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Front cove r: Aloes (and blue sky) providing a warm and colourful setting at the Desert Botanical Garden, Phoenix, Arizona2 for the 33rd IOS Congress, April 2014 (photo:Olwen Grace)

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Message from the President

This year the 33rd IOS Congress was held in Phoenix, Arizona, on 8–11 April. For the IOS it was an honour and a great privilege to hold for the third time our traditional Congress at the Desert Botanical Garden. Previous Congresses were held in 1992 and 2002, and 2014 is a significant date for the Garden, as it marks the 75th Anniversary of its foundation. This Congress, like the previous ones organized at the DBG, were extremely well organized and, as always, provided an excellent opportunity for positive interaction among people interested on the study and conservation of succulent plants. As indicated in the Program reproduced here, the Congress included a keynote speaker, oral and poster presentations, exhibits of botanical art and bonsai, and a fieldtrip to the Grand Canyon. In addition, a tour to the remarkable collection of the Wallace Desert Gardens was organized.

The Desert Botanical Garden and IOS are very closely related organizations because their goals are highly convergent. For several decades, both organizations have been working towards the same purpose: to advance in research and conservation of succulent plants. On behalf of the Executive Board, I would like to express our thanks and appreciation to Mr Kenneth Schutz, Executive Director of the Desert Botanical Garden, for making available to the Congress the Garden's facilities and amenities. Also, special thanks to Raul Puente, Andrew Salywon, Wendy Hodgson, Christina Carlson, and members of Garden's staff and volunteers for taking care of all the details of the organization of the Congress.

Over the last few years, the IOS Board was under severe tension as a consequence of unfounded criticism of the IOS management, emitted by a member of the Board. As a result, the Board turned nearly dysfunctional during several months before the Congress and the situation caused considerable confusion among the membership. Fortunately, however, the current Board for the 2014–16 biennium has changed composition and normal conditions have already been restored for a constructive environment and positive interaction. The current IOS Board is in the best disposition to work towards the fulfilment of the substantive goals of our organization: to promote the study and conservation of succulent and allied plants and to encourage international collaboration amongst those interested in them.

Due to the fact that most members of the IOS Board were not able to attend the Congress, there was not a quorum for the customary meeting of the Board. Consequently, arrangements have already been made to hold a meeting of the new Board on 26 September 2014, at the Museum of Natural History in Paris, France.

Héctor M. Hernández

33rd IOS Congress, Desert Botanical Garden, Phoenix, Arizona 8–11 April 2014

Programme

Tuesday 8 April 2014

- 08:00-9:15 Registration Coffee and light refreshments
- 09:15 Welcome: Ken Schutz, Executive Director, Desert Botanical Garden
- 09:30 President's address: Héctor M. Hernández
- 09:45 Keynote Presentation: Gideon Smith
- Southern Africa: a hotbed for diversification of aloes, their kin, and other succulents
- 10:45 Break light refreshments

11:00-13:00 Ecology, Physiology & Reproductive Biology

- 11:00 Annual bloom production of the saguaro cactus (*Carnegiea gigantea*) Pima County, Arizona, U.S.A. *William D. Peachey*
- 11:30 Do functional tradeoffs in succulent stems predict responses to climate change in columnar cacti? *Kevin Hultine, David G. Williams & David L. Dettman*
- 12:00 Growth, water uptake, and water loss in three populations of saguaro across a rainfall radient *David L. Dettman, Nathan B. English, David G. Williams, Kevin R. Hultine & Owen K. Davis*
- 12:30 Reproductive biology of *Discocactus placentiformis* (Lehm.) K. Schum. and *Discocactus pseudoinsignis* N.P. Taylor & Zappi: globular cacti species endemic from the "Espinhaço Mountain Range" in southeastern Brazil

Yasmine Antonini, Reisla Oliveira & Rodrigo Assunção Silveira

- 13:00 Lunch
- 14:30 Free time
- 16:00 IOS Members' General Meeting
- 17:00 Poster session and scientific illustration exhibit
- 18:00 Cocktail Reception on Ullman Terrace
- 19:00 Welcome dinner on Ullman Terrace; entertainment by the Duncan Family

Wednesday 9 April 2014

- 09:00 Coffee and light refreshments
- 09:30-13:00 Opuntioideae and Asparagaceae
- 09:30 Phylogenetic relationships and morphological evolution in *Opuntia* s. str. and closely related members of tribe Opuntieae. *Lucas Majure & Raul Puente*
- 10:00 David Griffiths: *Opuntia* collector extraordinaire and his legacy *Raul Puente, Marc Baker & Lucas Majure*
- 10:30 New insights into the evolution of aloes Olwen M. Grace
- 11:00 Break light refreshments
- 11:30 Agave L. (Agavaceae/Asparagaceae) and its relatives in southern Africa Gideon F. Smith, Estrela Figueiredo, Neil R. Crouch & Ronell R. Klopper
- 12:00 Cultural plants and cultural landscapes: pre-Columbian agaves in the southwestern United States *Wendy Hodgson & Andrew Salywon*
- 12:30 Molecules and morphology: New data on the agaves of Arizona, U.S.A. *Andrew Salywon & Wendy Hodgson*
- 13:00 Lunch



Participants at the 33rd IOS Congress, Desert Botanic Garden, Phoenix, Arizona, April 2014 photo: courtesy of Andrew Salywon

Wednesday 9 April (continued)

14:30-17:30 Conservation & Systematics

- 14:30 Illegal sale and trade of native plants Robert Vaitkus
- 15:00 Authorized consumption without authorized cultivation: effects of the absence of regulatory structure in the conservation of *Lophophora williamsii Martin Terry, Keeper Trout & Bennie Williams*
- 15:30 Trading paraphyly by monophyly: infrageneric limits in *Echinocereus Rolando T. Bárcenas & Héctor M. Hernández*
- 16:00 Break light refreshments available
- 16:30 The family Cactaceae in Guatemala Mario E. Veliz
- 17:00 Genetic investigations hold promise for resolution of difficult relationships among red-flowered hedgehog cacti, *Echinocereus* section *Triglochidiatus Shannon Fehlberg, Jessica Allen & Kathy Church*
- 17:30 Evening free

Thursday 10 April 2014

08:00-13:00 Mid-Congress Field Trip to the Wallace Desert Gardens

- 08:00 Meet at Desert Botanical Garden
- 08:30 Depart for Wallace Desert Gardens Light breakfast on site
- 13:00 Lunch at Desert Botanical Garden
- 14:00-16:00 Tour of Desert Botanical Garden: Main trails and greenhouses (including the new Kattermann collection) with *Scott McMahon, Raul Puente & Wendy Hodgson*
- 16:00 Evening free

Friday 11 April 2014

- 08:00 Coffee and light refreshments
- 09:30-13:00 Horticulture
- 09:30 History of the Kattermann collection Fred Kattermann
- 10:15 The potential use of xerophytic Dhofari plants in amenity landscapes *Ian Oliver*
- 10:45 Study, conservation and enhancement of botanical collections of succulent plants at the Hanbury Botanical Gardens, Italy *Alessandro Guiggi*
- 11:15 Break light refreshments
- 11:30 Creating bonsai trees using succulent plants Tom Gatz
- 12:00 Rock gardening with cacti and succulents Michael Chamberland
- 12:30 Challenges of growing cacti in the Phoenix area Scott McMahon
- 13:00 An update on Cactoblastis cactorum Michael D. Wallace
- 13:15 Lunch
- 14:00 Optional trip to Pueblo Grande Museum (www.pueblogrande.org)
- 18:00 Cocktail Reception on Boppart Patio
- 19:00 Farewell dinner on Boppart Patio, entertainment by Hurt County

Congress Participants

IOS Members

Andrew Gdaniec (Alameda Botanic Gardens, Gibraltar)

Olwen Grace (Royal Botanic Gardens, Kew, England)

Malcolm Grant (Pukekohe, New Zealand)

Carlos Gómez-Hinostrosa (Instituto de Biología UNAM, Mexico)

Alessandro Guiggi (Hanbury Botanical Gardens, Italy)

Héctor M. Hernández (Instituto de Biología UNAM, Mexico)

Fred Kattermann (Wantage, New Jersey)

Donald Pinkava (Desert Botanical Garden, Phoenix, Arizona)

Emiliano Sánchez Martínez (Jardín Botánico Regional de Cadereyta, Querétaro, Mexico) Gideon Smith (South African National Biodiversity Institute, Pretoria, South Africa)

Desert Botanical Garden Representatives

Christina Carlson*, Kathleen Church, Shannon Fehlberg*, Thomas Gatz, Wendy Hodgson*, Kevin Hultine, Kristen Kindl, Scott McMahon, Veronica Nixon, Raul Puente Martínez*, Andrew Salywon*, Ken Schutz, Starr Urbatsch, Joni Ward (**Members of the Organizing Committee*)

Guests

(from countries in alphabetical order)

Yasmine Antonini (Federal University, Ouro Preto, Brazil)

Mario Esteban Véliz Perez (Universidad de San Carlos, Guatemala)

Rolando T. Bárcenas (Universidad Autónoma de Querétaro, Mexico)

José Belem Hernández Díaz (Cadereyta, Querétaro, Mexico)

Maria Magdalena Hernández Martínez (Jardín Botánico Regional de Cadereyta, Querétaro,

Beatriz Maruri Aguilar (Jardín Botánico Regional de Cadereyta, Querétaro, Mexico)

Martha González Elizondo (Inst. Politécnico Nacional-CIIDIR, Durango, Mexico) Kathleen Grant (New Zealand)

Abdullah Al Hosni (Oman Botanic Garden, Sultanate of Oman) Ian Oliver (Oman Botanic Garden, Sultanate of Oman) Cathy Babcock (Boyce Thompson Arboretum, Arizona, USA) Lee Brownson (Wallace Desert Gardens, Scottsdale, Arizona, USA) Michael Chamberland (Tucson Botanical Gardens, Arizona, USA) David Dettman (University of Arizona, USA) Lucas C. Majure (University of Florida, Gainesville, Florida, USA) George Montgomery (Arizona-Sonora Desert Museum, Tucson, USA)) Bill Peachy (Tucson, Arizona, USA) Gonzalo Ruiz (Boyce Thompson Arboretum, Arizona, USA) Mary A. Swaty (Central Arizona C&SS, Arizona, USA) Martin Terry (Sul Ross State University, Texas, USA) Michael Wallace (United States Department of Agriculture, USA)

Impressions of the Congress

Olwen M. Grace Jodrell Laboratory, Royal Botanic Gardens, Kew, Surrey TW9 3AB, United Kingdom

The biennial IOS Congress is the occasion where members present their latest findings in the study of the world's succulent plant diversity and think about future directions. On this occasion the Sonoran Desert provided a superb backdrop for the event and, for me, days of sun and warmth were an antidote to the long winter in upstate New York where I was on sabbatical at Cornell University.

Congress participants received a warm welcome at the Desert Botanical Garden. We were greeted by a team from DBG's vibrant volunteer community, and directed to the Dorrance Hall where lecture sessions were held, along with displays of succulent-related botanical art, bonsai and research posters.

The programme was structured to allow time for conversation during refreshment breaks and evenings, as well as moments for photography and contemplation. The meeting was opened by Director of the Desert Botanical Garden, Ken Schutz, on Tuesday morning, followed by the IOS President Dr Héctor Hernández. An engaging plenary talk by Professor Gideon Smith on invasive and naturalized New World succulents, illustrated how the celebrated native plants of one part of the world are the subject of conservation efforts and eradication efforts elsewhere. Other programme highlights included Wendy Hodgson's talk on the systematic botany of Agave in the American south west and the influence of human migration on their present-day distribution and complex taxonomy. Fred Kattermann gave an entertaining travelogue describing a lifetime of field work collecting cacti, clearly illustrating the capacity for individual succulent collectors to contribute to the taxonomy, documentation and conservation of succulents. Fred's talk demonstrated the role of well-curated living collections – something close to my heart – in plant conservation. Habitat loss and land use changes have caused the demise of several populations collected and photographed by Fred, and I estimate that for certain species, the genetic diversity represented in his well-sampled collection is arguably now broader than in nature. The Kattermann collection recently arrived at the Desert Botanic Garden after an epic road trip across the United States in an exceptionally severe winter. This important addition was celebrated at the Congress with guided tours of the collection given by Fred himself. Besides enjoying the visitor experience and behind-the-scenes views of the Desert Botanical Garden, Congress participants toured the impressive collections of the Wallace Desert Gardens in northern Scottsdale during the mid-week break in the lecture sessions.

Thematic sessions grouped talks by subject to provide useful overviews of taxonomic groups (agaves, cacti, 'other' succulents) and fields (reproductive biology, ecophysiology, conservation, systematics, horticulture). This may have been why physiologists dwindled after day one, and

those interested in growing succulents increased as the week wore on. The programme, however, could not account for the poor turnout at the business meeting on Tuesday afternoon, with just seven members in attendance. Recent tensions over the IOS Board structure and financial reporting likely dissuaded some members from attending the meeting and the Congress altogether, at the very time when members' support and active discussion are most needed. The Board was represented only by Dr Héctor Hernándes, while reports from the Secretary and Treasurer were read at the meeting in their absence. Nonetheless, the meeting was productive and provided useful opportunity for discussion about matters that will affect the future of the IOS, such as funding and web presence, as described in the minutes from the meeting.

Looking forward

In the convivial atmosphere at the Desert Botanic Gardens, acquaintances were formed, friendships cemented, and avenues for future work explored. As a first-time participant, I was left with no doubt of the relevance of the IOS and its potential to support the pressing need to document and conserve the world's flora. The challenge lies in harnessing this potential.

There are tremendous opportunities to enhance the influence of the IOS on research on succulents around the world, honing attention on the most threatened species and investing in expertise that fuels momentum. Currently, there are members doing excellent work who are not visibly active in the IOS and there are excellent studies of succulent plants by non-IOS members. The IOS was formed with the intention of advancing research and cooperation among succulent specialists; historically many of these experts resided in Europe and North America and, to stay current as this changes, the IOS needs place attention on cultivating links among succulent experts where species diversity is highest. An inclusive, diverse IOS membership will inspire continued change by supporting excellent studies of the world's succulent flora.

The benefits of local and international collaboration to botanical research and horticulture are well known: knowledge exchange, shared resources and ways to tackle large, complex questions across geographical regions and taxonomic groups. The IOS has a firm track record of supporting the study of New World succulents, and those successes can now be applied to supporting projects elsewhere, particularly in Africa and Madagascar. A funding strategy to guide decisions on eligibility and grants will help the IOS prioritise its resources and maximise impact towards understanding succulent plants and their conservation. The scale and scope of most IOS-funded studies are ideal 'seed' projects which often pave the way for large research grants, and allow students and non-professional succulent experts to complete discreet studies which are immensely valuable in steadily pushing forward knowledge frontiers.

The IOS is in an extraordinary transition phase. This is the moment to render the IOS stronger than ever in nurturing succulent plant experts and having real, positive impact on the study of succulent plants.

New IOS Members

We are pleased to welcome the following new members who have joined since the Congress:

Lucas C. Majure Ronaldo Bárcenas Andrew Salywon

Abstracts and Summaries of Congress presentations

Reproductive biology of *Discocactus placentiformis* (Lehm.) K. Schum. and *Discocactus pseudoinsignis* N.P.Taylor & Zappi: globular cacti species endemic from the "Espinhaço Mountain Range" in southeastern Brazil

Yasmine Antonini (antonini.y@gmail.com), Reisla Oliveira & Rodrigo Assunção Silveira Federal University of Ouro Preto, Ouro Preto, Minas Gerais (Brazil)

Discocactus is a genus of just 14 species of globular Brazilian cacti most notable for the nocturnal white tubular flowers. The species are associated to outcrop fields mainly on cliffs and ledges of crystalline rocks on Espinhaço Mountain Range, Minas Gerais State. The present work reports preliminary results focusing on the floral biology, reproductive system, and floral visitors to Discocactus placentiformis and D. pseudoinsignis at Rio Preto State Park, Minas Gerais, Brazil. The two species are on the IUCN list as vulnerable and endangered, respectively. Both species flower at the end of dry season (September-October). The treatments were conducted on 450 flowers from 140 individuals of D. pseudoinsignis and 230 flowers of 42 individuals of D. placentiformis. With the exception of controls, all flowers were bagged in the bud stage with voile bags. We bagged the flowers of all treatments (including for diurnal and nocturnal visitors) after anthesis in order to protect the fruit from possible predation. We determined the breeding system success based on the fruit production in each treatment. Pollen is available and the stigma is functional during anthesis as a whole, from between 19:00-22:00h and 6:00-09:00 flowing morning for both species. Visits were recorded during the day by bees (only *Apis mellifera*) coleoptera and some ants and during the night by sphingidae moths. In both species spontaneous and manual self-pollination did not produce fruits. The ratio of fruits formed by cross-pollination was quite high: 80% for D. pseudoinsignis and 72% for D. placentiformis. The ratio of fruits formed for control experiment was of 30% for both species. Fruits were intensely predated by ants. This result indicates that the predominant reproductive system in both species is allogamy, and that its reproduction depends on the efficiency of the pollen-vectors.

Acknowledgments: CAPES-PRODOC, CNPq, FAPEMIG, Forest Institute of Minas Gerais State (IEF-MG).

Trading paraphyly by monophyly: infrageneric limits in Echinocereus

Rolando T. Bárcenas¹ (rtenoch@uaq.mx) & Héctor M. Hernández² ¹Laboratorio de Genética Molecular y Ecología Evolutiva, Campus Aeropuerto, Facultad de Ciencias Naturales, Universidad Autónoma de Querétaro, Querétaro, Mexico; ²Departamento de Botánica, Instituto de Biología, UNAM, D.F., Mexico

Echinocereus has been treated as monophyletic despite its paraphyletic nature and no previous study has tested its infrageneric taxonomy with molecular datasets. The majority of the species of *Echinocereus* have not been questioned as members of the genus, with the exception of *E. pensilis* whose generic affiliation has been debated. The anomalous *E. pensilis* has been postulated as the most basal sister species to the core *Echinocereus*. However, the inclusion of *E. pensilis* into *Echinocereus* renders an otherwise strongly supported monophyletic group into a paraphyletic taxon and obscures the recognition of diagnostic characters that could provide evidence for evolutionary studies. The twofold objective of the present study is to confirm the monophyly of *Echinocereus* based on the analysis of the psbA-trnH and the trnK/matK sequence data and to test the current infrageneric taxonomy. Sequences produced for the psbA-trnH were carried out for 51 terminal taxa of *Echinocereus* including *E. pensilis* and various outgroup taxa.

Previously generated trnK/matK sequences were added to the newly generated psbA-trnH dataset and analysed under a Bayesian search of 10 million generations. The analysis of the 2939 bp matrix recovered a paraphyletic *Echinocereus* with only two sections being monophyletic. We concluded that a sensu stricto *Echinocereus* should be recognised excluding *E. pensilis* from the genus in order to circumscribe a fully and strongly supported monophyletic group without any impact in its nomenclature since many valid alternative names already exist for *E. pensilis*. The current study demonstrates that most of the infrageneric groups proposed for *Echinocereus* are not recovered as monophyletic. However, we refrain from proposing a new classification since further analyses are still necessary in order to increase our understanding of the group with greater resolution.

Rock gardening with cacti and succulents

Michael Chamberland (horticulture@tucsonbotanical.org) Tucson Botanical Gardens, Tucson, Arizona (USA)

Cacti and succulents in their native habit often grow among rocks. Sometimes they seem to grow straight out of solid rock. Rocks are important to consider when designing a naturalistic display of cacti & succulents. The art of rock gardening has been pioneered by growers of alpine plants. In spite of the close association between desert plants and rocks, the interaction is rarely brought to full potential in cactus and succulent horticulture.

Boulders, rocks and gravel are each important to shaping and covering a growing space. They may occupy more area than the plant material on display. The employment of these elements is more than decorative. Properly placed stones can provide shade, direct water flow, and create microclimates. Building a cactus and succulent rock garden begins with choosing a proper site. Inclusion of non-succulent desert plants is often desirable for the creation of shade and variety. A backbone of boulders and large rocks should be built prior to planting, while smaller rocks are added after planting. Large rocks can be expensive. Proper handling and transport of rocks is essential for worker safety and protection of rock surfaces.

Growth, water uptake, and water loss in three populations of saguaro across a rainfall gradient

David L. Dettman¹(dettman@email.arizona.edu), Nathan B. English², David G. Williams³, Kevin R. Hultine⁴ & Owen K. Davis¹

¹Dept. of Geosciences, University of Arizona, Tucson, Arizona, USA; ²School of Earth and Environmental Science, James Cook University, Townsville, Queensland, Australia; ³Dept. of Botany, University of Wyoming, Laramie, Wyoming, USA; ⁴Desert Botanical Garden, Phoenix, Arizona, USA

We monitored growth and stem diameter of saguaro cactus (*Carnegiea gigantea*) over six years from three sites with different rainfall regimes in Arizona. Micro-meteorology stations at each site recorded local temperature, humidity, rainfall, and soil moisture. The most arid site, Kofa National Wildlife Refuge experiences infrequent rainfall, and is on the edge of saguaro's distribution, limited by aridity (170 mm/year). The wettest site (333 mm/year), Cave Creek Regional Park, Phoenix, receives more winter rain than summer rain. Tumamoc Hill, Tucson (284 mm/year), receives the majority of its rain in the summer monsoon. Monitored saguaros are single stemmed plants from 80 cm to 5 meters tall. Diameters were measured at a single height, approximately 1.5 meters above ground surface. Growth was tracked by painting apical spines with durable fabric paint in the spring of each year. The spines retain the colored paints yielding

detailed growth records. Bomb-spike 14C measured in spines is also used to document the height of plants and growth rates.

The minimum diameter in saguaro usually occurs in June, just prior to monsoon rains. A second minimum occurs prior to winter rainfall. This bi-modal pattern suggests that water usage for flowers and fruit, which grow in the pre-monsoon period, is dependent on winter rain. In contrast, somatic growth, occurring later in the year, is more dependent on successful monsoon rainfall. Evidence for this is seen in the higher growth rates for Tumamoc Hill saguaro in comparison with those at Cave Creek. Although Cave Creek receives more total annual rainfall, Tumamoc Hill receives the most monsoon season rain of all sites. Freezing winter temperatures can reduce annual growth rates even when rainfall is adequate for monsoon season growth. Seasonal water loss, measured by changes in stem diameter, ranged from 20% to 60% of maximum water volume.

Genetic investigations hold promise for resolution of difficult relationships among redflowered hedgehog cacti, *Echinocereus* section *Triglochidiatus*

Shannon Fehlberg (sfehlberg@dbg.org), Jessica Allen & Kathy Church Desert Botanical Garden, Phoenix, Arizona, USA

The primary goal of this project was to examine genetic relationships among Echinocereus arizonicus subsp. arizonicus and other closely related species in order to provide essential information that will aid in the proper identification of this species and begin to clarify long-standing taxonomic confusion in the group. Thirty-one populations representing all focal taxa (E. arizonicus subsp. arizonicus, E. arizonicus subsp. nigrihorridispinus, E. coccineus, E. santaritensis, E. triglochidiatus var. mojavensis, and E. triglochidiatus var. triglochidiatus) were visited, and 150 spine and/or floral tissue samples were taken. Data for one nuclear and two chloroplast DNA sequence regions and four nuclear microsatellite regions were obtained for a subset of samples and combined with data from a previous E. arizonicus subsp. arizonicus study (16 populations). Results presented here indicate that there are at least three distinct genetic groups based on shared multilocus haplotypes in this study system: the diploid *E. arizonicus* subspecies, the diploid E. triglochidiatus varieties, and the tetraploid E. coccineus and E. santaritensis, and there is some level of genetic differentiation among populations and taxa. Although these results should be considered preliminary because of their limited scope, they do provide evidence that continued genetic investigations hold promise for resolution of the difficult relationships among red-flowered hedgehog cacti, Echinocereus section Triglochidiatus.

Creating bonsai trees using succulent plants

Tom Gatz (tommygatz@cox.net) Desert Botanical Garden, Phoenix, Arizona, USA

Succulent plants with woody stems and small leaves are ideal candidates for bonsai display in shallow pots because they require minimal water and many species thrive in full sun, even here in the Sonoran Desert. Traditional bonsai techniques applied to succulents, such as those in the genera *Adenium, Bursera, Euphorbia, Ficus, Fockea, Operculicarya, Pachycormus, Pelargo-nium* and *Portulacaria*, among many others, can result in interesting miniature specimens that resemble trees growing in nature. An overview of specimen selection, wiring, styling, potting media, pairing pots and plants, and staging will be presented.

New insights into the evolution of aloes

Olwen M. Grace (o.grace@kew.org) Jodrell Laboratory, Royal Botanic Gardens, Kew, Surrey (UK)

Aloes are among the most charismatic of the Old World succulent plant groups. The collective term 'aloes' refers to over 600 species in Aloe and the recently-circumscribed genera Kumara, Aloidendron and Aloiampelos native to Africa, Madagascar, the Arabian Peninsula and Indian Ocean islands. Tremendous diversity of taxa and high levels of endemism add to their appeal as collectibles, but challenge systematic studies of aloes. Research efforts over the last century have accumulated substantial descriptive information about the leaf exudate chemistry, cytology and morphological features in Aloe and related alooids. The interpretation of such characters in the classification of aloes has been problematic, due to apparent convergence, hybridisation and a complicated taxonomy. Consequently, little was known of when and where the aloes evolved. A dated phylogeny based on nuclear and plastid DNA sequence data for approximately 40% of aloes, representing their morphological diversity and geographical extent, provides new insights into the evolutionary history of aloes. In this paper I will present the findings of recent phylogenetic and biogeographical studies, and revisit previous research milestones in the context of this new evolutionary hypothesis for the aloes.

Study, conservation and enhancement of botanical collections of succulent plants at the Hanbury Botanical Gardens, Italy

Alessandro Guiggi (alessandro.guiggi@edu.unige.it) Hanbury Botanical Gardens, University of Genoa, Genova, Italy

The Hanbury Botanical Gardens is world-renowned for its collection of plants. This study aims to preserve and enhance the Hanbury collections of succulents and the gardens themselves, within the framework of guidelines drawn up by the International Organization for Succulent Plant Study (IOS) and the European Strategy for Plant Conservation (ESPC). The project pays particular attention to the family Cactaceae, the main object of study by Alwin Berger when he worked at Hanbury. This study also aims to monitor the presence of several taxa belonging to this family that are naturalized in the Mediterranean area.

The project aims to create a continuum with the recent past, by achieving the following objectives:

- 1. to census of taxa belonging to the families of succulents
- 2. to create cards for each taxon
- 3. to collect seeds and reproduce the various taxa for preservation and horticulture
- 4. to combat the spread of pests through biological control and/or chemicals means
- 5. to enhance the collections through the acquisition of material with locality data from botanical gardens, specialists and in the field research
- 6. to create a collection of naturalized cacti with scientific and educational purposes;
- 7. to implement a database to monitor the cacti in the Mediterranean
- 8. to publish a monograph on the collection of succulent plants of the Hanbury Botanical Gardens
- 9. to establish and strengthen the relations with IOS and other scientific institutions

Cultural Plants and Cultural Landscapes: Pre-Columbian Agaves in the Southwestern United States

Wendy Hodgson (whodgson@dbg.org) & Andrew Salywon (asalywon@dbg.org) Desert Botanical Garden, Phoenix, Arizona, USA

Agaves ("century plants") have played an important role in peoples' lives for thousands of years, providing food, beverage, fiber and many other uses. However, their importance to southwestern pre-Columbian cultures is not well understood. Archaeologists provided evidence that an unknown agave was extensively cultivated outside Mexico north of Tucson, Arizona, dating from AD 700. The Hohokam agave (*Agave murpheyi* Gibson) has long been suspected to be a pre-Columbian domesticate, still surviving in the landscape today. Desert Botanical Garden scientists recently found and described four additional species new to science, believed to also be pre-Columbian domesticates. They are the Tonto Basin agave (*Agave delamateri* Hodgson & Slauson), Phillips' agave (*Agave phillipsiana* Hodgson), Sacred Mountain agave (*Agave verdensis* (Hodgson & Salywon) and Page Springs agave (*Agave yavapaiensis* (Hodgson & Salywon). Four of the five are found only in Arizona, and all may have originated in northern Mexico and traded as far north as the Grand Canyon. They are living artefact – plants seen today are remnants of populations once farmed several centuries ago. Garden researchers, in collaboration with other scientists, are investigating their origins, affinities, and possible roles in pre-Columbian cultures, as well as potentially new cryptic taxa.

Do functional tradeoffs in succulent stems predict responses to climate change in columnar cacti?

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Columnar cacti occur naturally in the driest and least productive desert regions of sub-tropical America. Massive amounts of water and other resources stored in the succulent photosynthetic stems of these species confer a remarkable ability to grow and reproduce during the intensely hot and dry periods experienced during the lifetime of these charismatic plants. Stems in columnar cacti and other cylindrical stemmed cacti are morphologically diverse; stem volumeto-surface area ratio across these taxa varies by almost two orders of magnitude. Here we examine the intrinsic physiological tradeoffs across diverse stem morphologies in species of columnar cacti. We propose that variation in photosynthetic gas exchange, growth and response to stress is highly constrained by stem volume-to-surface area ratio (V:S), establishing a mechanistic framework for understanding the sensitivity of columnar cacti to climate change and drought. Specifically, species that develop stems with low V:S, and thus have little storage capacity, are expected to express high mass specific photosynthesis and growth rates under favorable conditions compared to species with high V:S. But the tradeoff of having little storage capacity is that low V:S species are likely to be less tolerant of long-duration drought compared to high V:S species. We further review the application of stable isotope measurements of cactus spines as recorders of growth, water relations and metabolic responses to the environment across species of columnar cacti that vary in V:S. Taken together, our approach provides a coherent theory and set of observations necessary for predicting responses of columnar cacti to climate change.

History of the Kattermann collection

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1965 I bought a packet of mixed cactus seeds. The same year I built a small greenhouse, not for cacti but for flowers and vegetable plants. There were a few Zygocactus but most were Geraniums, Begonias and others. By 1976 all of the flowering plants were displaced by cacti, most of them in genera from Chile. 1975–76 we hosted an exchange student from Chile. His father knew a Mr Pumpin through the Valparaiso Rotary Club, who in turn introduced us to Walter Jung. Walter Jung was planning a Cactus expedition, which we joined in 1977. In 1979 Gerry and Bea Barad with Ed and Betty Gay joined us on a second expedition with Walter Jung. In 1980 I went again this time by myself. The CSSA Journal published my travel reports. This brought an invitation to the Santa Fe Cactus and Succulent conference. There I met Hubert Earle, the director of DBG. He invited me to use the Library at the DBG to research Chilean cactus descriptions. I spent a week in this Library with a courtesy copy machine in the next room. What a wonderful Library. This is also the time that the thought of writing a book about *Erioscve* evolved. In 1986 I attended the IOS congress in Salta. This gave me the opportunity to study the Argentinian species of *Pyrrhocactus*. Roberto Kiesling helped in providing support and CITES permits. Adrianna Hoffmann joined Kathleen and me in our camper on the trip to Salta. Ted Anderson, then Professor of Botany at Whitman College, invited me to do SEM studies of the seeds of Eriosyce. In 1994 a DBG team consisting of Ted Anderson, Joe McAuliffe and Wendy Hodgson joined Kathleen and me on an expedition to Peru to study the Islava group, which I included in *Eriosyce*, the genus revised, published in 1994. I never can give enough thanks to all the people that helped me and especially Nigel Taylor, Daniella (Zappi) Taylor, Robert Wallace and David Hunt, editor/publisher, for their input and work on this book. I continued my field studies of the Chilean Cactaceae to include all the genera and especially the genera in the subfamily Opuntioideae. Part of my Opuntia work is a contribution to a book in preparation by David Hunt on South American Opuntioideae. My most recent venture is the transfer of my field-collected plant to their new home at DBG.

Phylogenetic relationships and morphological evolution in *Opuntia s.str.* and closely related members of tribe Opuntieae

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Phylogenetic analyses of tribe Opuntieae DC., have in recent years, refined the way that we delimit Opuntia s.str. Seven segregate genera within tribe Opuntieae have been recognized based on previous morphological studies, as well as results from phylogenetic data (i.e. *Brasiliopuntia, Consolea, Miqueliopuntia, Opuntia, Salmiopuntia, Tacinga,* and *Tunilla*). Here we underscore the major clades of tribe Opuntieae, with a specific focus on the genus *Opuntia,* analyze morphological evolution throughout the clade, and discuss morphological synapomorphies of individual clades, when known. Polyploidy and hybridization have been major drivers of speciation within the Opuntieae, where polyploids account for nearly 61% of recognized species. Taxonomic implications regarding phylogenetic and cytological studies also are discussed.

Challenges of growing cacti in the Phoenix area

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The climate of Phoenix, Arizona, and the surrounding area presents challenges during significant parts of the year not only for people but also for plants, including cacti. The image most people have of cacti is one of them growing in hot deserts such as seen in westerns or cartoons. The truth is that many species of cacti cannot thrive here without assistance during the long hot summers and occasional hard freezes. Exposure to direct summer sunlight can yellow and burn the tissue of species from cooler climates, requiring placement under trees or in shade structures that provide filtered light. Phoenix sees minimum summer temperatures above 85 deg. F for days or weeks at a time, interfering with the CAM that cacti and succulents use to survive in dry climates. OHard freezes (below 28 deg. F) occur every few years, requiring frost-sensitive cacti to be covered or even heated to prevent tissue damage.

The potential use of xerophytic Dhofari plants in amenity landscapes

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The flora of the Sultanate of Oman is relatively unknown from a landscape perspective. There are approximately 1300 native plant species within Oman. Very few of these plants have ever been used in amenity type plantings before. The south of Oman (Governate of Dhofar) is particularly rich, where approximately 75% of all native Omani species are concentrated in a narrow band along the coast adjacent to the Arabian Sea. The annual summer monsoon, deep canyons and relatively rich soils all contribute to plant diversification and speciation. The flora of Dhofar, due to its limited and erratic summer rainy season, has a number of plants that have a xerophytic nature. Succulent species are relatively common, for example, aloes, stapeliads, cissus, adenium, euphorbia, kalanchoe and even one colony of adansonia. Some xerophytic trees and shrubs include *Commiphora, Boswellia sacra* (Frankincense), *Sterculia* and *Dracaena serrulata*.

The flora of Dhofar is partially influenced by western India, western Pakistan and east Africa. Through centuries of trade with these areas, many plants have been introduced. In other cases it may be assumed that certain genera were evolving in the region prior to the continental drifts, for example, aloe, commiphora and adenium. The xerophytic and succulent flora of Dhofar hasmany interesting forms and shapes and, most importantly, are water wise, which is a bonus when using them as subject plants in amenity landscapes. In the Gulf region, landscaping with native Arabian plants is only in its infancy. There are opportunities in the larger metropolis of Abu Dhabi, Doha and Dubai. In these areas massive transformation in land use is taking place. Urbanization and residential areas are springing up at a very fast rate. The time is now right to add a new and exciting dimension to amenity landscaping with native Dhofari plants.

Annual bloom production of the saguaro cactus (*Carnegiea gigantea*) in Pima County, Arizona, United States

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Yearly monitoring of saguaro cactus (*Carnegiea gigantea*) bloom production has taken place since 1997 on the "Red Hills Saguaro Plot" (RHSP): an array of adjacent, nominally 10 meter

square, plots (\approx .96 hectare) in Rincon Valley of east-central Pima County, Arizona, U.S. It is situated within an upper Sonoran Desert biome at a mean elevation of 1,073 meters. Over the study interval the total yearly number of reproducing saguaros on the RHSP has varied from a low of 133 to a high of 151 cacti. From 1997–2003 a detailed methodology was derived. Beginning with the 2003 season, for the first time accurate daily bloom rates from a statistically significant population of saguaros began to be recorded at the same daily bloom rate and temporal scales that graphically portrayed major characteristics of the annual bloom for the species.

Presented are bloom records for the years 2003–2013. The rates usually show extreme variations from day to day. Most of that variation is, as yet, unexplained. More remarkable were variations in the year-to-year totals. Production "normally" varied by statistically significant amounts. In turn, that variation was overprinted by five years of very low totals (2004, 2007, 2011–13) due to the effects of discrete weather events. The lowest production of only 97 blooms (and no fruit!) occurred in 2004 due to a drought/heat event in 2003 and the low plot yields of 2007 and 2011–13 were the result of regional severe freeze events that happened in 2006, 2011, and 2013. Production from 2004–2010 that included the drought/ heat event and one freeze events that dropped the average to 5,482 blooms year.

David Griffiths: Opuntia collector extraordinaire and his legacy

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This talk is an historical account of the contributions of botanist David Griffiths (1867–1935) to the study of *Opuntia* spp. and preliminary results of an ongoing reassessment of the species proposed by him, initiated by the authors. Griffiths was born in Aberystwyth, Wales, but emigrated to the United States with his family and grew up on a farm in South Dakota. After graduating from South Dakota Agricultural College in 1892 and receiving his MSc in 1893, he taught science at the local high school in Aberdeen [South Dakota] for five years until he enrolled as a doctoral candidate at Columbia University in 1898. His research at this time was focused on the study of fungi and resulted in numerous published articles on powdery mildews, smuts, ergots and others. After receiving his PhD in 1900, he was appointed professor of botany and botanist at the Experiment Station of the University of Arizona and there began his studies on grasses and other range plants. The following year he joined the Bureau of Plant Industry of the United States Department of Agriculture and for the next 15 years worked as an agrostologist in the Office of Grass and Forage Plant Investigations. This post involved extensive collecting of native pasture grasses, saltbushes, and cacti in the United States and northern Mexico. Griffiths became especially interested in the use of cacti and other xerophytic plants of the Southwest as emergency livestock feed in times of drought. He was also impressed by their economic importance as ornamental plants and assembled a comprehensive collection of species and varieties at the Plant Introduction Garden at Chico, California and San Antonio, Texas including about 3,500 numbers of Opuntia. During his studies between 1904 and 1920, he described and published 103 new species of Opuntia, in the United States and Mexico. Some of these species have been accepted and a large number have been reduced to synonyms by various authors. During this project we are visiting and collecting in type localities in order to relocate his taxa. We are reviewing type specimens, field books and photographs housed at the Herbarium US, the Smithsonian Institution Archives and University of Arizona. Chromosome counts and morphological comparison with related species will be carried out in order to determine its taxonomic placement. Fieldwork includes visiting type localities in the United States and in Mexico.

Molecules and morphology: new data on the agaves of Arizona

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Along with cacti, agaves are iconic and signature plants in the flora of Arizona. Despite the conspicuousness of most agaves (at least when flowering and fruiting) there are still new discoveries to be made relatively close to the large metropolitan area of Phoenix. The origination and diversification of *Agave* sensu lato has been estimated to be recent and rapid, and thus most morphological diversity found within the genus differs by degree and for the most part not by clear synapomorphies. Geographical and ecological provenance is very helpful in understanding and deciphering taxonomic relationships, but is hindered by the long association and movement of agaves by pre-Columbian peoples. Recent fieldwork, new collections and molecular data are providing new insights into several Arizona agaves including *Agave chrysantha*, *A. deserti* subsp. *simplex*, and the putative pre-Columbian domesticates *A. delamateri*, *A. murpheyi*, *A. phillipsiana*, *A. verdensis* and *A. yavapaiensis*.

Agave L. (Agavaceae/Asparagaceae) and its relatives in southern Africa

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The New World genus Agave is a well-known component of the flora of Mexico, Mesoamerica, the southern United States of America, northern South America and the Caribbean. The genus consists of approximately 250 species, which also makes it the most speciose genus of the family Agavaceae as traditionally circumscribed. In the most recent APGIII classification system, Agave and its two dozen-odd generic relatives are included in the subfamily Agavoideae in the family Asparagaceae. At least three genera are widely represented in cultivation in South Africa. Species of these genera, Agave, Yucca and Furcraea, are mostly grown as garden ornamentals and are popular in medium- and large-scale landscaping projects in the country. Several are used as barrier plants, in both urban and rural settings. Over half-a-dozen species of the Agavoideae, including the well-known A. americana var. americana and A. sisalana, have become naturalized in southern Africa and in many areas could easily be mistaken as components of the natural subcontinental flora. Agave and Furcraea generally consist of miniature to massive monocarpic, rosulate leaf succulents that multiply by stolons, bulbils that form on the inflorescences, or seed. The naturalized species all have weed-like tendencies and at least some are regarded as invasive and have become problem plants in many parts of the region. The species are vigorous growers and will rapidly colonize both disturbed and undisturbed areas, often displacing the indigenous flora. In their native habitats in Mexico and the southern states of the USA, the uses of the genus Agave and its relatives have been rigorously documented. We reflect on the uses of these plants in southern Africa and update the inventory of the agavoid species recorded as naturalized in the region.

Authorized consumption without authorized cultivation: Effects of the absence of regulatory structure in the conservation of Lophophora williamsii

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Lophophora williamsii (peyote), a cactus of the Chihuahuan Desert, is utilized for medicinal and ceremonial purposes in indigenous cultures of Mexico and the United States. The plant is currently considered "Vulnerable" in terms of its conservation status, due in large part to the overharvesting of wild populations for the last several decades. The situation is exacerbated by the fact that the wild populations constitute the only source of peyote for all the uses by all the groups of legal consumers. Peyote, a bi-national cactus, is subject to the different laws and regulations of the two countries. Up until now, the focus of those legal instruments has been the consumption of peyote - either to prohibit it or to create exceptions to the prohibition in order not to interfere with the traditional customs of the indigenous cultures that use peyote. But there has been practically no governmental concern about the absence of cultivation of peyote to sustain the authorized consumption, despite the clear language in US legislation (AIRFA 1994 Amendments) authorizing rule-making to enable it. Here we present a brief summary of the conservation problems affecting peyote, plus an inventory of the techniques now available for the propagation of peyote. Finally we proffer a rationale for promoting governmental action preferably in both the US and Mexico – to promulgate the appropriate regulations that would provide regulatory structure for cultivation of peyote on a scale appropriate to actual levels of authorized use. The eventual objective is that enough peyote would be produced through regulated cultivation to satisfy the demands of legal consumption. That would likewise make possible the recovery of the decimated wild populations of peyote, as well as the restoration of extinct populations.

Cacti of Guatemala

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Guatemala is floristically highly diverse with roughly 10,645 species. The country has an altitudinal gradient ranging from 0-4220 meters, an area of 108,889 km² and rainfall ranging from 500-4000 mm/year. It is one of three places in the Mesoamerican region with the highest richeness of cacti, the other two are the State of Chiapas (Mexico) and Costa Rica (Arias & Véliz 2006). In the Guatemalan territory there are a total of 27 genera and 82 species of cacti, 48 native species and 4 infraspecific categories, and 30 exotic species. There are 21 native species of cacti (40.38%) that are endemic. Endemism is found locally with the following examples, *Disocactus biformis*, *D. eichlamii*, *D. quetzaltecus*, *Hylocereus escuintlensis*, *H. guatemalensis*, *Mammillaria eriacantha* ssp. *velizii*, Myrtillocactus eichlamii, Opuntia deamii, and Pachycereus lepi*danthus*. Cacti with regional endemism are: *Epiphyllum thomasianum*, *Hylocereus minutiflorus*, *Mammillaria eichlamii*, *Myrtillocactus schenkii*, *Nopalea guatemalensis*, *N. lutea*, *Opuntia deamii*, *O. eichlamii*, *Peniocereus hirschtianus*, *Selenicereus chontalensis*, *S. grandiflorus* ssp. *hondurensis*, *Stenocereus eichlamii* and *Weberocereus glaber*.

The main types of vegetation in Guatemala where cacti are distributed are: Low deciduous forests, this type of vegetation is distributed in dry regions, between 400–1100 meters, the climate is warm, with rainfall of less than 1000 mm/year, there are 13 species of cacti frequently observed such as: *Acanthocereus chiapensis, Mammillaria albilanata, Mammillaria eichlamii, Myrtillocactus schenckii, Nopalea dejecta, Nopalea guatemalensis, Opuntia decumbens,*

Opuntia pubescens, Pilosocereus leucocephalus, Stenocereus pruinosus, S. eichlamii, Selenicereus grandiflorus and S. chontalensis. Deciduous forest with xerophytic plants, with a rainfall less than 600 mm/year, altitudes of 100-500 meters. They are very interesting floristic scenarios, where there are 15 species of cacti which are: Acanthocereus tetragonus, Hylocereus guatemalensis, Mammillaria karwinskiana ssp collinsii, Myrtillocactus eichlamii, Nopalea guatemalensis, N. lutea, Opuntia deamii, O. decumbens, O. pubescens, Pereskia lychnidiflora, Melocactus curvispinus, Pachycereus lepidanthus, Peniocereus hirschtianus, Stenocereus pruinosus and S. eichlamii. Medium evergreen forests of temperate lands located from 1200-2500 meters, with frequent fog and abundance of ferns, mosses and epiphytes, with 8 species of epiphytic cacti: Epiphyllum crenatum, E. thomasianum, Disocactus biformis, D. eichlamii, D. nelsonii, D. quetzaltecus, D. speciosus ssp. speciosus and D. speciosus ssp. cinnabarinus. Oak and pine forests are very common between 1500 and 2800 meters in the Guatemalan highlands where there rainfall is of 1500-2000 mm/year. Often seen are: Disocactus speciosus ssp. speciosus, D. speciosus ssp. cinnabarinus, Epiphyllum crenatum, Opuntia eichlamii, O. tomentosa, and Weberocereus glaber. There are no cacti in the pine, bunch grass and subalpine meadows located above 3000 m.

All native cacti in Guatemala are included in the Red List and are included at the Appendices II of the Convention on International Trade in Endangered Species of Flora and Fauna (CITES).

Posters

Two new species of cacti from Mexico and Honduras

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Peniocereus canoensis and *Weberocereus alliodorus*, two new cactus species from the vicinity of Tegucigalpa, Honduras and from the southern slopes of the Sierra Madre del Sur, Oaxaca, Mexico, are described and illustrated. *Peniocereus canoensis* is easily distinguished from the remaining species in the genus by the following combination of morphological characters: monomorphic, green-glaucous stems, and deep-pink, diurnal flowers. The species probably is critically endangered because it is restricted to a small, subtropical dry forest area and because only 6 individuals have been detected in its natural habitat. *Weberocereus alliodorus* is characterized by its three-winged stems with rigid and setose, relatively long spines, relatively large flowers, and fruits with a penetrating onion-like odor.

Cactaceae in Durango, México, diversity and distribution

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The cactus family is one of the most representative and perhaps the most emblematic of Mexico. There is no consensus on the number of taxa that it includes, but it is known that Mexico is the most species-rich country and contains a high percentage of endemic species. We present an updated floristic list of this family for Durango State, as well as a preliminary analysis on the ecoregional distribution of the listed taxa. The information presented here is the result of a comprehensive literature review, revision of the specimens deposited in CIIDIR, ENCB and MEXU

herbaria, and several years of fieldwork in the region. The updated floristic list includes 130 species distributed in 30 genera, corresponding to approximately 20% of species and 40% of the genera of Mexico. These numbers represent an increase of 30% of previously known taxa for the region. Although cacti are generally related to drylands, in Durango only nine genera (31%) are restricted to xeric shrublands (Ariocarpus, Astrophytum, Epithelantha, Escobaria, Glandulicactus, Grusonia, Leuchtenbergia, Lophophora, and Neolloydia); seven are exclusively in tropical forest (Acanthocereus, Hylocereus, Pachycereus, Stenocereus, Pereskiopsis, Pilosocereus and Selenicereus), one in subtropical scrub (Myrtillocactus) and another one in temperate forest (Disocactus). The remaining eleven genera (38 %) are distributed in more than one ecoregion. Regarding the endemisms, we found that only eight taxa (6%) are endemic to Durango and 90 (69%) are endemic to Mexico. The great cactus diversity in Durango is determined by the confluence in its territory of two important cactus ecosystems: the Chihuahuan Desert in the northeast region, and the tropical deciduous and subdeciduous forest on the Sierra Madre Occidental western slope. There is still uncertainty about the current existence in the area of some species, and others are taxonomic complexes; hence, it is important to continue field and laboratory studies.

Mammillaria herrerae Werd. (Cactaceae): Propagation against its extinction in the wild

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Thirty Mammillaria species grow in the state of Querétaro (México). Mammillaria herrerae Werd. (Cactaceae) is the most menaced one. Critically endangered, it has only nearly 400 individuals remaining in wild areas of eastern Querétaro. Due to this severe condition, the Cadereyta Regional Botanic Garden started and sustains a propagation program, as a precautory measure to cope with possible in situ extinction of this emblematic species. We experimented with sexual and asexual methods for efficient artificial reproduction of *M. herrerae*. Using seed propagation, emergence values of 68% were attained at 32 days of sowing. However, since seed is scarce and growing rates are slow, we developed a micropropagation technique that allows up to 8 times multiplication factor every four weeks. The procedure uses half-strength Murashige and Skoog (1962) medium (MS/2), with activated charcoal (1.5g L-1) and no hormones. Rooting and soil adaptation is successful (90-100%). Thirteen different germplasm lines, from wild and cultivated origin, were obtained and tissue-cultured in order to preserve as much diversity as we could collect. Acceptable results were obtained in 6 of these lines (4-6(-8)) shoots per explant every four weeks) and more than 500 hundred plantlets were propagated and adapted to soil conditions in our greenhouse facilities. Germplasm lines are maintained in vitro by constant sub-cultivation from the original material and will be sent to the greenhouses for acclimation as required. The next steps to consolidate our conservation procedure are the evaluation of the genetic diversity of the cultivated plants and the sample transferring of the duplicated flasks to the recently created National Genetic Resource Center for their long-term preservation. Notwithstanding the uncertain future for this species in its habitat, it is our responsibility to fight for its survival and to strive until its wild populations are recovered.

Agavaceae from the state of Querétaro, México: A new collection of the Cadereyta Regional Botanic Garden

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Establishment of botanical collections, documentation and maintenance are some of the principal goals of the Cadereyta Regional Botanic Garden. These collections provide a solid basis for scientific research, in situ conservation, horticultural practices and propagation, educational activities and ecological restoration, among other activities. A new collection was established last year at the Botanic Garden: "Agavaceae of Querétaro". It shows all the taxa of the Agavaceae family in Querétaro, including species of Agave, Beschorneria, Manfreda, Polianthes, Prochnyanthes and Yucca, and has become one of the specialized collections of this family in Mexico. The collection was developed in three annual stages, and the work included: conceptual and landscape design; arrangement of official flora collection licenses; site preparation; field plant collection and curatorial aspects like guarantine and preparation of each individual introduction. The site was arranged according evolutionary criteria, and was divided in zones -one for each genus-. The zone designated for the genus Agave is divided, in turn, in nine subzones, one for each taxonomic Group (Salmianae, Americanae, Dipetalae, Rigidae, Sisalanae, Marginatae, Filiferae, Polycephalae and Striatae). The complete collection has 38 taxa: 28 Agave, 4 Yucca, 1 Beschorneria, 3 Manfreda, 1 Prochnyanthes and 1 Polianthes. Documentation of individuals took place in situ. Data are stored in the database of the Botanical Garden and include records about geographic information, plant morphology, habitat characteristics, phenology, and horticultural recommendations, among others. Curatorial tasks are constantly undertaken at the collection for prevention of pests and diseases, germplasm collection and irrigation, among others. Additional information and products of this collection have been obtained, like information of priority sites for Agavaceae conservation in Queretaro, and identification of ornamental species. A specific group of activities in this collection is also being developed for the environmental education programme at the Cadereyta Regional Botanical Garden.

Mapping the National Cactaceae and Agavaceae Collections: Development of a GIS-augmented plant records system to improve plant record keeping at botanical gardens Veronica Nixon (vnixon@dbg.org) & Kristen Kindle Desert Botanical Garden, Phoenix, Arizona, USA

Botanical gardens require accurate plant records to provide reliable data to the research community. The Desert Botanical Garden has partnered with Missouri Botanical Gardens to create a Geographic Information System (GIS)-augmented Living Collections Management System (LCMS). The project began two and a half years ago with a grant from the Institute for Museum and Library Services. Our Conservation Director, Curator, and Plants Registrar collaborated with Missouri Botanical Garden staff to design one system that could dually represent our botanically and geographically distinct gardens. A GIS Specialist was hired to update the Garden's plant maps using survey grade GPS and store the locations in a GIS. The LCMS is now connected directly to our garden's GIS, ensuring that the two systems are always in synch. Designated as The National Collection of Agavaceae and Cactaceae by the North American Plant Collections Consortium (NAPCC) of the American Public Gardens Association (June 2010), our initial project focus was to map all the specimen of these two families in our living collection. Having an accurate map location for each plant in our collection linked to the corresponding record in our database, provides comprehensive and ready access to information for DBG staff, researchers, and the public, enabling better management, care, and tracking of plants. As we continue mapping the remainder of our garden's collections, the publicly accessible database will also include photographs of thousands of plant species and information on their use and care. As the value of having a GIS-augmented database is demonstrated, we will invite other botanical gardens to add their plant records data.

The creosote bush desert of Querétaro: A priority site for a protected and working bioreserve

E. Sánchez Martínez (esanchez@concyteq.edu.mx), M.M. Hernández Martínez (mhm @concy teq.edu.mx) & B. Maruri Aguilar (bmaruri@concyteq.edu.mx) Jardín Botánico Regional de Cadereyta, Consejo de Ciencia y Tecnología del Estado de Querétaro, Querétaro, Mexico

The small state of Querétaro (11,699 km2) is located in México's Central High Plateau and has a complex plant diversity (circa 4000 species). Its middle portion is an arid zone, phytogeographically related to the Chihuahuan Desert. It sustains five different scrubs; all of them are composed of rich native species assemblages. The creosote bush desert of Querétaro (microphyllous desert scrub) represents the southernmost distribution limit of Larrea tridentata in the northern hemisphere: it occupies an isolated surface of only 39 Km² and gives habitat to 59 botanical families (Asteraceae, Cactaceae, Fabaceae, Koeberlinaceae, Verbenaceae, Zygophyllaceae), 145 genera (Koeberlinia, Larrea, Maytenus, Lophophora, Vachellia, Strombocactus), and 199 species. Even though the protected areas of the state of Querétaro already cover 37% of its territory, this tiny critical biodiversity hot-spot has been neglected, as have other dry zones of the State that remain unprotected. We propose a management plan, based on the general methodology used to integrate this sort of programs for Mexican nature reserves. The document includes: 1. Introduction with background information, history of the site and rationale for protection; 2. Biophysical and social description of the area, highlighting its biotic values and requirements for sustainable use of resources; 3. Management category for the protected area and conservation objectives; 4. Administrative management plan (overview), including necessities of operational research and a proposal for the diversified use of natural resources; 5. General inventories of flora and fauna. We conclude that more focus should be given to the protection of these almost forgotten areas in order to secure its permanence through management and to provide sustainable development opportunities for the people that live there. These are strategic actions for the accomplishment of the Global Strategy for Plant Conservation objectives and the ABS goals of the Nagova Protocol.

Desert Botanical Garden voucher program: Celebrating 20 years of documenting the collections

Joni Ward (jward@dbg.org) Desert Botanical Garden, Phoenix, Arizona. USA

The Desert Botanical Garden (DBG), aside from being a beautiful place to visit, is an institution which holds documented collections of living plants for the purposes of scientific research, conservation, display and education. In keeping with the mission of the DBG, "...to advance excellence in education, research, exhibition, and conservation of desert plants...", the Cactus Voucher

Program (CVP) was started in 1993 by Dr Ted Anderson and Wendy Hodgson, researchers at the Garden. Using the Garden's collections to preserve material for future scientific reference seemed an important step to take to ensure documentation of the gardens nationally recognized Agavaceae and Cactaceae collection for years to come through herbarium vouchers.

One strategic part of the success of this program is training a group of volunteers to implement and continue the collection of specimens, documentation of data needed and the processing involved in making a complete herbarium voucher. Over the twenty years we have had over 25 volunteers participate and help. The program began with the members of the Cactaceae collection which have original collection data. We then expanded the program to include the Agavaceae collection, the Aloaceae collection and our trees and shrubs. The methodology used for collecting specimens and preparing the herbarium voucher will be discussed.

To date the volunteers have completed vouchers on about 1700 different plants. All of these vouchers are part of the herbarium at the DBG and are accessible through SIENet at http://swbio-diversity.org/seinet/index.php. Currently we are in the process of linking the herbarium vouchers to the Living Collections Data Base for the DBG, which can be accessed at www.livingcollections.org. We also hope to have images linked to the Agavaceae and Cactaceae accessions. This program has been crucial in preserving information about the collection at the DBG and has served in many ways to augment the research on these two families.

Report of the General Meeting of Members Tuesday 8 April 2014, 16:00 hrs

Present: The President, Héctor M. Hernández (Chair), Gideon Smith (Past President), Andrew Gdaniec, Carlos Gómez-Hinostrosa, Olwen Grace, Alessandro Guiggi, Fred Kattermann, Donald Pinkava, Emiliano Sánchez Martínez.

Meeting agenda

1. Apologies for absence

The following sent apologies for absence: David Hunt (Secretary) and Sara Oldfield (Treasurer).

2. Obituary

Two IOS members died within the last two years: DR WERNER HOFFMANN (b. 1925) died on April 2nd 2013 (*see IOS Bulletin 15(6): 162*); PROF. GIANCARLO SLEITER (d. 2014) was prominent in the cactus hobby in Italy as President of Associazione Italiana Amatori delle Piante Succulente. He joined IOS at the Congress in Palermo in 1989. The meeting participants stood for a minute of silence.

3. IOS Executive Board meeting 2014

The President informed the participants that due to the fact that most members of the IOS Board were not able to attend the Congress, there was not a quorum for the customary meeting of the Board and handover to the newly elected Board during the Congress. Arrangements would be therefore be made to hold a meeting of the new Board as soon as possible after the Congress, probably in Europe. [*The meeting has since been arranged for 26 September 2014 and will be held at the Jardin des Plantes, Museum of Natural History, Paris, France.*]

Some members were disappointed at the absence of most members of the Executive Board.

4. Secretary's report (read by Olwen Grace)

Having much enjoyed my past visits to the Desert Botanic Garden in 1988, 1992 and 2002, I am sorry not to be present at the meeting today and offer my apologies to the President and IOS members attending, as well as to Dr Schutz and his staff who have invited IOS and made the arrangements for us.

In this brief report I shall not comment on the difficulties experienced during the past biennium by the senior members of the Executive Board, but we are grateful to all those members who registered their confidence in us by re-electing us with clear majorities for a further term of office. Action has already been taken to obviate further misunderstanding and criticism of the Board's management of the organization's finances, and the new Board will be meeting as soon as practicable after the Congress to discuss measures to increase the effective-ness of the Board itself in the 2014–2016 biennium and that of IOS in the achievement of its clearly stated statutory aims to promote the study and conservation of succulent and allied plants and to encourage international collaboration amongst those interested in them.

That is not to suggest that IOS has not already achieved a great deal. Over the past six and a half decades, various significant projects have been initiated by or associated with IOS through the participation of IOS members, and the number continues to grow, as may be seen from the list in the most recent issue of IOS Bulletin (IOS Bull. 15(6):160–162. 2013). Most of the projects have not depended on financial support from IOS, but in recent years the number of grants that we have paid or offered has increased, and grant applications will now be considered up to an individual limit of Euros 2000 and an overall limit of Euros 6000 per annum.

In my previous report I referred to the difficulty of putting a precise figure on the number of members in IOS, and this difficulty remains, for several reasons. IOS does not immediately delist members who do not pay their fees promptly, members who are retired can be excused payment, and others may be excused because of currency restrictions, or they are students or researchers in receipt of grants etc. There are also questions of data protection and general security if members' e-mail addresses are publicized (as they have been) in our Bulletins. These are concerns to be addressed by the new Executive Board before a definitive list of IOS members can be published. Meanwhile, it is with regret that I record the passing of two of our senior members during the past biennium, that of Dr Werner Hoffmann , already mentioned in the last of the Bulletin, and, more recently Professor Giancarlo Sleiter, a former President of the Associazione Italiana Amatori delle piante Succulente (AIAS) and member of IOS from 1989.

David Hunt

5. Treasurer's Report (read by Olwen Grace)

A Summary Statement of IOS Income, Expenditure and Balances for 2012 was published in IOS Bulletin 15(6): 150 (December 2013) and the Summary Statement for 2013, currently subject to audit, is prepared for publication in the next Bulletin issue. These statements custom-arily record and itemize all items of expenditure incurred by IOS.

As stated in a footnote to the 2012 Statement, the end of year (2012) balance in the British Pounds cash account held by the Secretary was transferred in full to the Central Reserve Account on 18 September 2013, and Euros 3500 (= GBP 2863.22) from the Euro account was transferred to the Central Reserve Account on 18 September 2013. These two accounts are temporarily closed pending a decision by the new Executive Board on future arrangements for the payment of membership fees, but fees and donations can be made by bank transfer to the Central Reserve Fund. This currently holds a credit balance of approximately GBP 50,000 (equivalent to US \$ 83,000 or Euros 59,700). Further IOS funds held in Switzerland and the United States are currently equivalent to very approximately GBP 2000.

Sara Oldfield

IOS Accounts for the Year ending 31 December 2013

Summary Statement of Income, Expenditure and Balances

Central Reserve Fund

Central Reserve I	unu
(HSBC a/c opened 07/1	2/2009)
Income	GBP
Interest received 02/06/13	8.28
Transfer from GBP a/c 16/09/13	6016.45
Transfer from Euro a/c 02/10/13	2863.22
Interest received 03/12/13	8.98
Membership fees (2) 31/12/13	48.97
Total	8945.90
Expenditure	
Board expenses (Oldfield)	171.13
Transfer to UK account	413.83
Total	584.96
Balance brought forward 01/01/2013	41463.65
Income less Expenditure	8360.94
Balance carried forward 31/12/2013	49824.59
Regional currency ac	counts
British Pounds (Account Holder: Dr	D.R. Hunt)
Subscriptions (15)	425.00
Rep Pl Succ	100.25
Tfr from IOS HSBC a/c	413.83
Total	1029.08
Expenditure	
Printing IOS Bulletin 15(5)	142.00
Postage RPS/Bull*	52.26
Gottlieb (UBA) grant	437 50
Board expenses (Hernández)	413.83
Transfer to HSBC a/c	6016.45
Total	7062.04
Balance brought forward 01/01/2013	6016.45
	0010.15
Income – Expenditure 2013 (deficit)	6032.96

N.B. Repayments to Dr Hunt for copies of IOS publications (IOS Bull. 15(6) and RPS 63) printed in 2013 have been made in 2014.

Euros (Account holder: Dr R. Bauer, Offenburg)

Income Subscriptions (28)	Euros 1063.00
Total	1063.00
Expenditure	
Mecklenburg refund of donation	300.00
Mecklenburg Board expenses	200.00
Meve Board expenses	200.00
Guerrero grant + bank charges	2032.00
Other bank charges	22.64
Transfer to HSBC a/c	3500.00
Total	6254.64
Balance brought forward 31/12/12	5626.71
Income Expenditure 2013 (deficit)	5191.64
Balance carried forward 31/12/13	435.07
US Dollars (Account holder: Dr R. D	orsch, Houston)
No transactions in 2013	
Balance brought forward 01/01/13	2509.96
Balance carried forward 31/12/13	2509.96
Swiss Francs (Postcheck a/c, holder F	R. Deubelbeiss)
Income 2013	CHF
Subscriptions (14)	516.10
Donations (D. Supthut)	100.00
Total	616.10
Expenses 2012	
Refund	36.00
Bank charge	6.85
Total	42.85
Balance brought forward 01/01 2013	1888.40
Income –Expenditure 2013	573.25
Balance carried forward 31/12 2013	2461.65

Sara Oldfield Hon. Treasurer

Auditors' report

Hereby, we declare that after carefully reviewing the submitted documents, related to the IOS accounting 2013, we found the accounts in order, so we affirm their acceptance. However, we recommend that: (1) All future movement is supported with invoices or receipts; (2) Each of the receipts must be serially numbered. 3 Considering that payments for membership will be annulled, it is opportune to unify accounts, keeping only one possibly based in the United Kingdom (London), on behalf of the IOS. We remain at your service and hope that our organization continues to strengthen. (Signed:) *Carlos Gómez Hinostrosa, Emiliano Sánchez Martínez, Hon. Auditors, 22 July 2014*

6. Cactus d'Or

The President informed the meeting that during last Inter-congress held in Berlin last year, the IOS Board nominated Dr Urs Eggli to receive the Cactus d'Or (given by the Mairie of Monaco) in recognition to his outstanding contributions to the knowledge of several groups of succulent plants. The award will be presented to him at the Jardin Exotique of Monaco in 2015. Participants received the news with great pleasure.

7. Election of Executive Board 2014–2016

The President informed those present about the recent ballot to renew the IOS Board for the period 2014–2016 (*for the scrutineers' certificate see page 28*)

President: The post for President was unopposed.

Vice-President: Dr Mats Hjertson (37) got majority of votes over Dr Ulrich Meve (24). The President welcomed Dr Hjertson in his new responsibility as Vice-President of IOS. In the same way, he thanked Dr Ulrich Meve for his contributions to IOS during the period 2012–2014.

David Hunt (Secretary), Sara Oldfield (Treasurer) and Rainer Mecklenburg (Assistant Secretary) got a majority of votes, so they will remain in their respective posts.

A comment was made regarding the rejection by Rainer Mecklenburg of his re-election as Assistant Secretary. His decision to disconnect the IOS webpage, which he unilaterally regarded as private, was considered as unfair (to say the least).

Fred Kattermann commented that the IOS Board could ask Ingrid Mecklenburg, who actually created the webpage, to "donate" it to IOS. Gideon Smith said that if a new web page has to be created, a mandate should be requested from the members to allocate some money from the IOS funds to pay a designer.

8. Election of Auditors

Two auditors were designated in order to review the IOS expenses during 2013. Emiliano Sánchez and Carlos Gómez were proposed and approved by the participants.

Since Sara Oldfield is expected to visit the Jardín Botánico de Cadereyta (Emiliano's workplace) in the near future, she can bring all the relevant papers (receipts, bank statements, etc.) so Emiliano and Carlos could do the audit in her presence.

It was commented that since the recent events within the IOS Board have created a great deal of confusion and lack of confidence among the membership, absolute transparence should be shown regarding the use of IOS funds.

9. Membership fee 2015-2016

The President mentioned that several members of the Board have the opinion that the members' fee has to be suspended in the near future, at least for a trial period. The rational for this is that:

a) The expenses of IOS have decreased (fewer expenses in postage and printed materials due to a generalized use of internet);

- b) Bank transfers from most countries are costly and complicated;
- c) There is the desire to recruit young members; and
- d) In the long run, income from members' fees may be supplanted by personal donations.

This proposal was fully supported by the members present. However, some relevant ideas were expressed:

a) The IOS should consult an expert in order to improve the management of the funds (better

interest rates, etc);

b) due to the fact that some funds are being used to provide Research grants (currently 6000 Euros per year), a plan should be created to prevent becoming bankrupt in 10 years; and

c) means of receiving donations should be explored.

10. Future Meetings

At present, there are no plans to hold an inter-congress meeting in 2015 or suggestions for a venue for a possible Congress in 2016.

There were no suggestions; however, all members agreed that regular inter-congress meetings should be suspended. Instead, a better planned Congress every two or three years could be more desirable. Inter-congresses could be organized sporadically to discuss particular topics or projects, only when necessary.

The meeting was closed at 17:30 hrs.

Post-Congress Announcements

Post of Assistant Secretary

In accordance with Article 8 of the IOS Statutes, the vacancy on the Executive Board created by the resignation of Rainer Mecklenburg has been filled by the Board's nominee, Christof Nikolaus ('Niko') Schröder (University of Heidelberg, Germany). The Board is grateful to Niko for accepting the nomination and pleased to welcome him in his new responsibility.

IOS Website

Immediately following his unilateral decision to take down the IOS website, requests were made to both Rainer Mecklenburg and his wife Ingrid (who claim private ownership and Copyright of the website) by the President and the Secretary to release our official domain name *iosweb.org* so that it could be re-registered. Regrettably, the Mecklenburgs did not respond. The matter was therefore placed in the hands of ICANN (the Internet Corporation for Assigned Names and Numbers) and their Accredited Registrar. Unfortunately it seems that organization has no power to enforce the domain transfer without the consent of the current registrant. In the circumstances I have now recovered and updated the content of the website as it was prior to 2009 and hope to get it reconstructed, hosted and on-line again as soon as possible.

Proposed membership survey

As a consequence of the Congress's decision to suspend the membership fee for 2015–16, the Membership List will be updated this year by requesting members to respond 'YES' or 'NO' the question 'Do you wish to remain a member of IOS for 2015–16?' and to confirm or update information held by IOS concerning their postal and e-mail address, connection with a relevant institution or botanic garden and current interests. When it has been approved by the Board, the membership renewal invitation will be mailed to all current members later this year.

Future IOS meetings

Please seem my (personal) comments on page 31. Meanwhile, as stated by the President in his message on , page 3, the IOS Executive Board will meet on 26 September 2014 at the Museum of Natural History in Paris, France.

David Hunt IOS Secretary

MASSIMO MEREGALLI LAURA GUGLIELMONE TORINO, March 3, 2014 **IOS BALLOT** Massimo Meregalli and Laura Guglielmone met at 9.00 a.m. in the Herbarium of the Dept. of Life Sciences of the University of Turin to proceed at the count of the votes. Only votes received by letter post from IOS members up to date with the IOS association were counted Sixty-two members sent their vote. Ballots were independently counted twice, and results were identical in the two counts. RESULTS VICE PRESIDENT: MATS HJERTSON 37 votes Ulrich Meve 24 votes blank 1 SECRETARY René Deubelbeiss 23 votes DAVID HUNT **37 VOTES** blank 2 Peter Mansfeld TREASURER 26 votes SARA OLDFIELD 35 votes blank 1 **REINER MECKLENBURG** ASSISTANT SECRETARY 31 votes Christof Schroeder 30 votes blank 1 At 11:00 the count is concluded and the results are recorded. All ballots and accompanying letters are conserved by Massimo Meregalli at the Department of Life Sciences, University of Turin.

Laura Guglielmone

Massimo Meregalli

Review of current projects associated with IOS

(Selected items only, updated from IOS Bull 15(6): 162. 2013)

[1] *IOS Repertorium Plantarum Succulentarum (compiler Urs Eggli)*. Issue no. 64 (for 2013) is in preparation. Printed copies and pdfs of Issue 63 and other recent issues are available via the Secretary.

[2] *IOS and Conservation.* The IUCN-SSC Cactus & Succulent Plants Specialist Group is chaired by IOS President Héctor Hernández with the secretarial assistance of Wolfgang Stuppy. Latterly the Group has been strongly involved in the *Global Cactus Assessment* project led by Dr Bárbara Goettsch.

[3] **Partnership with BGCI and Collections Survey** (Sara Oldfield, Secretary General, BGCI). Whereas our leadership of the IUCN-SSC group has its primary focus on *in situ* conservation matters, our partnership with BGCI is helping us redouble our efforts towards the 'organization and support of Reserve Collections of living plants' as required by Art. 2.e of our statutes. Over 90 botanic gardens have already provided information to BGCI as part of the Initiative including 11 in Mexico. As a practical contribution by IOS members, a first 40-page edition of a booklet on '*Growing Cacti for successful ex situ conservation*'*, based on a dissertation by our member and expert grower Andrew Gdaniec, was published and distributed to all the gardens taking part earlier this year. It is hoped in future editions to increase the booklet's content of practical advice, from experienced growers, on the cultivation of threatened and potentially threatened species. It is also hoped to to extend the concept of 'Reserve Collections' to noteworthy privately owned collections initiative is to ensure that all endangered cacti and succulents are in genetically-representative and well-maintained *ex situ* collections, to support research and species recovery in the wild. (**Copies available from the IOS Secretary*)

[4] **CITES Cactaceae Checklist ed. 3** (compiler David Hunt, Royal Botanic Gardens, Kew). Work is now proceeding on the compilation of this new edition, with the collaboration of numerous IOS and other specialists. The CITES Plants Committee has requested that changes in the list of genera recognized be kept, at this time, to a minimum, so potential changes suggested by molecular studies will mostly be indicated as alternatives, the most prominent exception being the re-division of *Opuntia*, this having become widely accepted, as for instance in the *Flora of North America* (vol.4, 2003). For a report of the recent meeting of the CITES Plants Committee, see next page.

[5] New Cactus Lexicon (compiler David Hunt)

The new edition of the 'Atlas' volume of illustrations published in August 2013 has proved very popular. A revised edition of the text volume is in preparation and will adopt the classification and nomenclature preferred for the new CITES Checklist.

[7] Ritter's Cacti in Colour (David Hunt, Paul Hoxey, Urs Eggli)

It remains the aim to publish this work as a series of fascicles, the first fascicle being devoted to *Copiapoa*, but publication is currently 'on hold' while an attempt is made to improve some of the images.

[8] *Phylogeny of the Andean Opuntioideae* and [9] *Molecular systematics and phylogeny of Opuntia series Armatae and Aurantiacae*. Papers resulting from collaboration beween IOS members in Europe and Argentina will be published shortly in *Succulent Plant Research* vol. 8 *(see page 31)*

[11] *Mapping the Cacti of Mexico* (*Héctor Hernández & Carlos Gómez-Hinostrosa, IBUNAM, Mexico*) All the maps of 155 species of *Mammillaria* are ready, as well as the corresponding texts, the list of specimens, references, index etc (6 July 2014). It remains to compile the Introduction, Methods, and an analysis of the distribution patterns. Publication as *Succulent Plant Research* vol. 9 is anticipated within the year.

Conservation Meetings in Mexico, May 2014

Sara Oldfield

The CITES Plants Committee met in Veracruz, Mexico, on 2–8 May 2014. Amongst the issues discussed was a review of high volume trade in all plants listed on CITES Appendix II. This was undertaken to determine where there might be concern about impact on trade in wild plant populations. Species selected ill be subject to the so-called Significant Trade Review process. Under this process, the export countries are initially asked to give assurances about the level of trade and the management procedures in place. If concerns remain, a series of procedures is introduced, which can, in a few cases, result in an international trade ban. The Plants Committee recommended various succulent plants for inclusion in the Review of Significant Trade. These include *Hoodia gordonii, Carnegiea gigantea, Euphorbia abdelkuri, E. globosa* and *E labatii*.

Another item on the agenda was cooperation between CITES and the Global Strategy for Plant Conservation of the CBD. Target 11 of the GSPC specifically links to CITES by calling for "No species of wild flora endangered by international trade". CITES activities also support many of the other GSPC targets and this will be acknowledged in a major review of the GSPC to be discussed at the CBD Conference of the Parties in October 2014. A side event organized by BGCI during the Plants Committee highlighted some of the practical mechanisms for supporting both CITES and the GSPC.

The international policy framework for plant conservation is extremely important, as recognised and supported by IOS for over 40 years, but has no impact without effective implementation and action on the ground. During the CITES Plants Committee meeting a poster display highlighted the many ways that Mexican botanic gardens are directly supporting the conservation of cacti and other succulents.

A poster by staff at the Cadereyta Regional Botanic Garden, "Ing. Manuel González de Cosío", for example, displayed work on *Yucca queretaroensis*. The Mexican CITES Scientific Authority (CONABIO) commissioned the Garden to carry out a detailed study of this species following concern expressed by the CITES Plants Committee. The main goals of the study were to evaluate the conservation status and uses of *Y. queretaroensis* and the threats it faced, assessing suitability for inclusion in CITES Appendix II. Results of the study confirmed that *Y. queretaroensis* is a very rare species which occupies less than 1% of Mexico's territory. Its distribution occurs in fragmented populations with a very low density. Illegal international trade has been a major threat. Cadereyta Regional Botanic Garden's research supported the inclusion of *Y. queretaroensis* in CITES Appendix II in 2013. This highly attractive species is one of of 85 threatened plant species grown at the Botanic Garden. Integrated conservation is required to ensure that *Y. queretaroensis* is safe in well-managed collections – as at Cadereyta – and in the wild.

During that of the CITES Plants Committee, the Mexican Association of Botanic Gardens also held a meeting in Veracruz The Association has been operating since 1983 and is currently an important element for the implementation of the Mexican Strategy for Plant Conservation and its counterpart the GSPC. The Association's collections consist of more than 5,000 native species, 20% of Mexico's plant biodiversity. 441 out of the 985 species listed in the Official Mexican Standard NOM-059-SEMARNAT-2010 are protected by the Gardens of the Association. Mexican botanic gardens also propagate 937 species, 187 of them are endangered species.

Despite the high level of commitment shown by all the Mexican botanic gardens, the Association considered at its recent meeting that it is still necessary to reinforce capabilities in order to ensure that the urgent conservation needs of Mexico are efficiently undertaken. It was agreed that BGCI should strengthen its collaboration with the Mexican Association particularly in relation to developing a national collections database and facilitating practical training for botanic garden staff. As part of this collaboration BGCI will think of ways to ensure effective collection management for cacti and other succulents building on the IOS/BGCI Reserves Collections Initiative.

IOS Meetings: Some comments by the Secretary

As reported at the recent Congress, there are no plans at present to hold an inter-congress meeting in 2015 or suggestions for a venue for a possible Congress in 2016. This is not very surprising, as attendance by IOS members at recent meetings has been disappointing.

Until the 1990s the biennial IOS Congresses were quite well supported but the ease of modern communications via the Internet along with financial stringency and other factors have made them less attractive and accessible. In 2002, the well-organized 27th Congress at the Desert Botanical Garden attracted only about 20 members – less than 10% of the total membership then, and since then the figure has not exceeded about 20 and was less than 10 in Brazil and Cuba (in spite of offers of interesting post-Congress excursions). It should be borne in mind that as no percentage attendance threshold applies to the validity of votes cast at the Statutory Meeting of Members held at Congresses, decisions affecting the management of IOS can be made by the votes of a handful of members (as indeed happened at the Havana Congress).

Since the Brazil Congress, and the last-minute re-location of the planned 2010 Congress in Gran Canaria, I have expressed my personal doubts to the Board concerning the viability of formal IOS meetings, especially if held outside mainland Europe where, at present, the great majority of our members reside. Institutional support to attend such meetings is now very scarce and those able to finance themselves for inter-continental trips often have other destinations and objectives, even if venues are chosen in places with a rich local succulent flora and a post-Congress tour is offered, as in 2008, 2010 and 2012.

In the past 'whistle-stop' tourist-style field-trips could be very enjoyable but nowadays I suspect many of us want to spend longer in a given area and focus on specific issues, taxonomic or otherwise, or perhaps take part in a narrowly defined fieldwork project with local botanists, such as a population survey perhaps or the search for a little known species.

Since 2010, when Jafet Nassar, my counterpart in the SLCCS (Sociedad Lationamericana y del Caribe de Cactáceas y Suculentas), attended the re-located Congress in Bonn, we have frequently discussed possibilities for joint SLCCS/IOS activities. With nothing yet planned by IOS for 2015/16 I very much hope there will be a chance for IOS members to participate in the next SLCCS meeting in South America.

Meanwhile if *YOU* have thoughts on this topic and/or practical suggestions for where, when or why we should try to organize something, please let me know!

David Hunt

Succulent Plant Research Vol. 8: Further Studies in the Opuntioideae

This sequel to SPR 6, *Studies in the Opuntioideae* (Hunt & Taylor eds 2002) is nearly ready for press. As with the earlier volume, the papers contributed concern the systematics of representatives of the subfamily in both North and South America and demonstrate the renewed and welcome interest in the subfamily. Papers include: Phylogenetic relationships and morphological evolution in *Opuntia* s. str. and closely related members of tribe Opuntieae. *L.C. Majure & R. Puente;* Cytogenetic characterization of southern South American species of *Opuntia. M.F. Realini et al.;* A revision of *Opuntia* series *Armatae* K. Schum. (*Opuntia* ser. *Elatae* Britton & Rose). *F. Font;* Northern hemisphere *Opuntia* and *Cylindropuntia* species naturalized in Argentina – and the riddle of *Opuntia penicilligera* Speg. †*B.E. Leuenberger & S. Arroyo-Leuenberger;*Further observations on the Andean Opuntioideae. *C. Ritz & D. Hunt;* Distribution maps of the Andean Opuntioideae. *M. Lowry;* Illustrations and observations of the Chilean Opuntioideae. *F. Kattermann;* A checklist of subfamily Opuntioideae (Cactaceae) in North and Central America. *H.M. Hernández et al.;* A checklist of subfamily Opuntioideae (Cactaceae) in South America and the Caribbean region. *David Hunt*