See website: www.fgas-sukkulenten.de

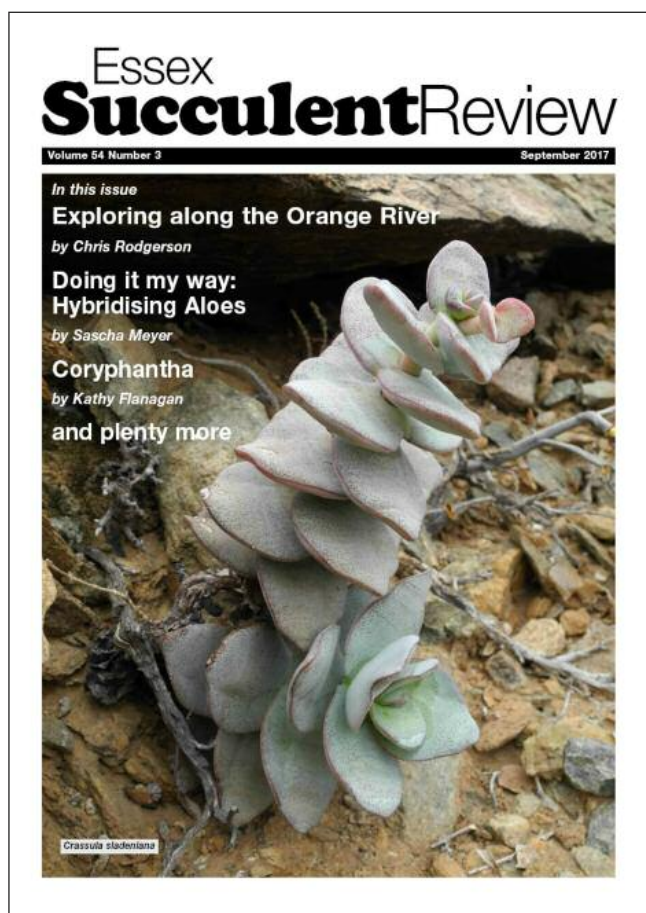
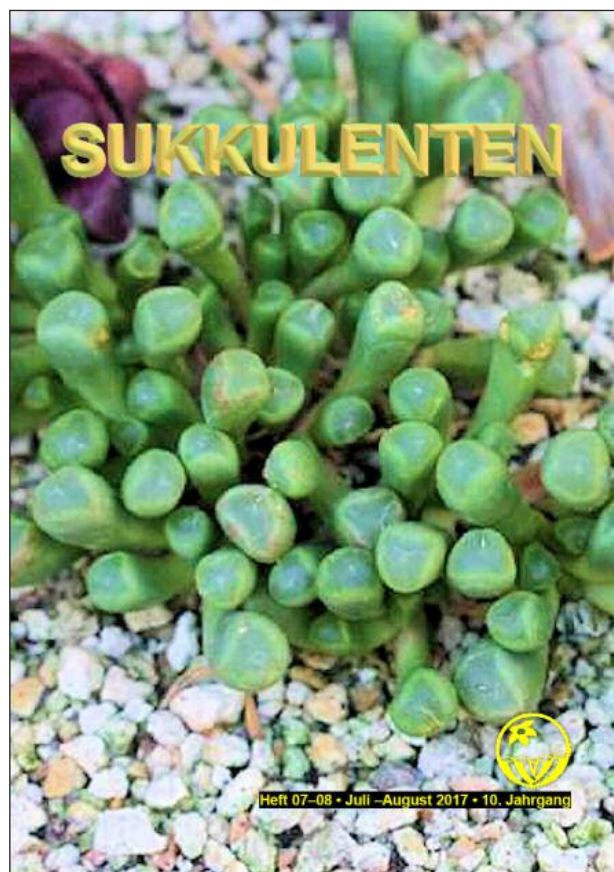
Annual seed list for members and much more.

Special interest groups for *Aloe* (incl. *Haworthia* etc.), *Ascleps*, *Euphorbia*, *Mesembs* and *Yucca*/winter-hardy Succulents.

For membership and further information contact:

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Wilfried Burwitz: Postfach 100206, D-03002 Cottbus, geschaeftsstelle@fgas.sukkulenten.de



Essex Succulent Review

Written by growers for other growers

The Essex Succulent Review is a high quality quarterly on-line UK newsletter featuring non-technical articles on all aspects of cacti and succulents.

Volume 54(3), published September 2017, has articles about *Coryphantha*; hybrid aloes; Two interesting Euphorbias –Madagascar; *Werckleocereus tonduzii*; Melocactus and the lizard; Exploring along the Orange River; More sleuthing in Central Mexico.

You can subscribe to the mailing list to be notified by email when each issue is ready to download. Subscription is completely free and you can unsubscribe at any time.

Further details and back issues are available on the website:

<http://www.essexsucculentreview.org.uk>

or email:

sheila@essexsucculentreview.org.uk

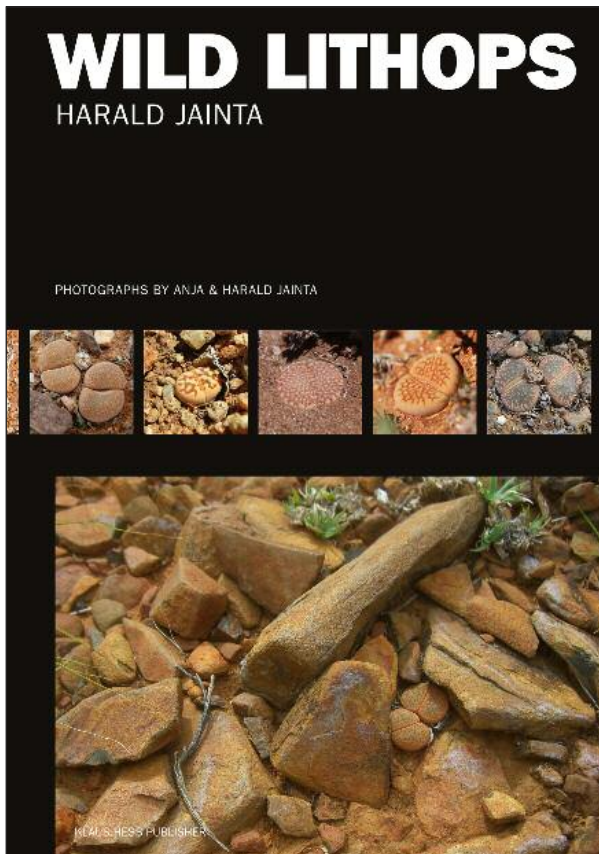
You don't have to live in Essex to read it!

THE LOVE OF BOOKS

News of Recent Publications. A Reminder of Old Favourites.

Wild Lithops
Harald Jainta

**Book of
the Year**



Lithops are, and have always been, very popular with succulent enthusiasts. Most collections have at least a few of these fascinating plants and there are many who find their attraction so irresistible that they cannot help but try to collect the 'set'.

Following the invaluable reference books written by Desmond Cole and Steve Hammer, we now have a magnificent new volume which will appeal to not only the ardent collector but also the average succulentophile.

The author, Harald Jainta was born in 1963 and grew up in Adorf, Vogtland, Germany. In the 1980s he became interested in succulent plants and established a small collection

including lithops. His passion to study lithops in the wild began in 2003 since when he has undertaken 16 field trips with his wife Anja to research the material for this book.

The author accepts 91 species, all of which are treated from a field research perspective providing a valuable guide to lithops in their natural surroundings. A new simplified taxonomy is suggested. The species are presented in 12 informal groups.

60 portraits and related biographic information honour the dedicated work of past and present students of lithops.

There is a thorough review of published botanical and scientific data on lithops plus a comprehensive bibliography including over 700 references. There is also a useful table of lithops discoveries and another of locality data.

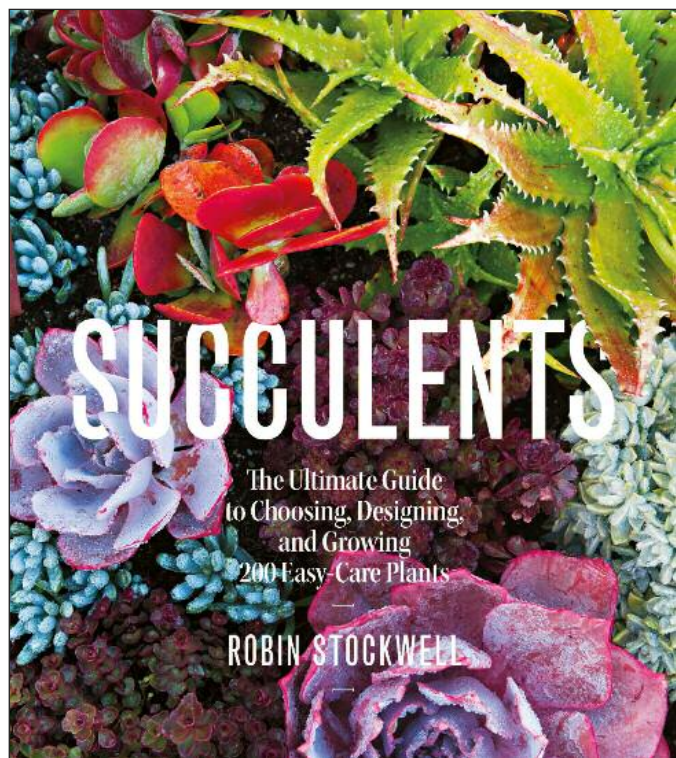
At the end of the book, there is a series of habitat pictures of lithops plants, four from each selected colony, giving a clear indication of the natural variation in the patterns.

The production quality of this book is exceptionally good with excellent realistic colour pictures and a pleasing layout, printed on high quality coated paper. It has 488 pages, A4 (210 x 297mm), hardbound with printed cover. There are 2000 colour and 60 b/w photographs, 13 clear maps, 14 tables and 10 diagrams.

I consider this to be the best book on succulents reviewed in the **Cactus Explorer** this year and deserves to be very popular. This is not a book about cultivation, nor about lithops cultivars but it comprehensively covers every aspect of the genus in habitat.

You can [buy it](#) from Keith Larkin Books for £75 or from the publisher [Klaus Hess](#) for 85€ plus carriage.

Graham Charles



by Robin Stockwell

The current fashion for succulents has resulted in bumper sales at Garden Centres. In the UK, the number of species which will survive our cold wet winters is limited, but for those fortunate enough to live in a warmer, dryer climate, they are perfect plants for containers or landscape schemes.

They benefit from being low maintenance; they require little watering; they usually grow relatively slowly and look particularly at home in a modern setting. For instance as shown in the two pictures opposite, of gardens I saw landscaped with succulents in Arizona, USA.

Succulents are also well suited to indoor living, ideal for a conservatory where they will wait for your return from holiday without dying of draught. In this book, Robin Stockwell highlights his 200 favourite varieties and shares advice on care and cultivation.

The book also includes a series of garden case studies and photographs that demonstrate imaginative and exciting ways to display succulents in your outdoor or indoor space, whatever the size.

Alongside these, a collection of simple step-by-step arrangement projects offers some inventive ways to display your plants and enhance your living environment.



Above: Living with succulents. Two gardens in Arizona, USA. Photographs by Graham Charles

Robin Stockwell is the founder of Succulent Gardens in California. He has been active in the nursery industry as a grower and retailer and has worked with succulent plants since 1972.

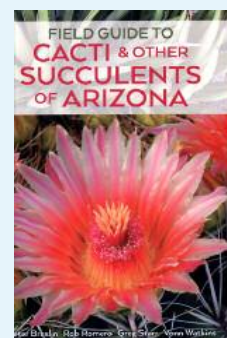
288 pages, 235 x 205mm, Flexibound with printed cover, well-illustrated with good quality colour pictures. This is a timely publication when the need for advice about these, often misunderstood, plants has never been greater.

You can [buy the book](#) from Amazon for about \$16 or [in the UK](#) for £19.99.

G.C.

In the next issue I shall review the new edition of *Field Guide to Cacti & other Succulents of Arizona*. This beautifully illustrated and well-written book is [available](#) for about \$50 inc. shipping worldwide.

G.C.



MATUCANA AURANTIACA AT CUMBE MAYO ABOVE CAJAMARCA (PERU)

Holger Wittner tells us about a habitat for *Matucana aurantiaca* near to the northern Peruvian city of Cajamarca.

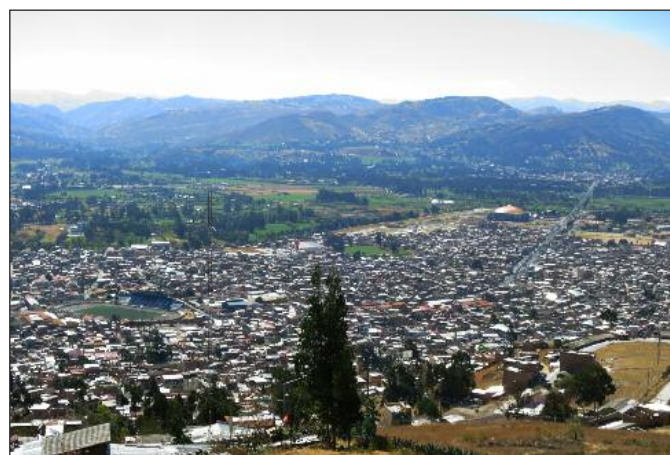
Photographs by the author



The natural volcanic lava stone city of Cumbe Mayo.



Cumbe Mayo is today the remains of an old volcano.



View on a part of Cajamarca city; middle right is the long straight street leading to Baños del Inca.

Cajamarca is the capital of the Northern region Cajamarca in Peru. Because of mining activities it is a fast growing city. Now it has more than 230,000 inhabitants. There are modern flight connections to Peru's capital Lima. Its beautiful old colonial churches and buildings make it an attraction for Peruvian and international tourists.

But all the people coming here love the nature around it and the fresh air. Cajamarca city lies at

2,700m above sea level and Peruvian winters allow the night temperature in July/August to fall to just above freezing point. One of the natural attractions above Cajamarca is Cumbe Mayo. Located at 3,400 to 3,500m above sea level the natural volcanic rock city Cumbe Mayo really has a mountain climate. Nearly all through the year there are clouds and rain here. Only in the holiday season in July/August does it look fine on sunny days with 15°C and a



People of Caxamarca made water channels 3,000 years ago to channel the water to the city of Cajamarca and its fields.



On the walls along the channels one can see very old inscriptions.



These tiny spiny bundles are seedlings of *M. aurantiaca* with a diameter of 2–3 cm



A big lava rock covered with a thick layer of moss and lichen in which *Matucana aurantiaca* grows.



A young *Matucana aurantiaca* with a single bud.

burning sun but always with a cooling wind. The volcanic lava rocks from an old volcano are covered with moss and lichen.

At these places one can find *Matucana aurantiaca*. The plants themselves are covered with lichens. That's why it's sometimes not so easy to find the cacti. Here *M. aurantiaca* grows very slowly and the plants remain small. The spines are



At many places one can find all phases of seedlings of *M. aurantiaca* in large numbers.



Fresh and strong growing plant with thick and short spines.



A very old plant with bud with an open flower.



An older plant with buds and very thick spines.

very heavy on older plants. With a little bit of luck one can see *M. aurantiaca* in flower here.

M. aurantiaca at Cumbe Mayo was first discovered and documented by Nelson Cieza Padilla. He is the best succulent plant expert of the region. Seven years ago I got seeds collected by Steffen Janke at Cumbe Mayo and up to now was able to grow two seedlings. These plants feel lucky outside in culture if the weather is cold and wet like in October or November. Then temperatures from 0 to 10°C by day are no problem. The plants make new



A plant in culture, grown from seeds collected by Steffen Janke (SJ 00905).

spines and really grow slowly. Short temperatures below zero at night (down to -5°C) are no problem. But you cannot successfully grow *M. aurantiaca* from these high altitudes in glasshouses!!

If some cactus friends, especially lovers of the genus *Matucana*, travel to Cajamarca they should not miss taking part in the trips of the tour operators to discover Cumbe Mayo. You will find cacti, fresh air and old pre-Inca-made water channels (nearly 3,000 years old).

[Holger Wittner](#)

TRAVEL WITH THE CACTUS EXPERT (18)

Zlatko Janeba continues his popular series of articles about exploring the American South West. Photographs by the author.

Immediately after breakfast we took U.S. Hwy 50 towards Delta. We passed the city and some 15 miles Northwest of Delta we turned west onto a dirt road heading into the wilderness. It is a beautiful desert area along the Gunnison River. Today it is part of the Dominguez-Escalante National Conservational Area (created in 2009) and it is managed by Bureau of Land Management (BLM).

We made our first stop less than a mile from the U.S. Hwy 50 where the landscape was tempting enough to stroll around a little bit. We saw several rosettes of *Yucca harrimaniae* just next to our car (Fig. 1). In a while we also discovered our first cacti growing in the gramma grass and among sparsely distributed sage brush and juniper trees at an elevation of some 1600m.

We found several specimens of *Sclerocactus glaucus* with freshly finished flowers (Fig. 2), low clumps of *Opuntia polyacantha* and clusters of *Echinocereus triglochidiatus*. But I should point out that none of the species was numerous there and one had to walk a lot to discover any cacti. When coming back to our car I noticed beautifully coloured Western Collared Lizard (*Crotaphytus collaris*) basking in the sun on the big rock (Fig. 3). This is quite a common lizard species in the open dry regions of the southern part of USA and northern Mexico. The lizard is well known for its ability to run upright on its hind legs when attempting to escape predators. This one (Fig. 3) did not care much about me ... probably because I did not look like a very dangerous predator.



Fig.1 *Yucca harrimaniae* on the road towards Escalante Canyon at elevation of 1600m, NW of Delta, Colorado.



Fig.2 Habitat of *Sclerocactus glaucus* along the dirt road towards Escalante Canyon at elevation of 1600m, NW of Delta, Colorado.

We followed the dirt road further down and we stopped again about 2.5 miles from the U.S. Hwy 50. The desert was in full flower and the landscape was really photogenic (Fig. 4). It was at an elevation of about 1500m, not too far from the Gunnison River. *Opuntia polyacantha* with red flowers (Fig. 4) was quite common there but we were able to find only two specimens of *Sclerocactus glaucus*. The scleros were nicely decorated with rings of immature fruits (Fig. 5). I could conclude from our trip and from my previous experience that *Sclerocactus glaucus*, although having a relatively large distribution range (western and central part of Colorado and northeastern part of Utah – there is also called as *S. wetlandicus*), is quite a rare plant, found only scattered on sandy or gravelly hills and mesas. Furthermore, when not in flower, it is difficult to spot in its habitat. It seems to be quite a rare species in cultivation as well but, on the other hand, it belongs among the most winterhardy scleros. It is certainly a very difficult plant to



Fig.3 Western Collared Lizard (*Crotaphytus collaris*), probably a female, road towards Escalante Canyon at elevation of 1600m, NW of Delta, Colorado.

grow on its own roots. It easily survives winters (no matter how cold it is), but it can be quickly lost in hot and humid summers. That is why they are mostly grown grafted on a winter-hardy stock.

We turned back, joined the U.S. Hwy 50 again and headed to Utah. We were given information that just North of U.S. Hwy 70, at exit 193 towards Thompson Springs, could be seen large old plants of *Sclerocactus parviflorus*. So we decided to check the spot. But unfortunately, we found there only several sclerocactus mummies, no living specimens. We did not even find any young seedlings. Hopefully, there are plenty of cactus seeds in the soil waiting for the favourable conditions to sprout and start the new cactus generation over again. This seems to be a common survival strategy of many sclerocactus species. *Opuntia polyacantha*, on the other hand, was doing quite well there. It was in full growth and producing flower buds.

We headed further to the West and took another exit from U.S. Hwy 70, exit 164 to Green River. North of the highway, at the elevation of some 1270m, I discovered only four sclerocactus mummies (actually only a couple of areoles and spines) and a single living seedling. At that point I was not sure what species could it be. Both *S. parviflorus* and *S. wrightiae* could grow in that area. The climate was quite unfriendly. It was very hot. The landscape was pretty dry and reminiscent



Fig.4 A blooming desert along the road towards Escalante Canyon with red-flowered *Opuntia polyacantha* in the foreground, elevation of 1500m, NW of Delta, Colorado.



Fig.5 *Sclerocactus glaucus* bearing immature fruits, on the road towards Escalante Canyon at elevation of 1500m, NW of Delta, Colorado.



Fig.6 Flowering *Sclerocactus parviflorus* next to U.S. Hwy 70, near Green River, elevation of 1280m, Utah.

of badlands where *S. wrightiae* is at home. For those unfamiliar with the term: badlands is a type of very dry terrain formed predominantly by softer clay-rich soils formed from eroded sedimentary rocks. They are characterized by a minimum of vegetation.

Only about a mile further on that road (exit 164) I spotted an old sclerocactus from the car.

We stopped. It was a large specimen of *S. parviflorus*, 20cm tall plant bearing flowers 6cm in diameter (although only the last flower was open, Fig. 6). We also discovered two seedlings nearby (Fig. 7), as well as *Opuntia polyacantha*. Here are more data on this spot if anybody wishes to check it out (1280m, N38.59.120, W110.08.022).



Fig.7 A seedling of *Sclerocactus parviflorus* with gorgeous spines, U.S. Hwy 70, near Green River, elevation of 1280m, Utah.



Fig.8 Flowering *Sclerocactus parviflorus* at San Rafael Swell View Area along U.S. Hwy 70, E of Green River, elevation of 1360m, Utah.

We headed to the west, passed by the exit towards Hanksville (and to famous Goblin Valley State Park), and we stopped at San Rafael Swell View Area. The landscape was attractively coloured with reddish sediments and decorated with green dots of sparsely distributed juniperus trees. Again, we could observe several flowering individuals of *S. parviflorus* (Fig. 8), *Opuntia polyacantha* with

yellow flowers and the quite common *Castilleja chromosa* (Desert Paintbrush, Orobanchaceae) with shining red flowers.

About 80 miles east of Salina, while crossing over the mountain range (at elevation of some 1900m) we saw more *Opuntia polyacantha*, and especially flowering *S. parviflorus* and *Echinocereus triglochidiatus* v. *mojavensis*.

I should mention that it was extremely windy the whole afternoon and local showers and thunderstorms were almost regular. It was not easy to walk around and especially to take pictures.

It was late afternoon when we finally reached Salina (UT). It was drizzling but it was warm. Ignoring the rainy weather, we tried to look for *Sclerocactus spinosior*, which was supposed to be quite common in that area. First we tried to search South of Salina, South of the US Hwy 70. But we could not find any scleros there. We saw only Indian Paintbrush (*Castilleja* sp.) and opuntias growing among juniperus trees. Then we tried to search on the other side of the Hwy, closer to Salina. There was a hill behind the Luxury Inn (across the street from the Best Western Inn and Texaco petrol station). Half of the hill was literally gone. It was mined away. And the rest was fenced in. We got over the fence and found eight specimens of *Sclerocactus spinosior* on the northwest and west slopes at the elevation of some 1560m, several of them with flowers closing for the night. The largest plant was some 20cm tall. Apparently, the plants had no future there. The habitat seemed it would be gone completely soon. And it probably does not anymore exist today.

That day we ended up in Best Western Inn in Salina with a 52 USD deal (after some negotiations).

[Zlatko Janeba](#)

CYLINDROPUNTIA × ANASAZIENSIS

Donald Barnett Jr and Donnie Barnett introduce the Anasazi Cholla. This article is an extract from their book *The Cactus of Colorado* where the hybrid was first named. The book is available as print on demand at <https://www.createspace.com/6664725>

The cholla *Cylindropuntia imbricata* has been reported to occur at several locations on the western slope of Colorado. Boisevain and Davidson reported in the addendum of *Colorado Cacti* that “*Opuntia arborescens* is now beginning to invade the western slope of the Rocky Mountains. We found a good sized colony at the foot of the Wolf Creek Pass near the Piedra River.” The cholla at this location had actually been recorded and collected here as far back as July of 1899 by botanist Carl F. Baker and identified as *Opuntia imbricata*.

William Weber, along with C.F. Livingston, made a collection of the plants here in June of 1951 and determined them to be *Opuntia imbricata*. It was not until Gerald Arp visited this colony in 1971 that it became known that the plants here were of hybrid origin. He recognized it as a hybrid between *C. imbricata* and *C. whipplei*. Arp included this “interesting hybrid” in his doctorate study and wrote an article about it that appeared in the *Cactus and Succulent Journal (U.S.)* in 1973. In the last paragraph of his article he states: “Occasionally probable hybrid populations of cacti are given a separate name as has been done by Benson (1950, p.48) and Grant and Grant (1971) but this population is so restricted in its distribution that there seems to be no good botanical reason why the hybrid should be named.”

Paul V. Heath believed otherwise and included this cholla in his article “New combinations to *Cylindropuntia* (Engelmann) Knuth” which appeared in his self-published journal *Calyx* (1994). He wrote a brief Latin description, four lines, of the hybrid cholla and named it *Cylindropuntia ×media*. As for a type specimen and type locality, he referenced Arp’s journal article. However, no type specimen was ever deposited in a herbarium or museum and is therefore an invalid species name.

Most cactus taxonomist (Pinkava, 2014) view the hybrid cholla found in southwestern Colorado as a synonym of *Cylindropuntia ×viridiflora* as they have the same putative parents. But this hybrid cholla, named in the book *The Cactus of Colorado*, *Cylindropuntia ×anasaziensis*, is distinct from *C. ×viridiflora* by several physical and floral characters.

The type locality of *Cylindropuntia ×anasaziensis* is at: USA. Colorado, Archuleta Co., 1.55 miles (2.54km) northwest of Chimney Rock National Monument upper parking area, 6,528-6,680ft. (1990–2036m) elevation. A south-facing slope growing with *Cercocarpus montanus*, *Quercus gambelii*, *Muhlenbergia sp.*, *Cirsium arvense*, *Ceratoides lanata* and *Opuntia fragilis*. *C. whipplei* is found on a level hilltop about 30m west of the *C. ×anasaziensis*



Magenta flowering *Cylindropuntia ×anasaziensis*



Butler wash thigmonastic response



Extra pistil.



No pollen



Hovenweep flower

colony. The type specimen was collected by Donnie Barnett 38023 with Donald J. Barnett Jr. on July 3, 2014 and is deposited in the Stanley L. Welsh Herbarium at Brigham Young University.

The plants of *Cylindropuntia* × *anasaziensis* have characteristics of both *C. imbricata* and *C. whipplei*. They have a growth form that is both erect and scrubby. Individual plants are low,

sprawling but have a few to several erect stems (up to 4ft) that resemble *C. imbricata*. The lateral joints are shorter and smaller, more like those of *C. whipplei*. The diameter of the joints ranges from 1.2–2.8cm, slightly larger than *C. whipplei*, but less than *C. imbricata*. Stems are somewhat brittle. The tubercles on stems are smaller than *C. imbricata* more like those of *C. whipplei*.

The spination of *C. ×anasaziensis* is a little more like that of *C. imbricata* than *C. whipplei* in that they tend to have more spines than *C. whipplei*. Total number of spines per areole on *C. ×anasaziensis* ranges from 8–12. Central spines number from 4–6 of which 1–3 may be deflexed. They range in length from 12–15mm. Radial spines number from 4–6 and range in length from 5–8mm. They are basally flattened with a few of them deflexed. Spines are generally white and sometimes tipped with



Cylindropuntia imbricata (left) compared with *×anasaziensis* on the right.

pale tan or yellow. Areole height average is 6.6mm with an average width of 4mm. Glochids are inconspicuous, pale tan and measure 0.5–1.5mm in length. Extra-floral nectaries are present on newer areoles.

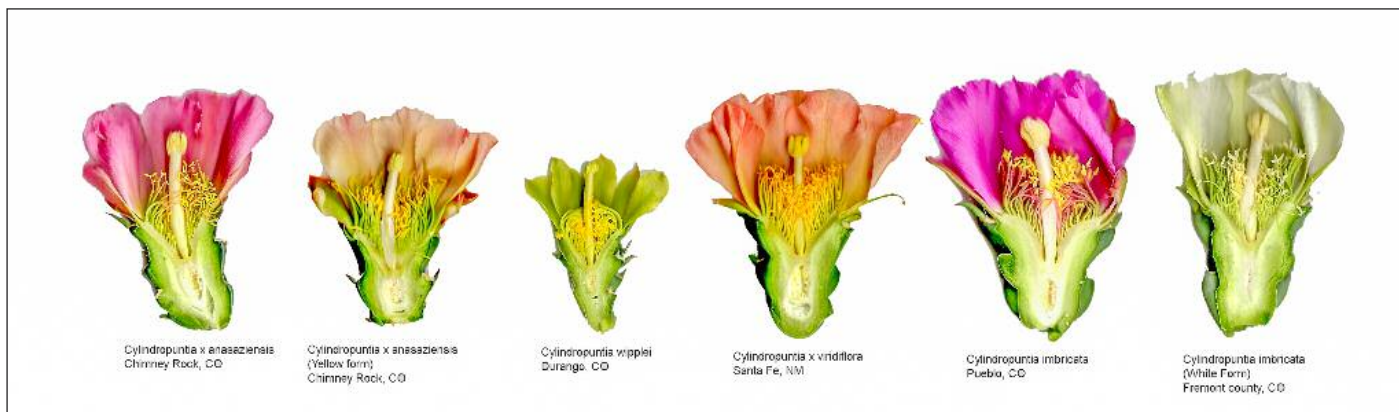
The flower characteristics are a definitive feature of *C. ×anasaziensis*. The flowers bear attributes from both *C. imbricata* and *C. whipplei*. *C. ×anasaziensis* has a red hued flower colour similar to *C. imbricata* and anther morphology resembling *C. whipplei*. Typical flowers have inner tepals rose to light pink and outer tepals orangish-green. The flower centre is often yellowish to pale orange. The pistil has a style that is pale yellow to white and a stigma that is very pale green. Stamens are yellow with the filaments extremely narrowed as they connect to the anthers. Very little pollen is produced by the anthers and the pollen



Yellow flowers are rare at the type locality.

that is produced comes off the anthers in sporadic whirls never completely covering the anther. Plants do not produce any viable pollen and are cytoplasmic male sterile. This was determined by a lactophenol cotton blue staining, resulting in no viability. This is probably the result of repeated hybridization with *C. whipplei*. The stamen displays a very strong thigmonastic response.

Six plants in the Chimney Rock population produce only yellowish flowers. The inner tepals of these flowers are pale whitish-yellow with some faint infusion of orange or red. The outer tepals are yellow-green infused with



Cylindropuntia ×anasaziensis
Chimney Rock, CO

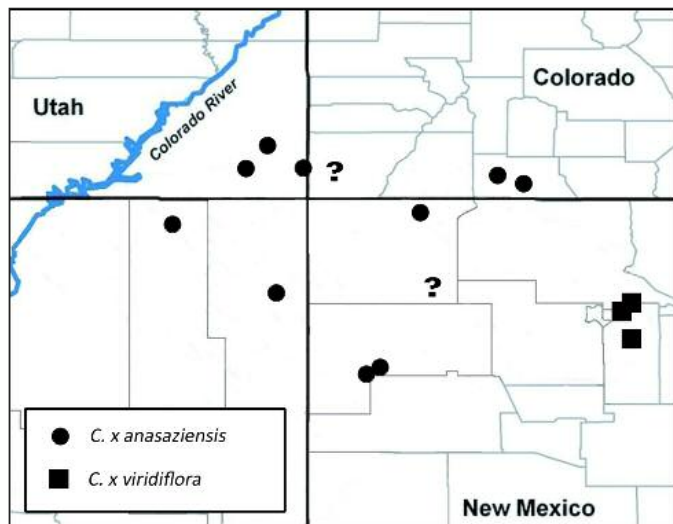
Cylindropuntia ×anasaziensis
(Yellow form)
Chimney Rock, CO

Cylindropuntia whipplei
Durango, CO

Cylindropuntia ×viridiflora
Santa Fe, NM

Cylindropuntia imbricata
Pueblo, CO

Cylindropuntia imbricata
(White Form)
Fremont county, CO



Distribution map

brown. The centre of the flower has a pale green hue. The stamen have filaments that are yellow to greenish-yellow and anthers that are yellow. The anthers of these yellow flowers produce no pollen at all and are completely barren.

The fruits are yellow to tan and less than 2cm long. They contain no seeds and eventually become flaccid, dry and shrivelled. The main form of recruitment for *C. x anasaziensis* is by vegetative means. The stems are most likely broken off by wildlife. There is considerable evidence, faeces and a carcass, that both mule deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*) use the south-facing slope that *C. x anasaziensis* inhabits. Recruitment by stoloniferous root growth was observed at the population near Hovenweep. *C. x anasaziensis* can produce viable seed if it receives pollen from *C. imbricata* or *C. whipplei*. A cultivated plant produced seed from the pollen of *C. imbricata* and *C. whipplei*.

Plants begin flowering in late June and may continue blooming to early August. The peak blooming period is usually around the 4th of July. The frustrated plants produce an incredibly large amount of flowers with some plants producing well over a hundred.

The ploidy level of *C. x anasaziensis* was determined by examining pollen and root-tips. Pollen from red flowering *C. x anasaziensis* was tested by following Marc A. Baker's chromosome determination protocol using acetocarmine, ferric ammonium citrate powder, Hoyer's mounting solution and

observed through a 100x dissecting 'scope. Root-tip mitosis was implemented on yellow flowering *C. x anasaziensis* and specimen of *C. x anasaziensis* not in flower from other locations other than the type locality. Root-tip squash examination was conducted following Colorado State University's chromosome determination protocol. *C. x anasaziensis* was determined to be a diploid, $2n=22$.

Previously it was mentioned that *C. imbricata* × *C. whipplei* crosses occurring in the Four Corners area have been considered *C. x viridiflora*. But *C. x viridiflora* differs from *C. x anasaziensis* in several ways but especially florally. The flowers of *C. x anasaziensis* are smaller than those of *C. x viridiflora* and are morphologically closer to *C. whipplei* other than the red hued flower. The anthers of *C. x anasaziensis* are much larger than those of *C. x viridiflora* and the stamen filaments of *C. x anasaziensis* are extremely narrowed, nearly pinched off or dried as the reach the anthers. The anthers of *C. x anasaziensis* have a very similar shape to *C. whipplei* and produce very little to no pollen. The anthers of *C. x viridiflora* are shaped similarly to *C. imbricata* and produce large amounts of viable pollen. The seizmonastic response of *C. x anasaziensis* is radical compared to *C. x viridiflora* and is very similar to *C. whipplei*. The flowers of *C. x viridiflora* are a brassy orange colour and those of *C. x anasaziensis* are a red hue or rarely yellow hued. However flower colour alone cannot be considered a defining characteristic as many *Cylindropuntia* species can have more than one flower colour as noted in *C. imbricata*. *C. x viridiflora* is known from only one three sites: Ft. Marcy Park; near Pajoague; and near Chimayo, which are in the vicinity of Santa Fe and Espanola, New Mexico. The New Mexico Cactus and Succulent Society, especially John "Obie" Oberhausen, is working to increase the number of the Santa Fe Cholla (*C. x viridiflora*) and possible introduce it to additional locations.

Cylindropuntia x anasaziensis is associated with Anasazi or ancestral Pueblo people habitation sites that occur in the Four Corners region. Hybrid cholla, fitting the *C. x anasaziensis* description, have been record at several other Anasazi sites in addition to the

Chimney Rock N.M. site which represents the largest and most diverse population with over 200 plants. The distances *C. ×anasaziensis* is found from the various Anasazi ruin sites ranges from less than a ½ mile to around 3 miles. The second largest population of *C. ×anasaziensis* is located in the vicinity of Hovenweep National Monument about ½ mile due east of the Colorado border. This colony of about one hundred plants sits on a gentle sloping sandstone 'slab' and is situated between several ruins including the Square Tower ruins about 3 miles (5km) to the southwest and the Hackberry canyon ruins which are 1.8 miles (2.9km) to east and are the closest. Apart from the Chimney Rock and Hovenweep locations all other known locations consist of very small populations or individual plants but for the most part are associated with cultural sites. The population of *C. ×anasaziensis* found very near the Bulter Wash Ruins (.4 miles), for example, consists of about 6 plants. No plants have been found on Mesa Verde and the National Park Service has not recorded *C. imbricata* nor *C. ×viridiflora* in any of their botanical surveys (Thomas *et al.* 2009). A lone plant situated amid a fence at Standing Cow Ruins, Canyon de Chelly National Park, Arizona, has orange flowers; besides its unique flower colour it has the same stamen and a light green stigma like other *C. ×anasaziensis* specimens. Other plants in the Canyon de Chelly have not been examined by the authors but they fit the same description (Mugabura, 2009).

The ancient Pueblo people had many uses for *C. imbricata* including ceremonial uses and as a food source (Housley, 1974). Anthropologists (Parsons, 1929; Stevenson, 1915) studying the modern Pueblo People, descendants of the Anasazi, have documented ceremonially uses by the Zuni and Nambe people. Details of the many ways the *Cylindropuntia* were used are detailed in the following chapter (*The Cactus of Colorado*: 261). The valuable plant, *C. imbricata*, was introduced to the Four Corners region by the Anasazi where it hybridized with the native *C. whipplei* resulting in *C. ×anasaziensis*. It cannot be mere coincidence that *C. ×anasaziensis* is found in the vicinity of Anasazi ruins.

The time period of when *C. imbricata* was introduced into the Four Corners area is another question. Hovenweep was occupied by the Ancient Pueblo people around 1100–1300 C.E. while the Chimney Rock site was occupied by two different groups from 950–1125 C.E. (Ferguson & Rohn, 1987). These two sites have the largest populations of *C. ×anasaziensis* and were inhabited longer than most of the other locations beginning with the Basket Makers 50–750 C.E. The record of *C. ×anasaziensis* at the Betatakin Ruins which was occupied for a short time from 1267–1286 C.E. could suggest it was used towards the end of the time the ancestral Pueblo people inhabited the Four Corners region. It could also suggest that the cholla only survived from the later Anasazi habitation sites. *Cylindropuntia ×anasaziensis* apparently represents a relict hybrid species of *C. imbricata* with a declining population trend.

The derivation of the specific name *anasaziensis* consists of two parts, *anasazi* and *ensis*. The prefix *anasazi* is the name given to the ancestral Pueblo people by the Navajo meaning *ancient ones*. The Latin suffix *ensis* is defined in Botanical Latin, 4th ed. (Stearn, 2004) as: "indicates country or place of growth or origin or else habitat." The suffix *ensis* is preferred over the Latin suffix *orum* which translates to *of the* and implies possession. The name *anasaziorum* would mean *of the Anasazi*. However, the hybrid cholla associated with the Anasazi (Pueblo) ruins of the Four Corners region of the southwest U.S. was not possessed by the Anasazi nor ancestral Pueblo people. They imported the cholla, *Cylindropuntia imbricata*, which repeatedly hybridized over a period of about 900 years with the locally endemic *C. whipplei* resulting in the hybrid plant we find today. *Cylindropuntia ×anasaziensis* is a modified, living relict of the Anasazi people. Though the Anasazi people have left this area, the ruins of their villages and this plant are a record of their presence. The specific name *anasaziensis* refers to the place of growth near Anasazi ruins and in a way the country where it is found "Anasazi Land."

[Donald Barnett Jr and Donnie Barnett](#)

WHAT ABOUT OPUNTIA ORBICULATA SALM-DYCK EX PFEIFF?

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Introduction

Opuntia orbiculata is a large and attractive *Opuntia* found in southern Oklahoma, Texas, and Mexico westward to Nevada and perhaps the desert mountains of eastern-southern California (Figure 1). The original description was published 180 years ago (Salm-Dyck, 1837).



Figure 1: *Opuntia orbiculata* shrub, near Artesia, NM.

Description

Opuntia orbiculata may reach 7 ft tall, but mature plants are typically 3 ft tall (or less if sprawling). It is often noticeably wider than tall for a large plant. The cladodes are thick and may be up to 12 inches wide but are typically about 8–10 inches. Cladodes are most often orbiculate (circular), but they may be spatulate, broadly oval, obovate, or even obdeltoid (Figure 2). Often, plants have a bluish look to them, but this is not determinative and stressed plants may be yellowish-green. In clement growing conditions, the plants make close-branching shrubs. In drier locations the plants may be shorter, semi-prostrate, and spreading. Spines are variable, but are typically relatively short, slender, whitish, yellowish, or light orange-



Figure 2: Close-up of *Opuntia orbiculata* cladodes.



Figure 3: Herbarium specimen labelled *Opuntia engelmannii*, but which is actually *O. orbiculata*.

brown, and can be lightly curved. Spines are usually dorso-ventrally compressed or flattened and oval in cross section, varying to terete. *O. orbiculata* grows on rocky soils as well as deep soils of many types. It is seldom found on sand soils or exceedingly rocky areas. Often *O. orbiculata* is misidentified as *O. engelmannii* or *O. lindheimeri* because it is not well known and because it is the same general size as these plants. Many herbarium specimens identified as *O. engelmannii* are actually *O. orbiculata* (Figure 3). The features that distinguish *O. orbiculata* from *O. engelmannii* are listed in Table 1.

We have observed *O. orbiculata* in Coahuila, Chihuahua, Nuevo Leon, Tamaulipas, and Sonora, Mexico. We have also seen it in southern-central Oklahoma, south of Ardmore in the hills; throughout central and western Texas; in New Mexico north to Albuquerque; in most of the southwest half of Arizona; and even on Mt. Potosi in southern Nevada. The



Figure 4: *Opuntia orbiculata* shrub showing areole distribution.

plants grow from low elevations (less than 1000 ft) on the South Texas Plains to 4,500 ft on Mt. Potosi in Nevada or even 7,000 ft in the Sandia Mountains near Albuquerque, NM. An easy place to see *O. orbiculata* is at the Aguirre Springs Campground located 20 miles east of Las Cruces, NM off of US Highway 70 in the Aguirre Spring National Recreation Area. *O. orbiculata* is abundant in the area and is the largest species present. It is also the dominant species present in thickets at the main entrance to the Carlsbad Caverns in New Mexico.

As is typical of most *Opuntia* species, the plants are variable, and while many pads on many plants are nearly circular, this is not a totally diagnostic trait. Oval, obdeltoid, and even spatulate pads are common, but some individuals seem composed only of circular pads. Mature pads are thick and appear fleshy, more so than is usually the case in *O. engelmannii* or *O. lindheimeri*. Even though fleshy looking, the pads are usually rigidly woody, more so than in *O. lindheimeri* but not more so than in *O. engelmannii*. Very old plants may reach 6–10 ft across and have a strongly woody base 12 inches across from which branches arise.

O. orbiculata areoles are more even in size and distribution across a cladode than is the case in *O. engelmannii* (Figure 4). Also, glochids are arranged as in *O. phaeacantha*, with an adaxial tuft in older areoles. In contrast, glochids of *O. engelmannii* are scattered throughout the areoles.

As in several related species (including *O. engelmannii* and *O. lindheimeri*), seedlings of *O. orbiculata* produce a covering of hair-like spines for the first two or three years. These are typically more strongly developed in *O. orbiculata* than in most species.

The Name

Britton and Rose (page 176) discussed this large plant and described a mystery. The original description indicated the plant was from South America (Chile or Brazil), but Britton and Rose knew that no plant of that type was present in South America. They studied live material from botanic gardens in Europe and concluded that *O. orbiculata* was the same as *O. crinifera* Salm-Dyck ex Pfeiffer and also *O. lanigera* Salm-Dyck. They also

Table 1. Comparison of *Opuntia engelmannii* and *O. orbiculata*.

concluded that the given type location was in error and must actually be northern Mexico.

If, for some reason, the name *orbiculata* (along with *lanigera* and *crinifera*) is discarded, the species could be referred to as *O. dillei*. Griffiths described a spineless variant of the taxon as *O. dillei* (1909) thinking it represented a spineless species (Figure 5). There is no ambiguity about this name. The qualification, of course, is that spinelessness is not a universal characteristic of *O. orbiculata*.

In the Garden

O. orbiculata is a standout in any garden due to its size, but it needs space. It will bloom when smaller (2–3 ft across), but it wants to be a large plant with a lot of room for roots. It has pleasing yellow flowers with bright green

<i>Opuntia engelmannii</i>	<i>Opuntia orbiculata</i>
Has larger areoles arranged further apart on pads so there are fewer areoles.	Has smaller areoles arranged closer together so there are more areoles
Glochids are usually of mixed sizes, and they are scattered throughout the areoles.	Glochids are usually neatly arranged in concentric rings of even sizes.
There is a lower number of areoles on fruits.	There is a higher number of areoles on fruits.
Pads are mostly longer than wide (often obovate), seldom wider below the middle, and almost never pointed.	Pads are often nearly orbicular, sometimes wider below middle, sometimes somewhat pointed.
Pads are of “normal” thickness.	Pads are thicker seeming.
Spines are typically stouter.	Spines are more slender.
Spines are more often flattened and may be up to 5-6/areole.	Spines are less strongly or not flattened, usually fewer per areole.
Spines may have yellowish, reddish, or warm hues.	Spines are commonly clearly yellow or white with dark bases.
Spines are often chalky seeming.	Spines may be or not be chalky.
The shape of the fruits is less defined over a plant fruits have fewer areoles.	The shape of fruits is generally more “defined” and with more areoles.
Fruit is variable but often broadly pear shaped, but does not have a pronounced narrow base—overall the shape is rounded.	Fruits are generally more barrel-shaped (with a more distinct top rim), and almost always longer than wide, but they are not narrow.
Plants may be as tall as wide, or taller, seldom mostly on the ground.	Plants are often wider than tall, sometimes mostly on the ground.
Seeds are small (like <i>O. lindheimeri</i>) and all of the same size within a fruit.	Seeds are commonly in two size classes within the same fruit—both tiny and small (either somewhat larger or distinctly smaller than those of <i>O. engelmannii</i>).



Figure 5: Spineless *Opuntia orbiculata* (e.g., *O. dillei* Griffiths).

stigmas surrounded by yellow stamens. Spineless forms (*O. dillei* types) are not in the garden trade but are worth growing if you can find them; however they may make a few spines in gardens under well-watered conditions. The plants often have a bluish look when well grown and a large plant of *O. orbiculata* will make a focal point for any garden or large flower bed. Some individuals have flowers that change from yellow to orange or even red before closing. These present a pleasing colour combination, often with flowers of different hues open at the same time on the same plant. Fruits are juicy and usually of a pleasing sweet flavour (Figure 6).

It will grow in most garden soils but dryer and less fertile soils mimic natural conditions better and help plants retain a natural look. Plants are tolerant of too much water, and forms from northern areas or high altitudes are very cold hardy—perhaps to -20°F (-20°C).



Figure 6: *Opuntia orbiculata* fruit.

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IN THE SHADOW OF ILLUMANI

Martin Lowry takes us on a spectacular journey to a part of Bolivia that is rarely visited. Photographs by the author.



Figure 1. The view of Nevado Illumani from the southwest at LM1085. These arid slopes lie in the rain shadow of the Cordillera Real and support many cacti and other xerophytic plants.



Figure 2. Crossing the Rio Sacambaya from Cochabamba into La Paz.

In November last year John Carr and I visited Bolivia together, again, for the fifth time. We spent most of our trip travelling along the Northern arm of the Andes from the foothills west of Santa Cruz into the highlands north of Cochabamba and onwards, eventually into the Yungas east of La Paz before returning via the Altiplano to Sucre. This article presents our observations from the middle part of that journey as we approached and then circum-navigated Nevado Illumani, the second highest peak in the country (Figure 1).

We left Inquisivi on 13th November 2016 late and somewhat disappointed since we had spent a large part of the morning trying to reach the type locality of *Cleistocactus chrysocephalus* without success. I had exact GPS

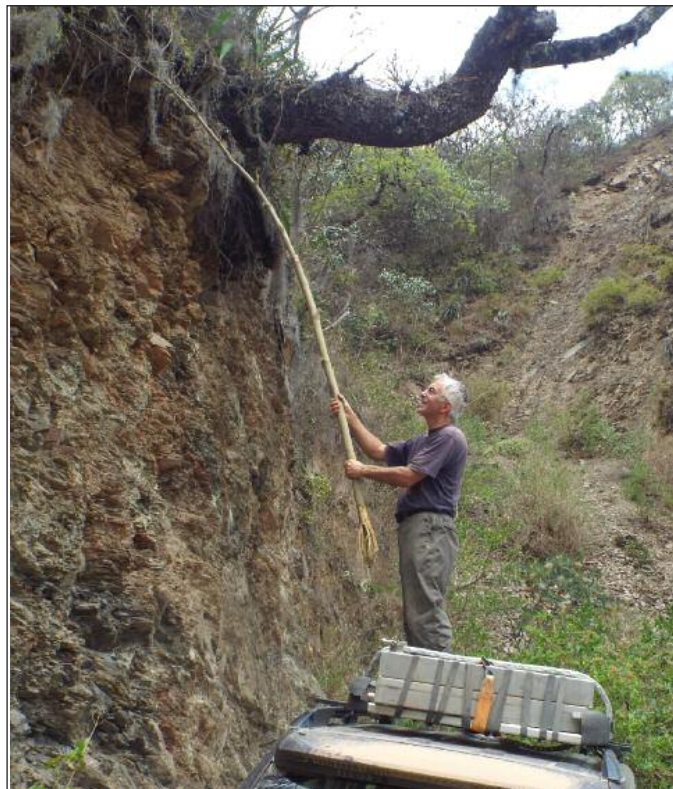


Figure 3. *Echeveria whitei* grew high above the road at LM1076 and we had to improvise to collect specimens for John's BCSS funded project.



Figure 4. The flowers of *C. chrysocephalus* arise from a lateral pseudocephalium composed of spines and stiff bristles.



Figure 5. A mature specimen of *Cleistocactus chrysocephalus* (LM1071.02) at the newly discovered location in Cochabamba Department.



Figure 6. An older, senescent, specimen of *C. chrysocephalus* at LM1071.

coordinates for a couple of plants from Holger Kelsch but, unlike him, rather than employing a local guide to take us to them we had attempted to reach them by road on our own. We took the road east towards Hacienda Parangani that we had first travelled in 2003 hoping this time to turn north towards the river and find the plants. At the time Google Earth's images were very poor but since our return new satellite images have been released that show we would have been better taking a track directly north from just below the town. Even then Holger's location might not have been accessible since the new images show no roads, or tracks, within 3km of the plants. As I mentioned we (well, mainly me) were only "somewhat" disappointed since we had already unexpectedly discovered *C. chrysocephalus* at two other locations the previous day so here I must digress for a short while.



Figure 7. *Cleistocactus buchtienii* that in the past I would have called *C. ayopayanus*. We found this population (LM1073) on the high ridge south of the Rio Sacambaya.



Figure 8. Just a few kilometers beyond LM1073 but 500m lower we found *Cleistocactus laniceps* (LM1074).



Figure 9. *C. laniceps* growing amongst xerophytic scrub on the northern bank of the Rio Sacambaya (LM1075). A new record for La Paz Department.



Figure 10. The small-flowered *Pereskia weberi* grows alongside *C. laniceps* at LM1075.

In October 2015, John and Johan de Vries had spent a few days in Independencia looking for alternative roads leading to Cocapata in their search for *Sulcorebutia* locations. Although unsuccessful, in one of the valleys they had found a *Cleistocactus* they couldn't identify. When John subsequently sent me an image I was quite surprised to see it was neither *C. buchtienii* nor *C. laniceps* both of which I already knew grew in the area. The image was of the top portion of a young stem with several strong yellow spines at each



Figure 11. The two arms of the Rio Sacambaya merge in extensive mud flats on border of Cochabamba and La Paz Departments. Here seen from the north side at LM1076.



Figure 12. Our third encounter with *Echeveria whitei* at LM1077.



Figure 13. A *Tillandsia festooned* specimen of *C. chrysocephalus* at LM1077. This plant is entering the senescent phase with once vertical stems now becoming horizontal and pendant.



Figure 14. Close-up of the stems of *C. chrysocephalus* showing the continued flowering of even old plants.

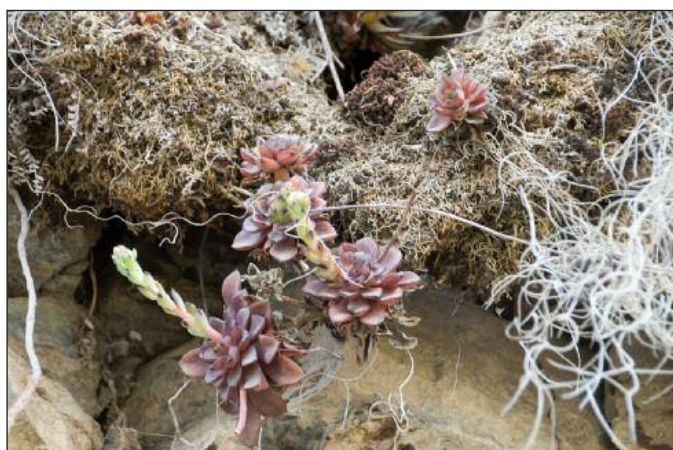


Figure 15. *Echeveria whitei* is quite common in the humid environment of the Rio Sacambaya valley. Here at LM1078 purple and green leaved forms grew side-by-side.

areole but the most striking character was the pronounced golden pseudocephalium along one side of the stem. This was either a new species or a specimen of *C. chrysocephalus* well



Figure 16. The green-leaved form of *E. whitei* at LM1078.

away from its then known distribution. It had to be verified!

We had arrived in Independencia late in the afternoon of November 11th and had tried to reach the location but unfortunately the poor track John and Johan had used was now totally impassable. We set up camp on the outskirts of town and hoped for better luck the next day. Rather than attempting another approach to

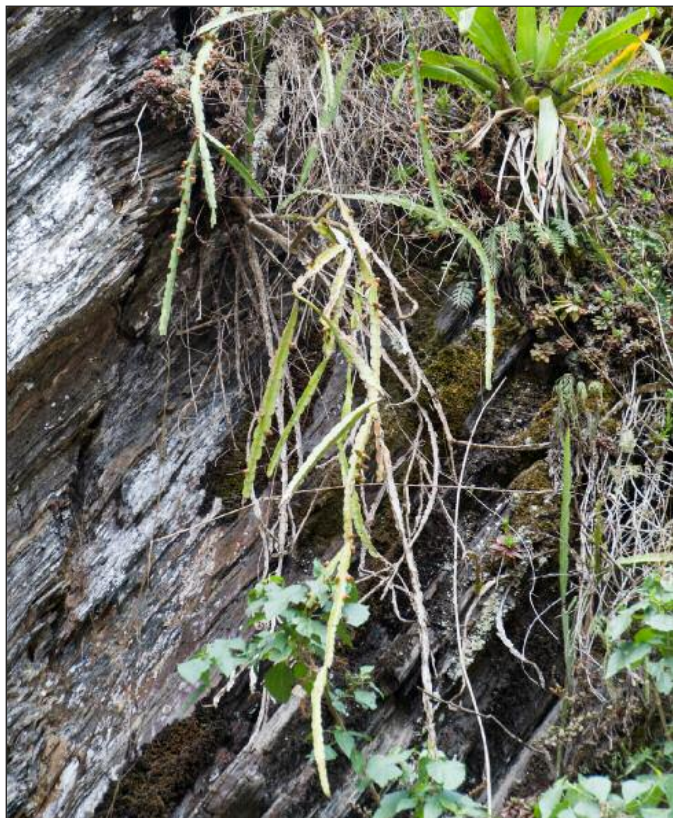


Figure 17. Fruiting *Lepismium paranganiensis* on the road-side cliffs at LM1078 along with bromeliads, ferns and *Echeveria whitei*.



Figure 19. *Cleistocactus buchtienii* (LM1079.02) growing on the dry hillsides north of Quime. This effectively the type locality of *C. reae* Cardenas, and I now consider the two synonymous.



Figure 18. *Yungasocereus inquisiviensis* and *Cereus hankeanus* (left) below Inquisivi (LM0500). When we first saw these plants in November 2003 it was raining and the trees were in full leaf.



Figure 20. Close-up of the stem and flowers of *C. buchtienii* (formerly *C. reae*) from near Quime. This population has redder flowers than those further east.

John's location we set off for Inquisivi along the old Ruta 25. Surprisingly this road has recently been labelled on the web as "the new road from Cochabamba to La Paz"! Always keen to explore new roads we soon took a side road to the south which led down to the Rio Ayopaya. We passed through the hamlet of Machaca with its colonial church and then, as we were descending John suddenly exclaimed "There it is! That's the same Cleisto we saw



Figure 21. Telephoto image of our first sighting of Nevado Illumani taken from the Cordillera Quimza Cruz. The image shows clearly how the mountain prevents rain clouds from reaching its southwestern slopes.



Figure 22. A large population of *Oreocereus pseudofossulatus* and other cacti growing in the xerophytic scrubland southwest of Nevado Illumani (LM1083).



Figure 23. *Echinopsis bridgesii* at LM1083, this, the type subspecies, has the longest spines.



Figure 24. *Echinopsis lageniformis* (erect plant at left) and *Coryocactus melanotrichus* (sprawling) in the scrubland at LM1083.



Figure 25. Flowering stem of *Oreocereus pseudofossulatus* (LM1083.06).

last year". Right there, beside the road was a tall - over 2m - many branched *Cleistocactus* with several branches bearing pseudocephalia just like the one in John's image from 2015 (Figure 5). As a bonus there were also several red flowers and ripe fruits pushing through the dense bristles (Figure 4). I still wasn't sure this was *C. chrysocephalus* but after a little searching we eventually found older plants with some decumbent and pendant branches

matching those seen at Inquisivi by Holger and illustrated by Ritter in his first description (Figure 6). This is a very important find since until then the only known location for the species was at the type locality. Although only around 40km as the Condor flies from Inquisivi, our find extends the species distribution and represents a new record for Cochabamba Department so we gathered a specimen which we later deposited at the Herbarium of Southern Bolivia (HSB) in Sucre. Quite pleased we returned to highway 25 by a different track spotting a few more plants as we drove along.

Our next encounter with *C. chrysocephalus* occurred several hours later shortly after fording the Rio Sacambaya which forms the boundary between the departments of Cochabamba and La Paz. Here Ruta 25 descends from a high ridge (3000m) into a deep valley (1650m) formed by the confluence of the two arms of the river. In times gone by there used to be a bridge across the river but it is now collapsed and abandoned. The only way to reach the other side is by taking to the river channel itself and making an 800m crossing over the debris strewn mudflats (Figure 2). Not a problem in the dry season but totally impossible after heavy rains. Fortunately for us the river was more or less dry and we easily made the crossing. On reaching the north side we entered a forest of scrub and tall trees amongst which were growing several cacti typical of the Yungas: *Cereus hankeanus*, *Echinopsis bridgesii* ssp.



Figure 26. Another plant of *Oreocereus pseudofossulatus* (LM1083.06) showing the frequently decumbent growth of this species.



Figure 27. More *Oreocereus pseudofossulatus*!



Figure 28. An unknown *Cleistocactus* species growing amongst the *Oreocereus* at LM1083. The stem is only 2-3cm in diameter, too thin for *C. luribayensis*.



Figure 29. Another specimen of the unknown *Cleistocactus* sp. at LM1083. The ginger spination of the new growth is characteristic and quite unlike that of *C. luribayensis*. This is very probably Ritter's *C. glaucus* var. *plurispinus*, finally rediscovered.

yungasensis, *Parodia ayopayana*, *Pereskia weberi* (Figure 10), and surprisingly, a small population of *Cleistocactus laniceps* (Figure 9), a new record for La Paz. As we climbed away from the river the trees become less dense and the air more humid and it was here on a cliff

above the road that we found another large specimen of *C. chrysocephalus*, so heavily draped with *Tillandsias* that it was barely recognisable (Figures 13 & 14). Here also were a few plants of *Lepismium paranganiensis* (Figure 17) and, as a treat for John, many clumps of *Echeveria whitei* (Figures 12, 15–17).

The remainder of the day was uneventful as we followed Ruta 25. The road contours the mountains at roughly 2600m through lush cultivated terrain so we saw very few more cacti. We eventually reached Inquisivi late in the afternoon and after several unsuccessful attempts found ourselves a pleasant B 'n' B for the night where we were treated to fresh bread with cheese and sweet coffee for an afternoon snack!

So back to the main story. We made our way southwest from Inquisivi heading for Quime. Along the way we made a couple of stops finding more *Echeveria whitei* near its type locality and also *Cleistocactus reae* which we had first seen along this road in 2003 (Figures 19 & 20). After seeing these *Cleistocactus* plants again after several intervening trips and observations I now believe they are synonymous with *C. buchtienii*, a species widespread at higher altitudes around Cochabamba.

Our target for that day was to reach the La Paz valley, only 50km by Condor but nearly 180km by road, and that across the Cordillera Quimza Cruz over some of the highest mountains in Bolivia. The route was spectacular for its scenery but there were few cacti, only the occasional *Echinopsis maximiliana* ssp. *caespitosa* and *E. tarijensis* ssp. *bertramiana*. It was along this stretch that we gained the first view of the mountain that would tower over us for the next few days, Nevado Illumani (Figure 21). By 5pm, our ritual stopping time when camping, we had made it only as far as the Araca valley so we made camp outside the village on the only level ground available, the football pitch!

It was perhaps fortunate that we had not reached our target the previous day since soon after we broke camp the following morning we entered an region with very different



Figure 30. Nevado Illumani rises above the bromelaid covered hillsides in its rain shadow viewed from LM1083.



Figure 31. *Echeveria* sp. (LM1084.03) growing in dense dry vegetation on the slopes shown if Figure 30.

vegetation than we had been travelling through. Gone were the cultivated fields below rocky slopes with scattered houses and little room for cacti. Although we had only descended a few hundred meters we were now in a much drier region. Instead of grasses the main ground cover here was a thicket of xerophytic shrubs and bromeliads on stony soil. Amongst them we soon spotted several species of cacti, most prominent of which was *Oreocereus pseudofossulatus* (Figure 22). We



Figure 32. The dry inflorescences of the *Echeveria* sp. were over 40cm tall.



Figure 33. An undescribed *Cereus* sp. (LM1085.01) growing amongst spiny bushes at 2500m along our route to the Rio La Paz.



Figure 34. Alongside the Rio La Paz at LM1086. Fortunately, we arrived early as, according to Lau, the afternoon winds here can be ferocious.



Figure 35. Another unknown *Cleistocactus* sp. (LM1086.02). Is this Ritter's *C. glaucus*?

selected a particular dense stand and made a stop to look more closely. As well as the *Oreocereus* (Figures 25–27) we quickly found *Corryocactus melanotrichus*, *Echinopsis lageniformis* (Figure 24) and, growing in the bare patches between them, *Echinopsis bridgesii* (Figure 23) and an occasional *Cylindropuntia tunicata*. The biggest surprise though was to find a thin-stemmed, orange-spined *Cleistocactus* with short red flowers growing across the rocks (Figures 28 & 29). The nearest location where I have also seen cleistocacti was at Luribay, about 30km to the south, where *Cleistocactus luribayensis* grows also alongside *Oreocereus pseudofossulatus*, *Corryocactus melanotrichus* and *Echinopsis bridgesii*. It is a many branched, thick-stemmed erect plant with pale spines nothing like the plants we were now looking at in the Araca valley. My suspicion was that we had rediscovered Ritter's *Cleistocactus glaucus* var. *plurispinus* for which we were searching but I wasn't certain since we were still some distance from the type locality and on the wrong side of the Rio La Paz.

As we continued on our way north we saw



Figure 36. Close-up of a stem of the unknown *Cleistocactus* sp. (LM1086.02) showing short stiff white spines and tessellated stem nearly 4cm in diameter.

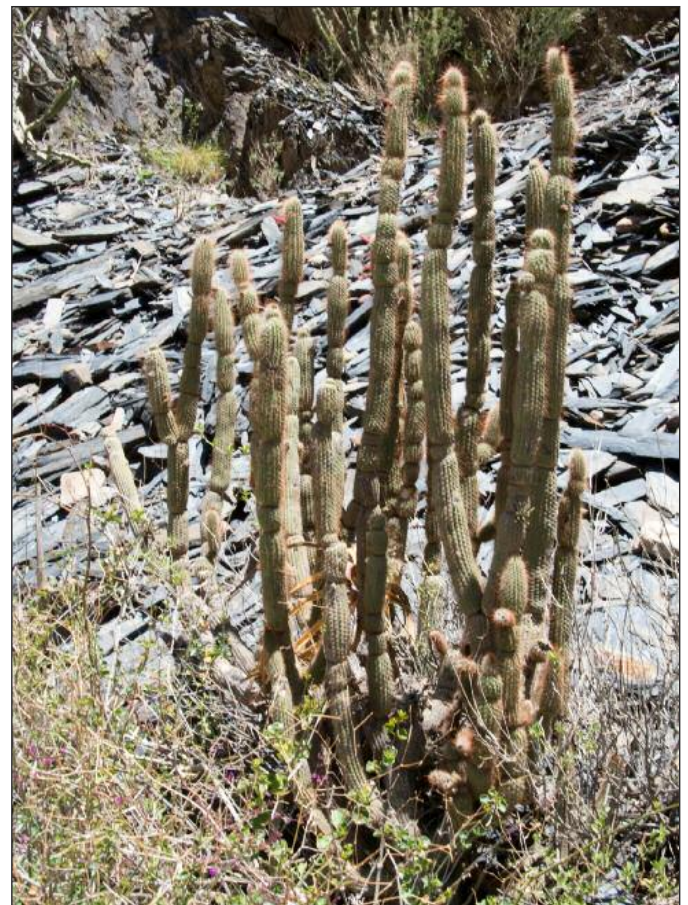


Figure 37. Another specimen of the unknown *Cleistocactus* (LM1086.02) with flowers similar to those we had seen further south.



Figure 38. A small colony of *Parodia ayopayana* (LM1086.05) growing on slate cliffs alongside the Rio La Paz.



Figure 39. The *Parodia ayopayana* (LM1086.05) growing here were originally given the name *P. echinus* by Ritter.

more of the same species. At our next stop the *Cleistocactus* reached to nearly 1.5m tall but still thin-stemmed and supported by the bushes. Here it was growing with a plethora of other succulents. Besides the abundant bromeliads we found a long stemmed succulent-leaved *Peperomia*, a succulent-stemmed *Oxalis*, and perhaps most interesting a thick-stemmed *Echeveria* with tall, long-spent inflorescences (Figures 31 & 32). John thought this was probably *Echeveria bakeri* but that species is so far only recorded from around Cochabamba.

The oldest name I can find for an *Echeveria* from near La Paz is *E. buchtienii* von Poellnitz but that name is currently considered a synonym of *E. whitei* yet the plants we were looking at were definitely distinct from those we had seen the previous day.

As we continued to descend towards the Rio La Paz the cacti slowly disappeared until all that remained were the occasional *Oreocereus pseudofossulatus*, *Cereus* sp. (Figure 33) and *Echinopsis lageniformis* growing on now bromeliad-free grassy slopes. We eventually reached the river along a narrow dusty dirt track – at one point so narrow it was barely wide enough for the car! (Figure 34) The cliffs along the south side of the river were quite bare but on crossing the bridge we found cacti again. Within a few meters of the bridge at 1720m altitude we found the *Cleistocactus* again (Figures 35–37). This time the plants were erect with thicker stems branching from near the base (Figures 35 & 37) and with fewer spines (Figure 36) although the flowers were the same as those on plants we had seen at our previous two stops. It is possible they are what Ritter described as *C. glaucus*. In addition to the



Figure 40. Another specimen of *Parodia ayopayana* (LM1086.05) showing the strong spination for which it was originally named.



Figure 41. A flowering specimen of *Cleistocactus* sp. (LM1087.02) showing spination and flowers similar to those seen in the Araca valley at LM1083.



Figure 42. The presumed *Echeveria buchtienii* in very dry conditions at LM1087. Note the very thick stems.

species we had already seen we also found many plants of *Parodia ayopayana* (Figures 38–40). The specimens here were much taller and spinier than those occurring near Independencia and were originally described under the name *Parodia echinus* by Ritter. Alfred Lau subsequently visited the same place in 1970 and declared that the *Parodia* was no different from *Parodia comosa* or *Parodia miguillensis*, two other species named by Ritter from along the Rio La Paz gorge. Strangely Lau made no mention of the *Cleistocactus* but



Figure 43. A surprisingly tall (1.8m) specimen of *Cleistocactus* sp. (LM1087.02).



Figure 44. Looking down onto Tirata in the Rio La Paz valley from LM1087. The village is on the far side of the river.



Figure 45. A very large plant and colony of *Cleistocactus* sp. (LM1087.02) growing near the type locality of *C. glaucus* Ritter.



Figure 46. A flowering stem of the *Cleistocactus* sp. (LM1087.02) shown in Figure 46.

did record an *Opuntia* and what he took to be an *Armatocereus*! It is very likely that this was the undescribed *Cereus* sp. we had observed along the road to the river (Figure 33). Fortunately, unlike Lau, we had arrived early enough in the day to avoid the strong orogenic winds prevalent along the gorge in the late afternoons.

By 1pm we had climbed to 3760m, out of the gorge and were well on our way towards the small town of Cohoni but I had one more important stop to make before reaching there; the type locality of Ritter's *Cleistocactus glaucus*. Ritter gives the location as Tirata and I had managed to locate the place on Google Earth. It was now 1250m below us along a narrow rock-strewn track that took us nearly an hour to negotiate (Figure 44). It was, however, well worth the effort for both of us since, on the steep cliffs above the village, we discovered both a *Cleistocactus* and an *Echeveria*. The latter was the same species we had seen at our second stop of the day and which, until I know more, I will call *E. buchtienii* (Figure 42). The *Cleistocactus* though was proving quite variable (Figures 41, 43, 45–48), here it had reverted to a



Figure 47. More stems of *Cleistocactus* sp. (LM1087.02) from the plant shown in Figure 46. These are very reminiscent of those in Backeberg's illustration in *Die Cactaceae*.



Figure 48. The short, straight, red flowers of *Cleistocactus* sp. (LM1087.02) are produced in profusion but there were no fruits.



Figure 49. Our final view of the lower Rio La Paz valley which I suspect still holds many surprises for intrepid Cactus Explorers.

sprawling thin-stemmed form with very many spines similar in appearance to Backeberg's illustration in *Die Cactaceae* (Band VI. Abb. 3350b) of FR106 which Ritter eventually described as *C. granjaensis*. The flowers though were again short, straight and red, just the same as those we had seen at each of the other locations. Despite the differences in stem morphology I am convinced that the plants we saw at each of the four locations are the same species and quite distinct from *C. luribayensis* with which they have until now been synonymized. The oldest name of the three available is *Cleistocactus glaucus* published by Ritter in *Taxon* in 1964.

By now it was getting quite late and we still had many kilometres to drive before our final destination of Palca so we had to abandon a visit to the type locality of *Cleistocactus granjaensis* some 15km off our route. I'm fairly sure the plant will turn out to be the same. We arrived in Palca just as the sun was setting and, unable to find lodgings, drove a short distance north of town onto the northern flank of Nevado Illumani to make camp. There we were well placed for our target for the next day – to explore the Chunga Mayo valley but that's another story and will have to wait!

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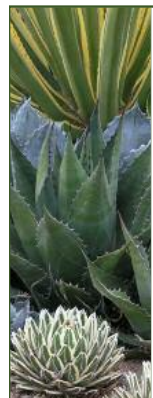
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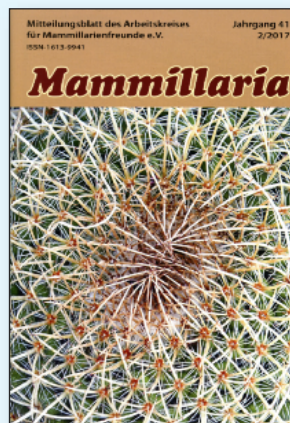
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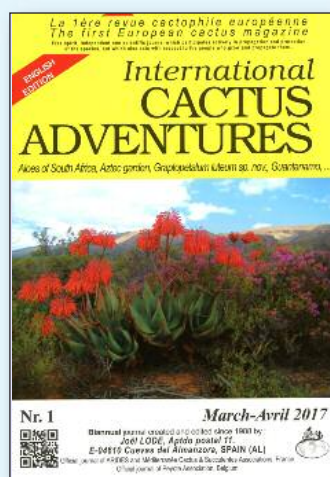
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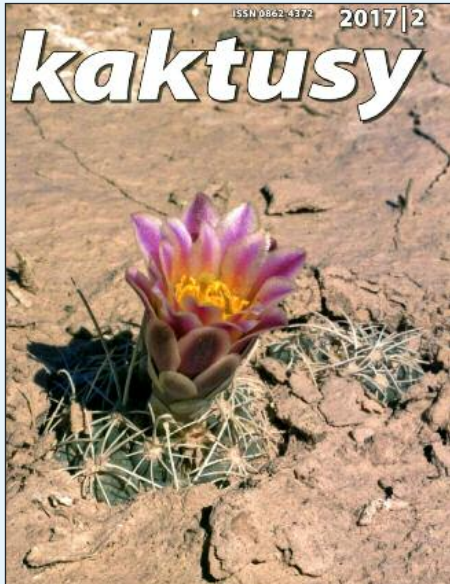


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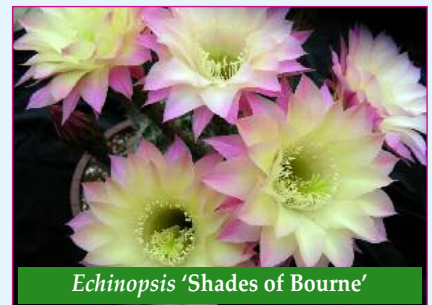
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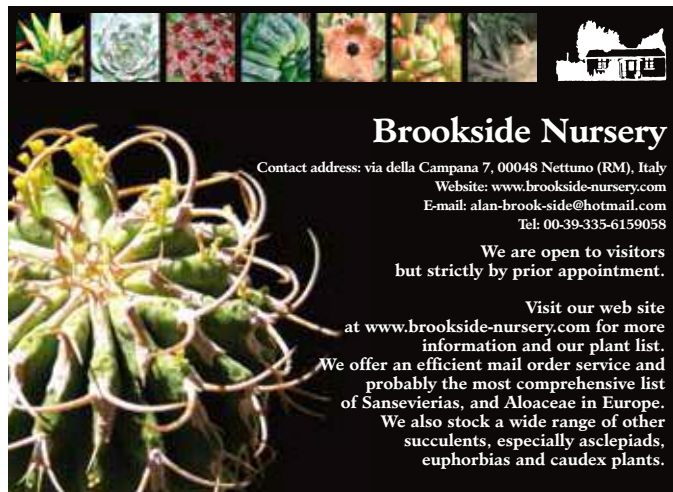
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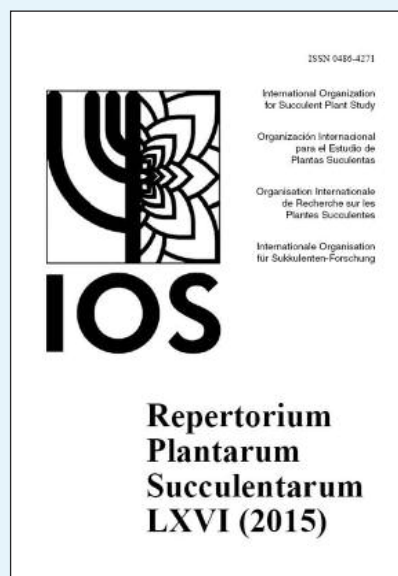
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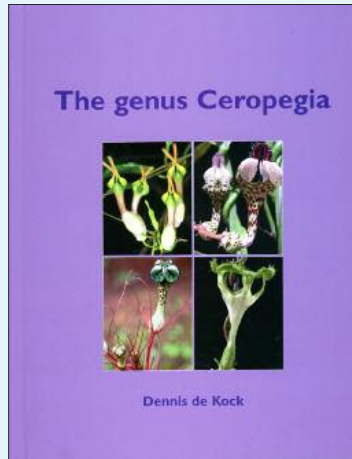
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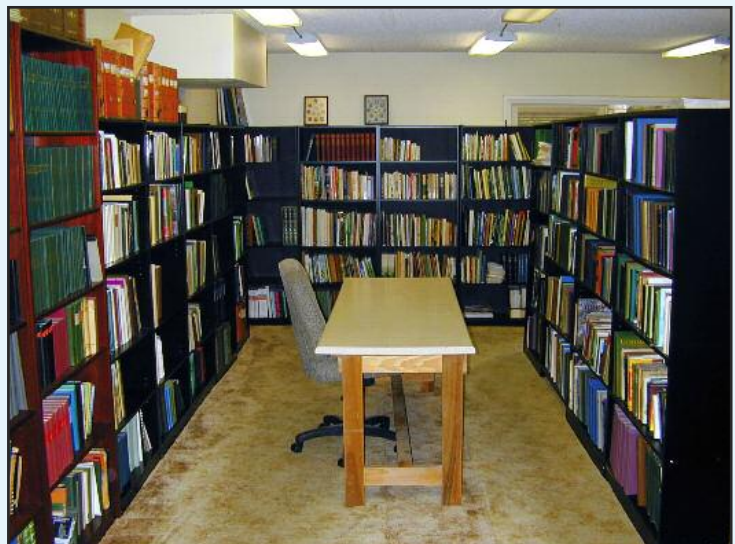
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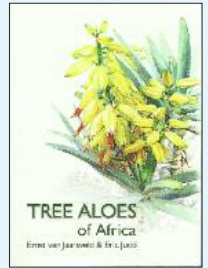
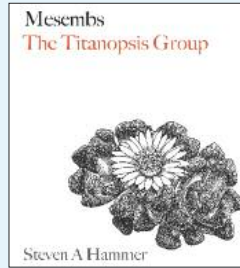
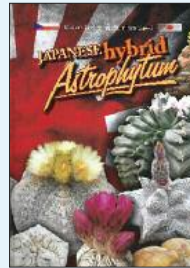
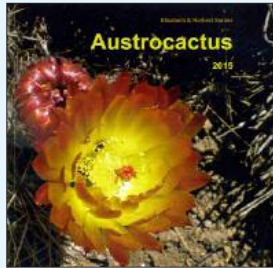
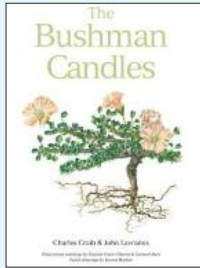
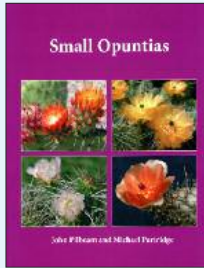
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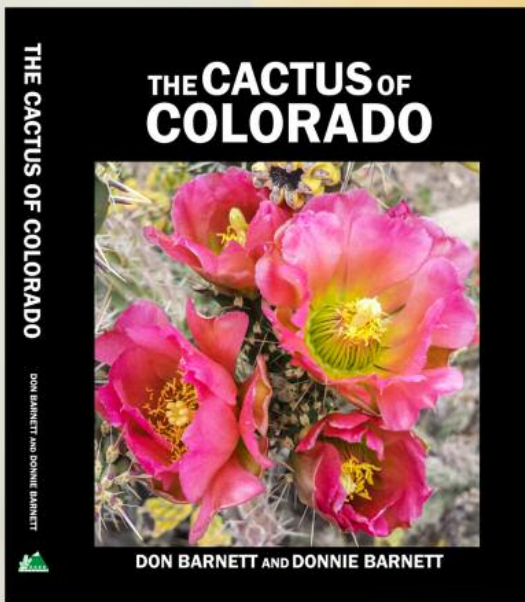
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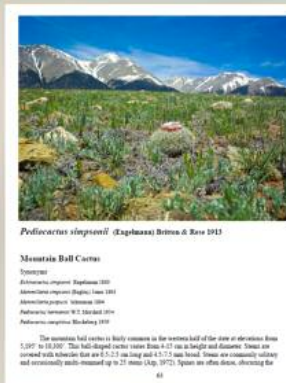
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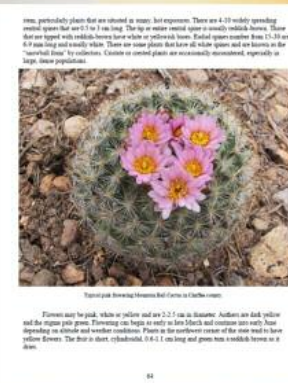
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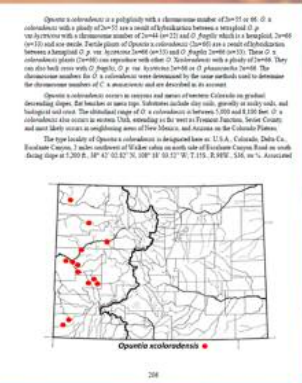
Pylaeocactus simpsonii (Ephedra) Britton & Rose 1912



Flowers are pink, white or yellow and are 2-2.5 cm in diameter. Anthers are dark yellow and the ovary pale green. Flowering can begin as early as late March and continue into early June depending on climate and weather conditions. Flowers in the northern corner of the state tend to have yellow flowers. The flower is short cylindrical, 0.6-1 cm long and grows from a woody base on a stem.



Flowers are predominantly a rose-red with approximately 10% of *O.* is colorless (having no red bases) and remaining 10% being yellow. Flowers: There are 10-15 flowers per stem, 1.5-2 cm high and 1.8 cm wide. Yellow flowers tend to fall or wither the lower end of the stem range. The flowers have yellow centers and are as white. Flowers: The upper lobes of the petal are pale yellow and the lower lobes are white. Other or rarely 2 flowers are produced at the apex and all of the lobes are pale yellow. All-ridge, some ridge plants that have more flowers, pink and purple flowers on the upper edges of white path like *O.* or *O.* flowers. *O.* flowers are colorless. Flowers from mid-July to mid-Aug.



Oryzopsis echinocarpa

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