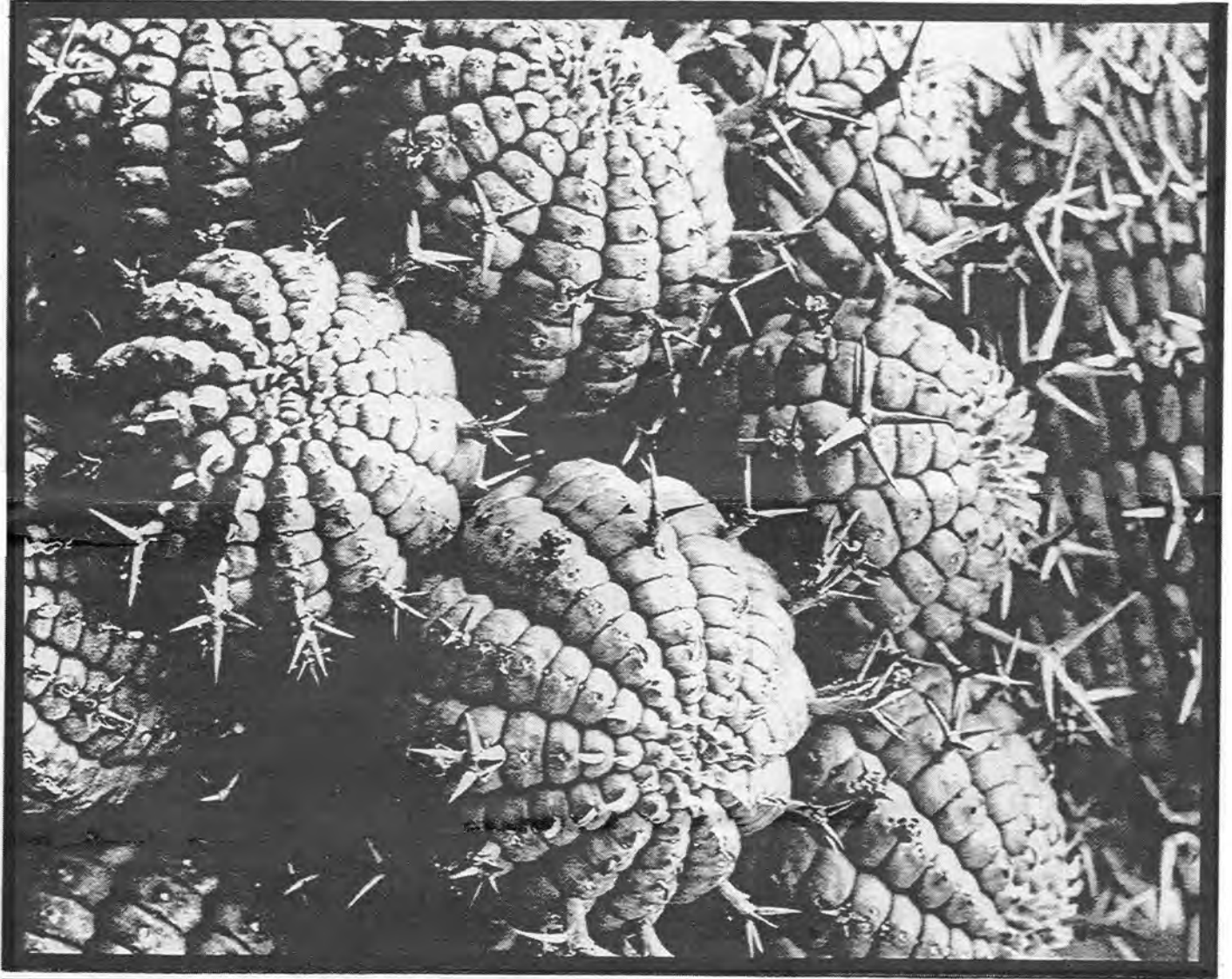


Espinas y Flores

BULLETIN OF THE SAN DIEGO CACTUS AND SUCCULENT SOCIETY
Affiliate of the Cactus and Succulent Society of America, Inc.

VOLUME XXIX NUMBER FOUR, SATURDAY, APRIL 9, 1994 @ 1:00PM



The star-shaped spines of *Euphorbia stellaespina* are actually the dried flower stalks.

MARCH MEETING

Bill Baker of California Gardens Nursery of Reseda, California will present a slide show program on the succulents, Bromeliads, and floral rarities of the Brazilian highlands. Bill, an intrepid explorer, plantsman, and nurseryman is a veteran of the natural history exploration of Mexico, Central America, and South America with numerous trips over the past 25 years. Bill will also have rare plants available for purchase through the SDC&SS plant sales table. See you all there!

★ ★ ★ PLEASE NOTE CHANGE OF ADDRESS ★ ★ ★

CORRESPONDENCE TO THE EDITORS SHOULD BE ADDRESSED TO: M & J BUCKNER, ESPINAS y FLORES, 4822 SANTA MONICA AVENUE, #103, SAN DIEGO, CA 92107
Newsletter editors whom we exchange with - please input this new address ASAP - we miss hearing from you!!! Thanks!

LETTERS TO THE EDITORS:

Dear Michael: Thank you for sending me the Cactus & Succulent Society's Newsletter. Its size and content is impressive. As a retired professor of Entomology from U.C. Berkeley I particularly enjoyed the bit about insects.

I know from experience how difficult it is to obtain speakers for program after program. So, I am sorry that I felt it necessary to pass on your kind invitation.

Some day I may hop on Amtrak for a visit to your fair city. I have not been there since WWII, when I was a Naval aviator and my squadron briefly visited the Naval Air Station on Coronado on a couple of occasions.

With warmest regards, Richard Douth "BIOQUEST"

Since 1980 Richard Douth and his wife Betty have managed Bio Quest International specializing in Cape African Bulbs at their Santa Barbara home and garden. We have treasured every Bio Quest catalog and enjoyed this gentleman's enthusiasm and informative articles. The most recent *Herbertia*, volume 48 #1 & 2, 1992, The Journal of the International Bulb Society published a delightful article: Conservation of Cape Bulbs in which Richard wrote:

"By making seeds available to gardeners, the National Botanical Garden [Kirstenbach] promotes conservation through cultivation. Gardeners can play an important role in the conservation of species that are at risk in their natural habitat. In my garden, for example, there are probably more plants of *Moraea loubseri* than exist in nature. So conservation has many faces ranging from individuals to institutions. All gardeners can participate in conservation through cultivation, and by their efforts they may save choice bulbs that otherwise might be lost forever."

We look forward to Richard's forthcoming publication CAPE BULBS, THEIR CULTIVATION AND CONSERVATION (in July '94).

Thanks to all of you who called or wrote to comment on our special March Insect Issue. It was by far the largest issue of Espinas y Flores ever produced and we're proud of it. The response of encouragement was heartening, especially from other newsletter editors - Carol & Joe Wujcik - ROADRUNNER NEWS (a terrific Cactus & Succulent Newsletter!) and Richard Bernard - San Francisco Cactus & Succulent Society Newsletter. Please remember! we are all working for a common good of bringing people together socially in their interests, hobbies, and most importantly in their education. Contribute what you can, when you can. Always consider the common cause - our society is an organization of people working together for the benefit of all. We are planning a special issue next year (probably in March) specifically about soil mixes: "The Down in the Dirt" issue. Please let us know what you think, and what you might contribute.

Now is the time to be preparing your plants for the June 2-3 Show. Preparation is always a necessity and will make it easier to participate. Fertilize, find the right pot for the right plant, inspect for insects, remove damaged leaves, and research correct plant names and spellings - our librarians Rick & Betty will happily assist you with this endeavor.

Graham Duncan, chief horticulturist of the National Botanical Institute of South Africa will present a slide-show lecture on Thursday, April 7th @ 7:00pm in the Ecke Building of Quail Botanical Gardens. Graham will begin his lecture with a brief exposé of the National Botanical Gardens followed by slides of bulbs in habitat all over southern Africa, particularly Namaqualand, and some of the more attractive species growing at Kirstenbach. He will summarize with a look at the rare and endangered species. Graham Duncan is co-author of Bulbous Plants of Southern Africa. He also co-authored (with Barbara Jeppe) Spring & Winter Flowering Bulbs of the Cape. Graham Duncan is sole author of The Lachenalia Handbook. His latest book will be available for purchase and signing. Some African bulbs in flower will be on display courtesy of Jim Duggan (new owner of the stock of Bio Quest International). So, come early! Members are free; non-members, \$2.00; information 436-3036.

Next month, May, our program will be a real educational demonstration by Rudy Lime, our in-house Avant-garde succulent Bonsai Master. This slideshow and demonstration is a delight for the "old-timers" and for you new members (our organization has doubled in members over the past three years) this is A-NOT-TO-BE-MISSED PROGRAM that will really open your eyes. We are so pleased that Teresita Lime has made such excellent health progress, so that they both can participate again.

THERE IS ROOM FOR THREE MORE PEOPLE FOR THE LOTUS LAND TRIP - COST \$40.00 PER PERSON INCLUDES FOOD, DRINK, BUS, ENTRY FEES AND TOUR, SATURDAY, JUNE 18th. FOR MORE INFORMATION CALL JOYCE BUCKNER @ 222-3216.

If you consider yourself a cactus and succulent bibliophile then you need to be on Myron Kimnach's "New & Used Book" list. His latest, catalog #12 has 53 pages filled with unbelievable offers and great deals. To receive list, write Myron Kimnach, 5508 N. Astell Avenue, Azusa, CA 91702; (818) 334-7349. Awesome!!

We are sorry to hear that Patricia Moorten of Moorten's Botanical Gardens, Palm Springs, has been under the weather lately we were pleased to learn that she has been released from the hospital. Best to you, hope you are feeling much better!

Congratulations to Woody and Kathy Minnich,

who exchanged Wedding vows on Sunday, March 27th at Elizabeth Lake, CA. Woody and Kathy are honeymooning throughout the desert Southwest beginning in Palm Springs and eventually arriving in Sante Fe, N.M. We wish you both the very best of Love and Life!!!

- PAGE 3 -

Thank You San Diego Cactus & Succulent Society Life Member Bob Taylor for your generous contribution of Cactus & Succulent Books and Journals for our library.

We Love You, Bob!!!

ENDANGERED SPECIES ACT INFORMATION

by Joyce Buckner

Protection for six plant taxa including one succulent associated with the Southern Maritime Chaparral was proposed October 1, 1993 by the Fish & Wildlife Service for the Endangered Species Act. The Southern Maritime Chaparral is a distinctive plant community found only along the coast of southern California and northern Baja California, Mexico. This highly diverse biome is characterized by low growing plants restricted to sandy coastal terraces and often covered with unusual small rounded iron nodules which have weathered out of the substrata. The Southern Maritime Chaparral (SMC) is familiar to many southern Californians, because it is one of the most sought-after and expensive real estate areas in the state. Consider the terraced homesite views of Del Mar, Encinitas, Solana Beach, Ocean Beach and Point Loma. Approximately 85% of the SMC habitat has already been lost to urbanization and agriculture according to the Wildlife Service; remaining areas are mostly private property and subject to fragmentation and denaturalization. The situation in Baja California is much the same, as building and agriculture continue to expand at explosive levels in Mexico.

The six California Southern Maritime Chaparral plants are:

- * Del Mar Manzanita (*Arctostaphylos glandulosa* subspecies *crassifolia*) a beautiful Manzanita (*Ericaceae*, Heath family) with dark red bark and white flowers - recommended for listing as endangered.
- * Encinitas Baccharis (*Baccharis vanessae*) a fall blooming shrub (*Asteraceae*, Aster family) discovered and named by Mitchell Beauchamp of Pacific Southwest Biological Service for his daughter Vanessa - proposed for listing as endangered.
- * Orcutt's Spineflower (*Chorizanthe orcuttiana*) a low growing flowering plant named for Charles Orcutt (Buckwheat family, *Polygonaceae*) - the only annual proposed as endangered.
- * Short-leaved Dudleya (*Dudleya blochmaniae* subspecies *brevifolia*) a miniature one inch succulent that looks like bird droppings with white flowers (*Stonecrop* family, *Crassulaceae*) - proposed for listing as endangered.
- * Del Mar Sand Aster (*Corethrogyne filaginifolia* variety *linifolia*) an upright growing perennial herb with whitish felty leaves and bearing flowers with violet ray florets and yellow disk florets, a striking combination - proposed as not endangered but threatened.
- * Big Leafed Crown Beard (*Verbesina dissita*) a low growing perennial shrub with yellow daisy flowers (*Aster* family, *Asteraceae*) - proposed listing as threatened.
- * One other plant of the eleven proposed threatened and endangered species, a cactus, should be mentioned here. Thought to be one of the rarest cacti in the United States with less than 20% of its original population still existent, *Pediocactus winkleri* is only known from six populations totalling only 3,500 plants on 200 acres. The plants remaining are still threatened by cattle grazing, off-road vehicle activity, and illegal collecting. This cactus has been recommended for listing as endangered. Interestingly enough *Pediocactus winkleri* was described in the *CSSA Journal* in 1979 by Heil from one collected plant - the holotype deposited at the University of New Mexico Herbarium with notation: "TYPE LOCALITY: Wayne County, Utah, further data withheld for conservational purposes."

Sources: ENDANGERED SPECIES TECHNICAL BULLETIN, vol XIX #1, 1994
 Benson, Lyman, 1982, *The CACTUS of the UNITED STATES & CANADA*, Stanford Univ. Press
 Schoenherr, 1992, *A NATURAL HISTORY of CALIFORNIA*, Univ. of Calif. Press

GROWING CACTUS AND SUCCULENTS FROM SEED

by Dorothy Byer

METHODS OF OBTAINING EVEN DISTRIBUTION OF SEEDS -



FOR REGULAR DISTRIBUTION MIX ONE OUNCE OF FINE SEEDS WITH ONE-HALF PINT OF FINE DRY SAND



TAPPING SEED FROM A FOLDED PAPER



A QUILL NOTCHED INTO THE SIDE OF A CORK MAKES AN EXCELLENT SEED SOWER

THIS TYPE OF SOWER IS FOR SALE BY SEEDSMEN

The excitement of watching for "sprouts" is worth the careful preparation and labor necessary to successfully grow cactus and succulents from seeds. Basic materials needed are minimal and can be as elaborate or inexpensive as one cares to deal with. A good idea is to start small until the confidence that comes with a few successes is achieved. There is a score of commercially available devices on the market that are nice to have but can be expensive - like thermostatically controlled heat mats and professional germination chambers with lights. There is nothing that cannot be handled on a small scale with items found around the house or purchased from a local hardware store. Seeds can even be germinated on top of a refrigerator from the heat given off at the back.

Fresh seed is the most important element. It is easy to obtain cactus and succulent seeds from many commercial sources (see list), local plant societies, friends and one's own plants. A problem may arise with the age of the seed. Often, seed that does not germinate is beyond the period of viability. Many seeds such as *Pachypodium* and terrestrial *Bromeliads* lose viability quickly. There is no way to judge the age of seeds, so one plants with due care and hopes for the best. Cactus seed does have a longer period of viability than many other succulents.

After the seed is obtained, proper soil mixes, containers, water, light, temperatures, and methods of planting the seed must be considered. Any of these improperly handled can be a major stumbling block. The following information can be applied to a large cross section of plant groups. It is assumed that the containers used are sterile and have adequate drainage holes. Disposable aluminum loaf pans from the grocery store, styrofoam cups, or containers from a restaurant supply house work well if several holes are punched in the bottom of the containers. These pans or cups need not be deep. One and a half or two inches will be sufficient for most seed sowing.

METHODS OF PREPARING SOME SEEDS FOR QUICK GERMINATION



SOAK SEEDS IN WATER OVER NIGHT FOR QUICK GERMINATION



POUR SOAKED SEEDS INTO A CLOTH ON DRAINBOARD OF SINK



IN SOME SEEDS GROWTH CAN BE HASTENED BY CLIPPING OR NOTCHING.

SOME SEEDS ARE SO HARD A FIRE MUST BE BUILT OVER THEM TO CAUSE GERMINATION

If such materials as sphagnum peat, coarse builders sand, pumice or perlite, chicken grit and leaf mold or a good grade of sandy loam are available one can adjust a soil mix for any type of seed. A mix such as "Super Soil" or "McCalif's Sunshine" seedling mix (about \$18.00 per bale) can be blended with coarse sand and pumice to provide an adequate medium on which to sow seeds. If one does go the route of using sandy loam as part of the mix, it should be heat sterilized at 165° Fahrenheit for at least one hour to kill nematodes, fungal spores, and weed seeds. For most North American cactus and mesems', a mix of 50% coarse builders sand (never beach sand), 30% sandy loam screened to remove debris & stones, and 20% pumice or perlite should be used. For South American cactus and many other succulents, use a mix of 50% builders sand and 50% sphagnum peat - or 1/3 builders sand, 1/3 sphagnum peat, and 1/3 pumice or perlite. McCalif's "Sunshine" seedling mix can be substituted for sphagnum peat. For large difficult seeds, such as *Adansonia* (Baobab) species, pure dampened pumice or perlite may be used for germination only, transferring seedlings to the proper mix upon germination.

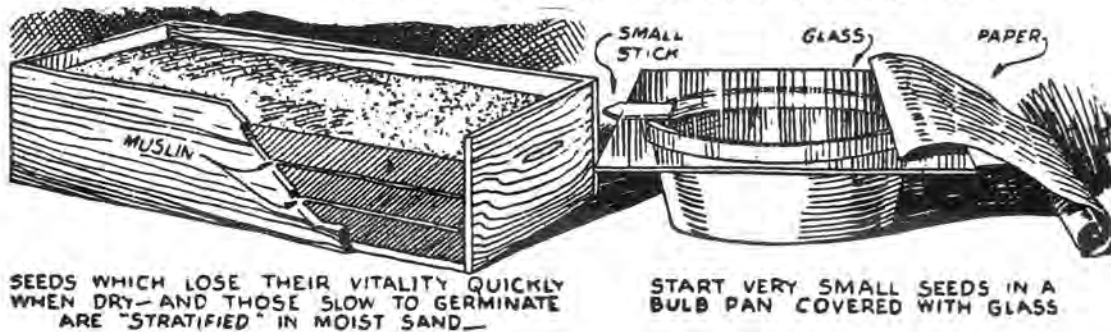
GROWING CACTUS AND SUCCULENTS FROM SEED

by Dorothy Byer

Certain seeds need stratification (subjection to refrigerator cold or freezing) for various periods of time - for example: *Talinum spiniscens* or *Lewisia* species. This applies to many plants from temperate or cold climates, but not all. Some seeds need scarification (filing or nicking of the seed coat), such as those with a hard, impervious coat. Soaking in warm water for a few hours or overnight can aid germination of *Bursera* and *Jatropha* seeds. Reading related literature and discussing the needs of different species with those who have some experience is most helpful. Luckily, these special considerations apply to only a few species.

When sowing the seed, fill the container about $\frac{3}{4}$ full with the correct soil mixture. Tamp (not pack) this soil lightly to prevent excess settling upon watering after the seed is sown. Scatter the seed thinly or space on the soil surface. If too much lands in one spot, use tweezers to place the seeds in proper positions. A good rule of thumb is to cover seed with soil to a depth not greater than the diameter or thickness of the seed. Very small seed can be sprinkled on top of a layer of sand and misted in. Certain seeds, like those of terrestrial Bromeliads should have no soil covering at all, merely a clear plastic cover placed over them until they have germinated. Cactus seeds may be sprinkled on top of the seed bed, then barely covered with a coarse sand and fine soil mix. Agave and Aloe seed need about a $\frac{1}{8}$ inch soil cover. As seedlings sprout, sand or chicken grit can be carefully sprinkled around to support the seedlings.

Illustrations for growing cactus and succulents from seed taken from:
GARDEN MAGIC by Roy Biles, Ferguson Publishing, c.1947.



After seeds are sown, place the container in a tray of distilled or reverse osmosis water that also contains a fungicide such as Chinosol or Physan until moisture shows on the surface. Use no fertilizer at this time. Drain the container on a piece of paper towel or other surface and, depending on the species, either cover with plastic or place in a germination chamber. A germination chamber can be constructed with nothing more than a box two feet square by up to one foot deep with two 15 watt light bulbs inserted and plugged into a timer set for 12 hour on-off cycles. A removable cover of cardboard, plywood, or acrylic is placed on top.

A good seedsman checks seeds for germination and soil moisture content at least once a day. Also check for fungus contamination. In spite of all the precautions, fungus sometimes shows as a transparent, very fine webbing on the soil surface. Spray with Chinosol® solution or a solution of Captan® or Physan®. Those seeds that have begun to germinate should be placed in a light location out of direct sunlight. Seedlings are very tender at this stage. Now one must watch for sciara flies (fungus gnats) and their nasty larvae which work under the soil. These pests are found whenever a peat mixture is used and more often indoors than outside. If any are seen, use a liquid solution of Sevin or sprinkle powdered Sevin on the seedlings and mist into the soil.

With increased size of the seedlings, watering, either from underneath (capillary) or misting, can be tapered off, but never allow soil to become dry. Dryness will cause seedling loss. A dilute solution of balanced fertilizer can be initiated at this time. *Mesembryanthimums* require a weaker solution of fertilizer. Watch for strong growth and good color. Pale color and etiolated stems may mean too much fertilizer and water, or not enough light. Experience is helpful here. Ask someone, if a problem is suspected! Plant society members may have the answers to individual questions and most are willing to discuss a problem or to share enthusiasm and success stories.

Do not try to transplant your seedlings too soon. Most plants enjoy the community container for the first few months of their first year. Enjoy watching your seedlings develop. Happy growing!!

SEED SOURCES:

CSSA Seed Depot
Sue Haffner
3015 Timmy
Clovis, CA 93612

Mesa Garden
P.O.Box 72
Belen, NM 87002

Christa's Cactus
529 W. Pima
Coolidge, AZ 85228

Thompson & Thompson Seeds
P.O.Box 1308
Jackson, NJ 08527-0308

Whitestone Gardens, Ltd.
The Cactus Houses
Sutton, Thirsk
N, Yorkshire YO7 2PZ
England

Doug & Vivi Rowland
200 Spring Road
Kempston
Bedford MK42 8ND
England

References: Mesa Garden Germination Tips
CSSA Seed Depot "Growing from Seed"
Pocket Encyclopedia of Cacti by Edgar & Brian Lamb, 1969, Blandford Press, Ltd.
CSSA Journal's - numerous articles (in SDC&SS library)

SDC&SS First National Bank of Seed

The seed is rolling in! Thanks go out to Rick Plant, Frank Thrombley, Joe Quijada, Joey Betzler and Michael Buckner. The seed list will be updated in this newsletter periodically and available for perusal at the monthly meetings. Should you find the extra seed you have is already listed, please don't be deterred - excess seed will be exchanged with the CSSA Seed Depot to increase their selection as well as ours. So, please keep an eye out for developing seed pods. (And Betty, you need not shuck the pods!)

Is there a plant you are looking for?? Please let me know. Thus far, our "NEED FOR SEED" list includes the following:

Aloe polyphylla (very unlikely)
Aloe heermanthifolia
Euphorbia francoisii
Haworthia springbokvlakensis

If you know of a seed source for any of these please let me know.

SOME NOTES ON SEEDING: Most plants in habitat are sufficiently separated whether by distance, flowering period or pollinator so that hybridization does not occur. In our collections, however, we create some strange scenarios in which plants that normally would have hundreds of miles of separation are happily flowering side-by-side. To increase the likelihood of obtaining seed that is "true to type" some precautions are in order. Separate plants of closely related genera. Isolate the flowers before, during and after pollination. (ed. note: sort of like having a teenage daughter). If you have familiarity with the mechanics of the plant's flower (some aren't that simple!) help it along by hand pollination. Paper match sticks, cactus spines or small cheap watercolor paint brushes make good disposable pollinators. Some flowers are complex and without the native pollinator will not set seed. Some are complex and set seed anyway. The *Ceropegia dicotima* I received from Phyllis Flechsig presently has six pods on it - with no assistance from me. It is wise to remove the flower petals to discourage any little bugger unwanted help - if you can bear it!

Have a goal in mind, if hybridization is your intent. Such as: a more robust plant, a different flower color or form, variegated leaves, etc. Keep good records of all your crosses. For variegated plants - use variegated plant for the pod plant (no guarantees!).

Protect the future seed from premature dispersal. Some plants "explode" their seed pods! A bit of shade cloth works well for larger seed; nylons can be used to save smaller seed.

Honesty is the best policy!! With regard to donated /exchanged seed, if the seed was open pollinated, evaluate if hybridization was possible or likely and please label as such. If you do not know the species it is Okay! But **PLEASE** don't guess with conviction. Simply label as *Glottiphyllum* species (nelli?) or *Aloe speciosa* (possible X with *Aloe arborescens*). The more we know, the more we can learn. KEEP GROWIN' AND SOWIN' *Kelly Griffin*

NON-CACTUS OF THE MONTH: CYCADS

by Alan Weiss

As in human history, where the long, rambling narrative of events is marked by a few outstanding achievements, the history of life on Earth is punctuated by milestone events. The lives of Moses, Christ, Shakespeare, Copernicus, Columbus, J.S.Bach, Einstein, and Gandhi all, very arguably, marked crucial milestones to our civilization as it exists today. In the history of life, one of the most notable "events", undoubtedly, was the sudden appearance at the beginning of the Cambrian Period (about 580 million years ago) of all the major groups of living organisms; also (one noted by Steven Spielberg) the apparently "sudden" extinction of the dinosaurs at the end of the Cretaceous Period sixty-five million years ago. Among the plants, which first ventured onto land about four hundred million years ago at the end of the Silurian Period, a crucial event occurred about three hundred million years ago when the ancestors of the Cycads began to develop seeds.

In about 1984 a unique fossil lycopod cone (lycopods include the living "ground pine" or "Christmas pine", *Lycopodium*, the "resurrection fern", *Selaginella*, and the giant "scale trees" of the ancient coal forests, *Lepidodendron*, was found by Scott MacKenzie near Union City, Pennsylvania, and named and described by the paleobotanists Chitaley and McGregor (1988). I doubt that Mr. Spielberg took notice of this discovery, but it is important in two respects: it is among the best structurally preserved fossils of its type, and it is the oldest known heterosporous lycopod

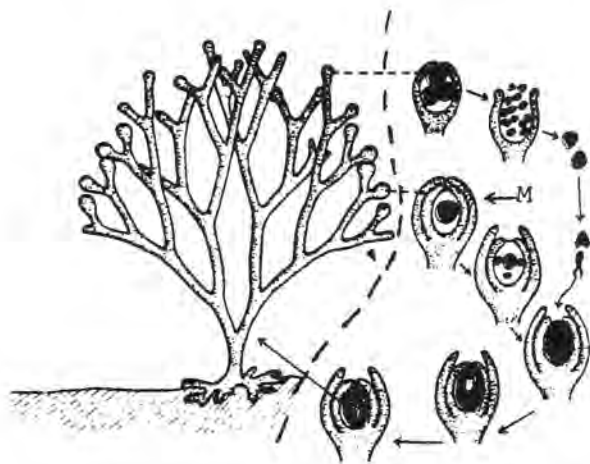


Fig. 1 - Hypothetical early seed plant. The megaspore (M) produces a prothallus on parent plant. Haploid generation (on right) much enlarge. (WILSON & LOOMIS)

(heterosporous meaning "having two dissimilar types of spores"). Unlike the ferns and many living lycopods, it has two types of spores - microspores, which as the name suggests, are very small with powderlike appearance, and

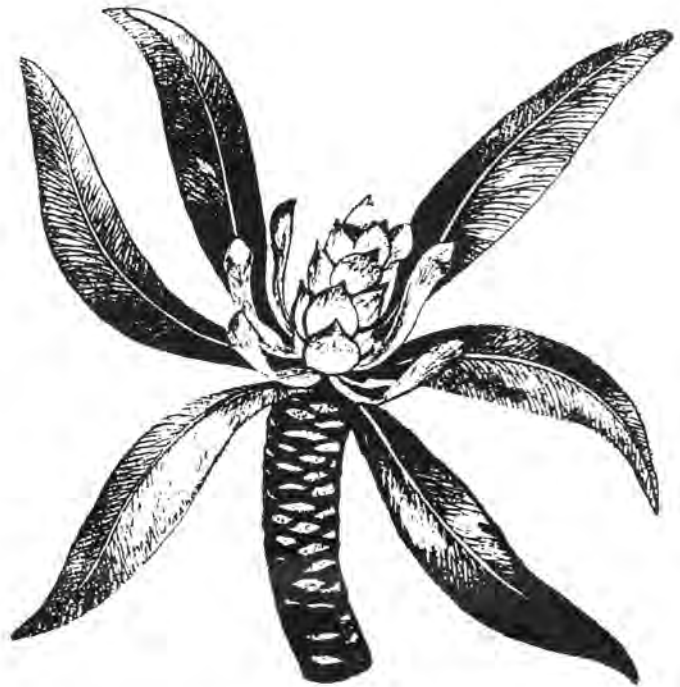


Fig. 2. Reconstruction of Cycadophyte, *Glossopteris linearis* with male cone of squamella australis scale fronds. Stem with ornamentation of leaf base scars. Outer whorl of foliage leaves and inner whorl (at cone base) of modified gangamopteroid leaves.

megaspores, which are much larger. The significance of the megaspores, which correspond with the female reproductive cells of more advanced plants, is that as the megaspores increased in size over geologic time and were retained within the nutritive system of the parent plant - the ultimate result was the production of seeds (see Fig. 1). Not to suggest that this fossil named *Bisporangiostrobus* (meaning "cone with two types of spores") was the ancestor of any seed-bearing plants, as none of the lycopods ever developed seeds. As far as the lycopods are concerned, heterospory was only a passing thought. It was only twenty million years after *Bisporangiostrobus*, in the Pennsylvanian coal age plants, that heterosporous plants were able to colonize the land extensively, allowing the expansion of

CYDADS by Alan Weiss continued . . . animals (including "Jurassic Park's" computer dinosaurs) into the environment.

Interestingly, many groups of plants in addition to the comparatively primitive lycopods became heterosporous in a completely independent manner. Among these were the extinct seed ferns and the pro-gymnosperms, any one of which may have given rise to the Cycads. A group of gymnosperm-like plants called the glossopterids bear considerable resemblance to Cycads, and may be an ancestor, or have an ancestor in common (see Fig. 2).

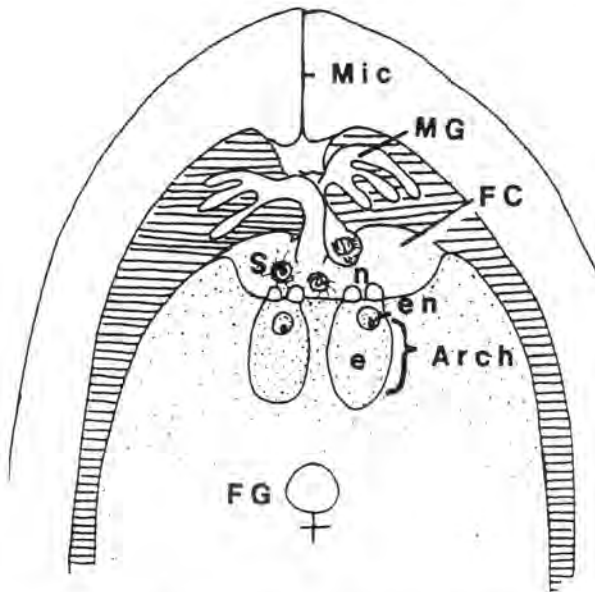


Fig. 3. Cycad ovule. Arch= archegonium (contains eggs). e= eggs. en= egg nucleus. FG= female gametophyte. MG= male gametophyte. Mic= micropyle. S= spermatozoids. (Stevenson)

The megaspore of the Cycads is very much enlarged (see Fig. 3) and borne on specialized leaves called megasporophylls, which are loosely arranged in *Cycas*, considered the most "primitive" of living cycads, and tightly arranged into a cone in the other cycads (see Fig. 4). Pollination occurs through the micropyle, a minute opening on one end of the megaspore, marked on the fully developed seed by a starlike pattern of radiating lines. In order for pollination to occur, the pollen must enter the micropyle. It is a mystery as to why nature imposes such a formidable obstacle to fertilization, as it does in flowering plants, where pollen must "germinate" and traverse an elongated structure (the style) in order to reach the eggs and fertilize them. (see Fig. 5 - Note that there is no style in the cycad ovule in Fig. 3.) Evidently, as in humans and other animals, where most sperm cells never reach the ovules, a rigorous selective process is opted for by the

discriminating female plant - maintaining the genetic vigor of the species.

Having megaspores solves a number of problems for the Cycads that more primitive plants must contend with. In the reproductive cycle of the ferns, the spores are dispersed by wind, and germinate only if they find a suitable environment, such as a forest floor where water is abundant. If the spore germinates, it forms a gametophyte (i.e., a sex-cell-producing plant, about a centimeter across and heart-shaped in ferns, and bearing sperm- or egg-producing organs, or both). The gametophyte is also known as the prothallus (note spelling!), which is the haploid phase of the reproductive cycle (see diagram, Fig. 6). It is a relatively small step in evolutionary terms - from free-growing prothallus in ferns to a prothallus which germinates within the megaspore wall, as in *Selaginella* (Fig. 6c).

When the fern prothallus releases its gametes (sex cells), the sperm cells usually must migrate (i.e., swim!) through the environment (hence the need for abundant water) to fertilize the eggs. When fertilization takes place, the resulting embryo contains the full complement of genetic material (indicated by $2n$, meaning diploid), resulting in a spore-bearing plant, or sporophyte, which is what we recognize as a mature fern - or a cycad. The cycad ovule not only retains the female gametophyte plant, but nourishes the embryo that results from fertilization (the sporophyte), and protects it in a thick endocarp wall (the seed "husk").

There is evidence that the process of pollination in cycads is aided by insects which respond to various attractants produced in cycad cones. In the extinct cycadeoids, known as group Bennettitales (these were conspicuously absent in "Jurassic Park"), the seeds formed in

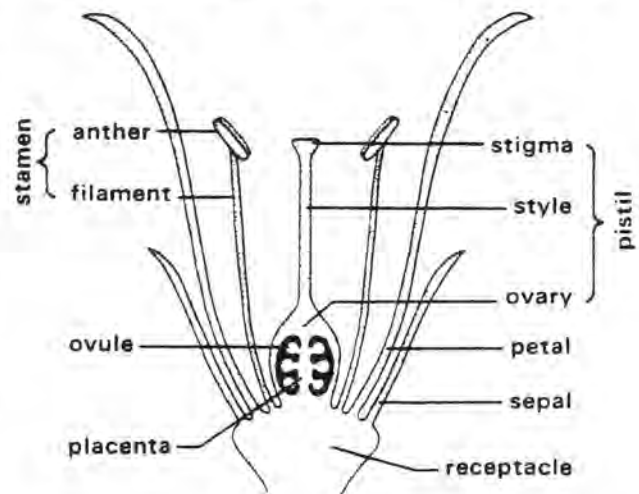


Fig. 5. Diagram of a generalized flower. (Wilson & Loomis)

NON-CACTUS OF THE MONTH: CYCADS

by Alan Weiss

- PAGE 10 -

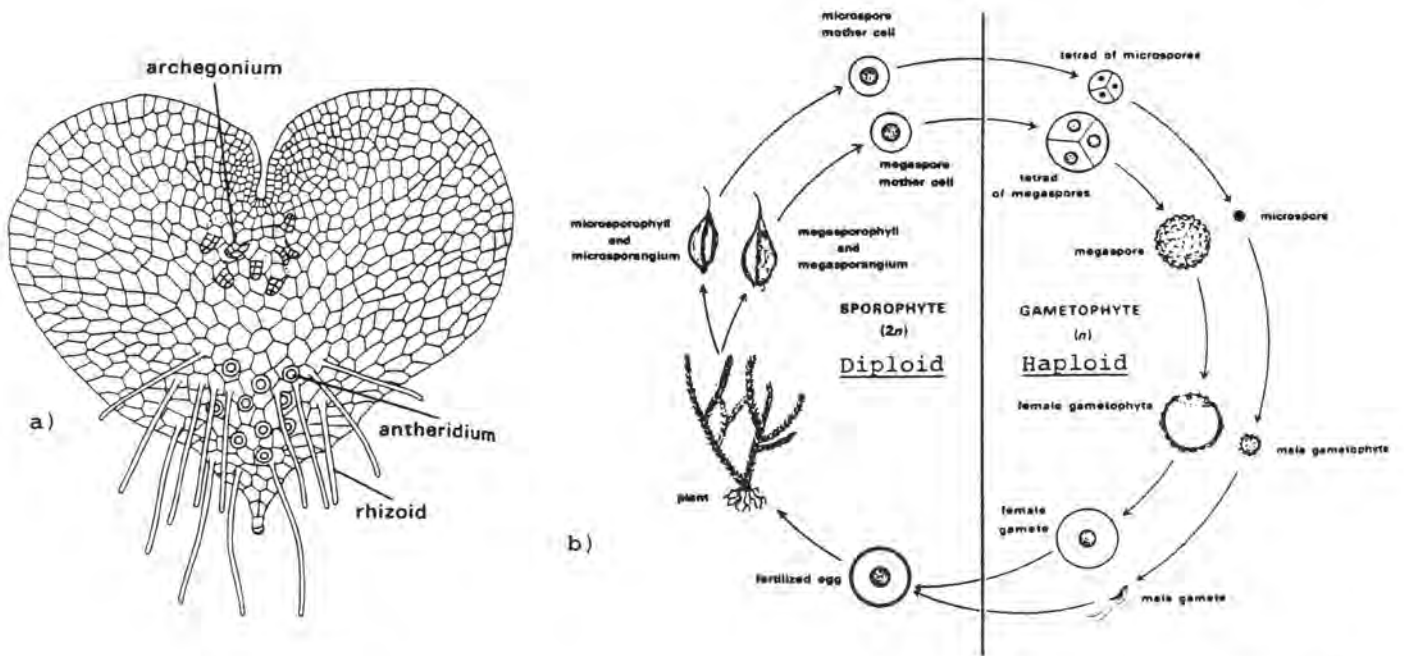


Fig. 6. a) Fern prothallus, enlarged. b) Life cycle of *Selaginella*. Haploid generation (on right) much enlarged. c) Young sporophyte of *Selaginella*, attached to prothallus, which in turn is contained within the megaspore wall. (Wilson & Loomis).

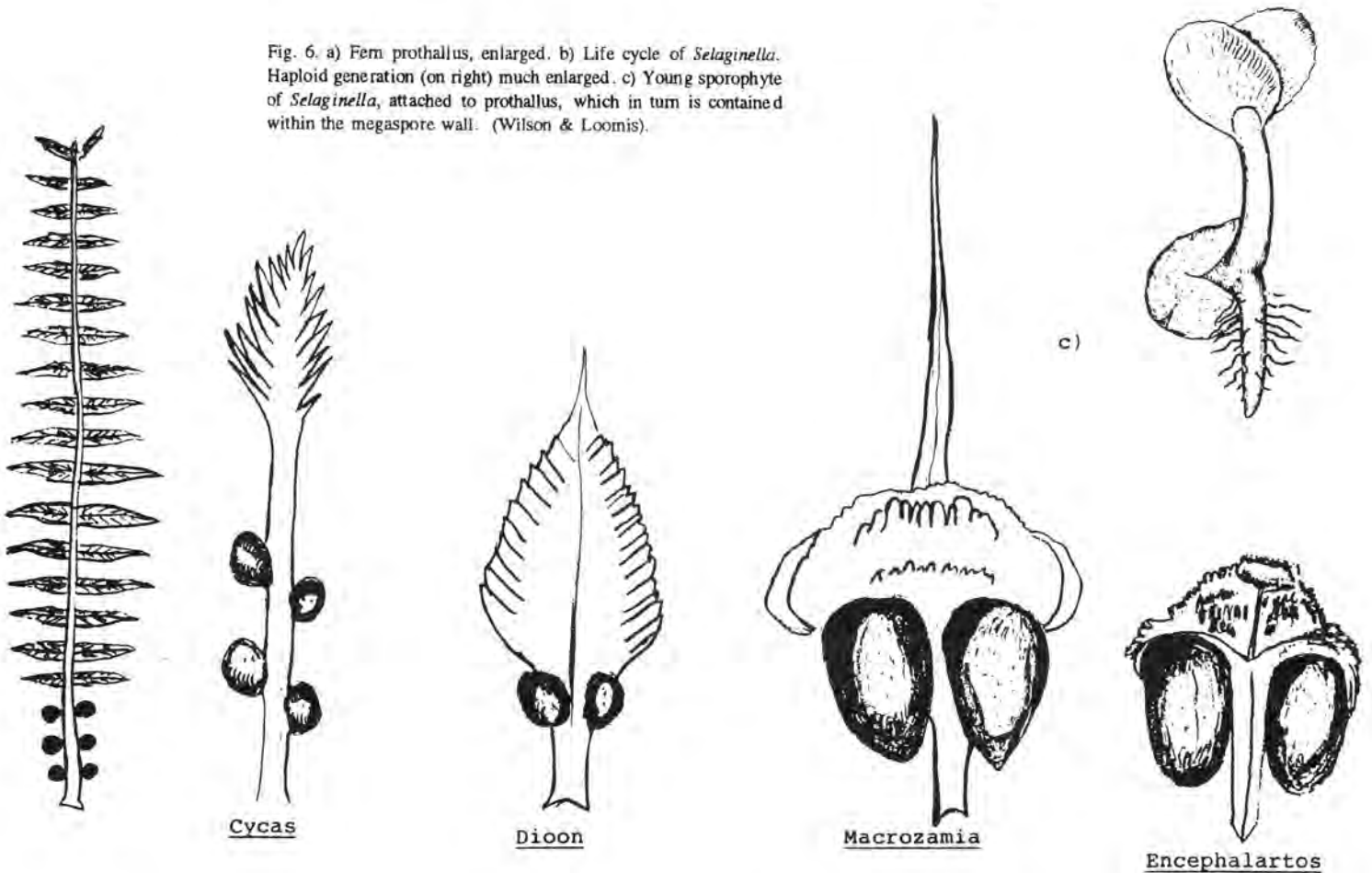


Fig. 4. Hypothetical megasporophyll of ancestor of *Cycas*, and megasporophylls of living cycads, showing reduction of the leaf axis. (Weiss)

CYCADS by Alan Weiss continued

receptacles in the trunk, and were surrounded by numerous bracts which protected the seeds and may have attracted insect pollinators - to say nothing of hungry dinosaurs (Fig. 7 & 8).

Exactly why the living Cycads continue to exist, and their relatives the Bennettitaleans did not, is a true mystery. Although the living species are a mere remnant of their former numbers - they are true survivors of enormous complexity, and should not be considered as "primitive" or "living fossils". There are ten living genera, representing about 150 species. The genus Encephalartos is probably the largest with around fifty-five species confined to the continent of Africa, where true cycad forests (the real stuff of "Jurassic Park") still exist. Cycas has about forty species widely dispersed throughout the western Pacific from Japan to Australia. Zamia, Ceratozamia, and Dioon are New World genera living in the tropics and subtropics. Bowenia, Macrozamia, and Lepidozamia are endemic to Australia. Stangeria and Microcycas are both monotypic (i.e., having only one species in the genus). Finally, Chigua is recently named genus with two species.

Aside from their slow growth, Cycads present few difficulties in cultivation. They require good compost, open drainage, abundant watering and regular feeding. Several are resistant to frost. Eventually, they reach enormous dimensions - if you are willing to wait 500 years or more. Most will take full sun, with a few of the forest types preferring some shade. Many Cycads are quite drought resistant, and grow in deserts.

Considered by some to be the "rarest" plant in the world, a single plant of Encephalartos woodii was found in 1895. No other plants have been found of this very distinctive species, but the original plant offsets freely, and offset clones of the original have been distributed around the world.

Propagation of other species from seed is agonizingly slow: coning may occur at intervals of one to six years, or more. Cones may take up to a year to mature and germination of seed may take eighteen months or more. A "typical" growth rate may be indicated by the Encephalartos longifolius planted at Kew gardens in about 1750; it is about twelve feet in height now - averaging less than an inch per year.

It may be more than merely interesting to speculate about what the earth was like even before the venerable cycads came onto the scene. When plants first emerged onto land at

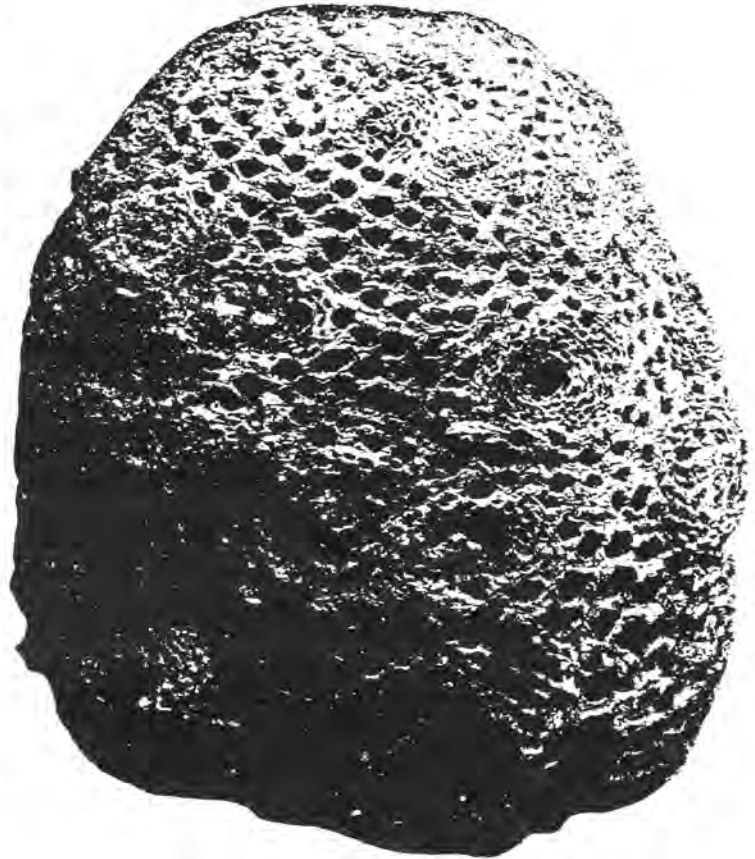


Fig. 8. Petrified trunk of a Cretaceous cycadeoid. Diamond shaped holes are leaf bases. Receptacles, containing seeds (often called "flowers" in older publications) are oval structures on the trunk. Leaves, not preserved, were at the top. (Ward)

about the time of the fossil psilophyte, Rhynia, from Scotland, they were faced with the problem of developing a vascular system to distribute nutrients throughout the entire plant. Psilophytes, represented by the living "whisk fern", Psilotum, are spore-bearing plants without true leaves or roots, and have only a rudimentary vascular bundle. I can imagine Rhynia growing in a near-shore bog, in a volcanic landscape, looking something like a mat of green straws or spaghetti along the surface, with an occasional spore-bearing branch reaching upward a foot or two at the most. Nothing growing at that time could have been much larger - certainly, there were no trees, no forests, no fields of grasses or flowers, 98% of the Earth's surface must have been mostly bare rock. When the plants developed more efficient vascular systems, trees and forest were possible, and even non-heterosporous plants were able to reach great size. It was the heterosporous, seed-bearing plants, however, including the Cycads, which really changed the face of the Earth, and certainly influenced the animals that depended on them.

CYCADS by Alan Weiss continued . . .

Whether or not plants became heterosporous as the result of purely random events over an immense period of time, or whether heterospory was an inevitable result of evolutionary forces, I cannot even guess. The fact remains that, except for some polar regions and areas where the land had been burned, bombed, bulldozed, dumped on or paved over, most of the Earth's land surface is covered with heterosporous green plants, and that simple fact is without doubt the most astounding thing written in this article.

REFERENCES and CYCAD READING LIST:

- Chamberlain, C.J., 1919, *THE LIVING CYCADS*. University of Chicago
GYMNOSPERMS: Structure and Evolution, 1935, Univ. Chicago Press
Chitaley & McGregor, 1988, *Bisporangiostrobos harrissii* gen. et sp. nova, *Palaeontographica*, Stuttgart.
Dyer, R.A., 1972, *CYCADS*. C&S Journal, vol. XLIV #5.
Encephalartos, Cycad Society of South Africa Journal - periodical.
Giddy, Cynthia, *CYCADS of SOUTH AFRICA*.
Goode, Douglas, *CYCADS of AFRICA*.
Jones, David, *CYCADS of the WORLD*.
Stevenson, D.W., ed., 1990, *The Biology, Structure and Systematics of Cycadales - MEMOIRS of the NEW YORK BOTANICAL GARDEN*, vol. 57.
Tidwell, W.D., 1975, *Common Fossil Plants of Western North America*.
Ward, L.F., *The Cretaceous Formation of the Black Hills as Indicated by the Fossil Plants*, U.S. Geological Survey Annual Report 19 (1898?).
Wieland, G., 1905-1916, *American Fossil Cycads*, 2 volumes, Carnegie Institution.
White, Mary, 1990, *The FLOWERING of GONDWANA*, Princeton.
Wilson & Loomis, *BOTANY*, 4th edition Holt, Rinehart, & Winston.

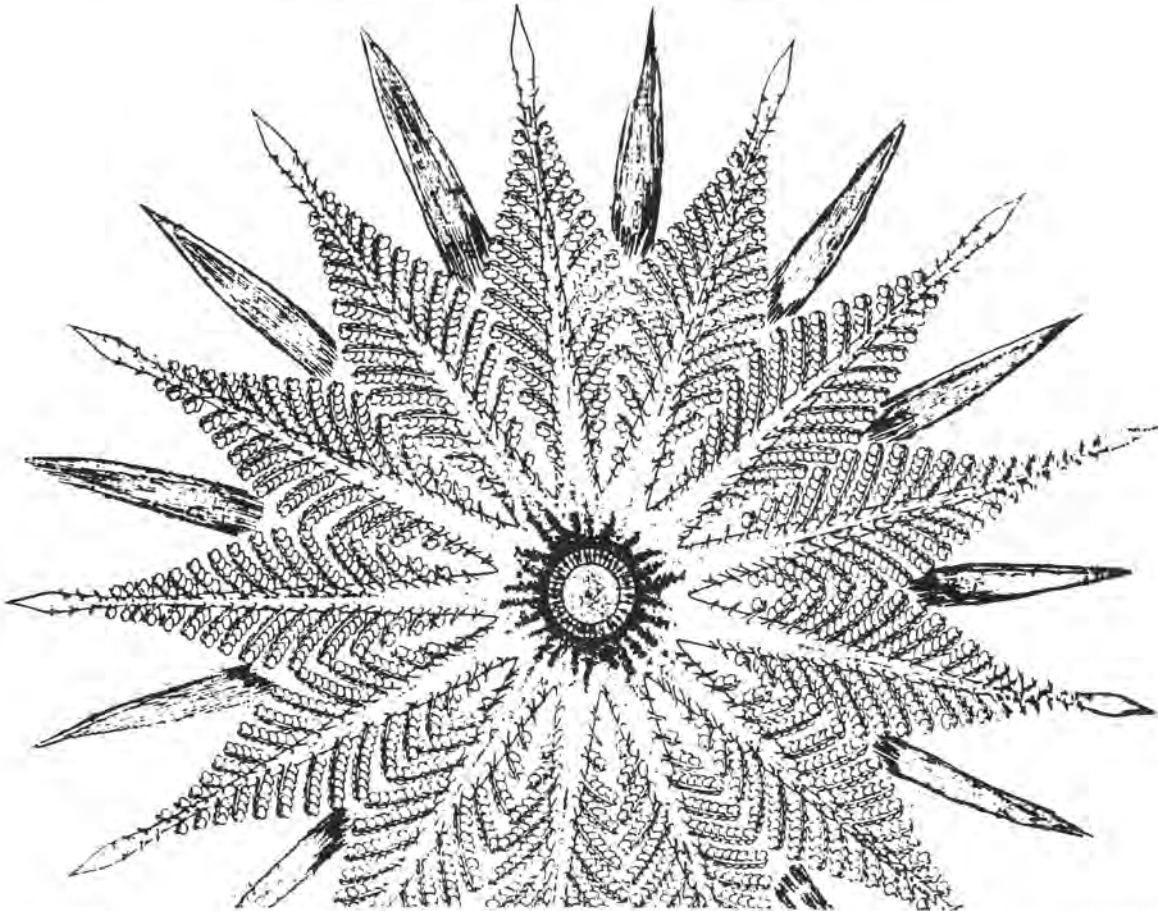


Fig. 7. *Cycadeoidea ingens*. Plan of the bisporangiate strobilus or flower consisting of central ovulate cone, an hypogynous staminate disk, and a series of spirally inserted enveloping bracts. (Wieland).

MEMORABLE MOMENTS

by Frank Thrombley

Judges and judging -- is it objective or subjective? Dr. Leroy Phelps and Madelyn Lee discussed having a course on the art of judging. It took John Pasek, however, to have the impetus to put the idea into reality.

In June of 1980 John approached several members of the SDC&SS with the goal of establishing a class. Lee Phelps was to be the teacher and Madelyn Lee was going to give the final exam. John must have known about my mind set against finals, for he did not tell me about that part of the course.

Those who "signed" up for the class were: Beverly Kirkegaard, Joan Johnson, Shirley Berry, John Pasek, and Frank Thrombley. Shirley Berry graciously offered to have the classes at her home. The first class was held June 28, 1980. Lee started the class by telling us that judges should feel they are aiding people to grow plants. Judges are attempting to obtain perfection in growing plants. Furthermore, judges should have entered plants in shows and won blue ribbons. Competition is healthy, fun, pleasurable and of course, winning a ribbon is great. So far so good, I can relate to all of that, I will ace this course. To condense three days of class into this brief article, the following, I believe, were important prerequisites for judges:

- 1) Apprentice judges should serve as clerks in shows as part of their training. Pay attention to the judges remarks, a good way to learn.
- 2) Judges should be able to recognize at least 50 different genera, or at least what group the plants belong to.
- 3) A good judge is one who has experience to judge with good judges who can and has overruled your point, and tell you why. However, be willing to argue your point and have the ability to concede. Try to be positive in what you believe and want to express. Do not concede to just concede.
- 4) The judge as a person must be willing to except criticism. If a person cannot except this and go on, do not judge.

For one of the meetings we each brought three plants to be judged by our peers. One plant of the three was to have a not too obvious flaw. The definition of peer is a person who is equal to another in abilities, qualifications, etc. . . So, not having any peers and not having plants without flaws, I soon realized that this course was not going to be aced by this person.

To end the class, Lee Phelps told us that the best judging is done with as least three judges that consult with each other. Try not to participate in a judging where one has a score card to fill out and a clerk tabulates the score to a award prizes. Judges should be able to compliment each other in their likes and strong interests.

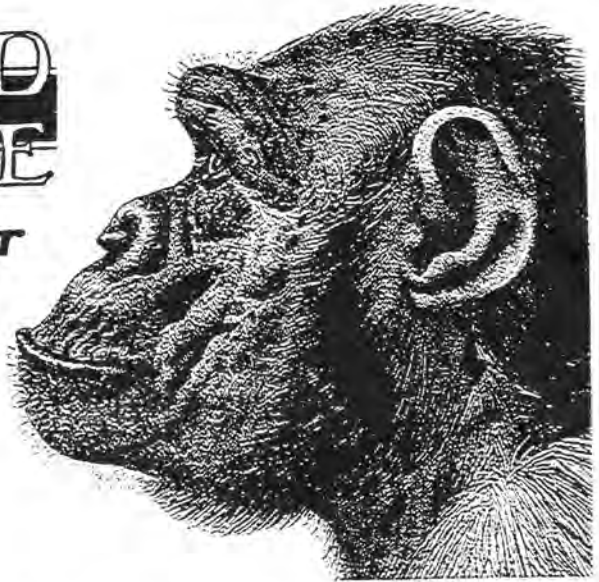
The big day is here, the day of judging. We met at Madelyn Lee's greenhouse in Vista. Madelyn had at least a dozen cacti and the same number of succulents all ready for the finals. All of my pseudo-peers, in this class, not only recognized the species, but were able to discuss the good and not-so-good points for the purpose of judging. Madelyn was very serious in her judgement of our abilities. However, it was at this point in time when I realized that Frank Thrombley was not prepared to be an apprentice judge. Beverly, Joan, Shirley and John had been growing plants for many years. They had thousands of plants they grew, observed and understood these plant's requirements (i.e. softgown, hardgown, seasonal growth, etc). What I had in common with them was a love for these plants. Which brings me to the point of this article.

It is alright to grow and love those specific species of succulents you may personally like. One does not have to know or grow plants of 50 genera to belong to this Cactus & Succulent Society. Some may specialize in one or two genera of plants only, or just a few species.

It is not right, however, to not show your favorite plants in the society's annual show. To display your plants is to help the society to nurture interest, educate and project a good image to the public, as well as helping with the sale of plants. If all members brought just three plants each, to display in the June Show, we would fill the room with magical love for all to see and "feel". Just remember judges are human, just like us, and if they do not award our plants a blue ribbon, we can criticize them.

WISE AND OTHERWISE

by Michael Buckner



There was an old fellow named Bryan,
Whose voice was forevermore cryin'
"Do you think that my shape
was derived from an ape?
Well, I think Charles Darwin was lyin'"

"It was the German poet and philosopher Goethe who, in 1790, first used the term "morphology", and it was most appropriate that it should have been compounded of two Greek words, for the ancient Greeks (and, in particular, Aristotle) are regarded as the founders of this branch of natural history. This first known use of the word "gymnosperm" was, in fact, by one of Aristotle's pupils - Theophrastus - who used it to describe PLANTS WHOSE SEEDS ARE UNPROTECTED. The quotation . . .

"Some seeds again are enclosed in a pod, some in a husk, some in a vessel, and some are completely naked."

. . . is taken from his ENQUIRY INTO PLANTS, one of the earliest known textbooks of Botany, written approximately 300 BC. Literally translated "morphology" implies no more than the study of form. However, if this were all, then surely there must have been some knowledge of the subject long before ancient Greek times. Indeed, man's very survival must always have depended upon his ability to remember which plants were edible and which poisonous; for this he had to know something of their form and structure. Thus, morphology in the narrow sense must have been developing gradually over a vast period of time before man became civilized, and the ancient Greeks must have inherited a large corpus of knowledge on which to build. However, till then, such knowledge had been put to purely utilitarian purposes; it now took on a deeper significance. It is in this respect that the Greeks can truly be called the founders of morphology."

- K.R.SPORNE, 1965, THE MORPHOLOGY OF GYMNASPERMS, HUTCHINSON UNIVERSITY LIBRARY, ENGLAND

A unique feature of cycads which in the seed plants is shared only with one other gymnosperm, *Ginko biloba*, is the production of motile sperm cells. Known as spermatozoids, the discovery of these structures in 1896 is regarded as one of the most exciting botanical discoveries of all time, since it provided a definite link between the gymnosperms and the ferns and fern allies, which also have spermatozoids. The discovery is made even more remarkable by the fact that two Japanese botanists, working independently in Tokyo, discovered the existence of spermatozoids in two different gymnosperms within a couple of months of each other. Those in *Ginko biloba* were discovered by Sakugoro Hirase early in 1896 and published in April of that year, about the time when Seiichuro Ikeno found spermatozoids in *Cycas revoluta*."

- CYCADS OF THE WORLD, ANCIENT PLANTS IN TODAY'S LANDSCAPE BY DAVID L. JONES, 1993, SMITHSONIAN INSTITUTE PRESS, WASHINGTON D.C.

WISE AND

ECUADOR'S PODOCARPUS (GYMNOSPERM) NATIONAL PARK IN PERIL

"First the good news: a Norwegian goldmining company, Ecuador A/S, has cancelled its application to regain mineral concessions in Podocarpus National Park. Podocarpus was established in 1982 to protect 365,000 acres in Ecuador. The diverse wildlife there includes the spectacled bear, the mountain tapir, 540 species of birds, and huge numbers of orchids. The mining company's decision comes as a result of a long campaign waged by Arcoiris, the local environmental group, and international conservation organizations.

Arcoiris is concerned, however, about the roads and infrastructure left behind by the mining company, which was originally conceded concessions within Podocarpus in 1986. As many as 500 miners may have gained access to the park via the road and are illegally panning for gold. They also are polluting streams with mercury, a byproduct of separating gold from ore; killing the wildlife for food; collecting orchids for sale internationally; and setting forest fires.

Arcoiris was successful in getting a plan for two new roads shelved as well. The roads would have provided for transportation of agricultural products and would have divided the park in half.

To express concern over the situation at Podocarpus National Park, please write to Direccion Nacional de Minería, Av. 10 de Agosto 5540 y Villalengua, Quito, Ecuador; and send or fax copies of your letters to Arcoiris, P.O.Box 11-01-860, Loja, Ecuador; 011-593-57-29-26."

- WILDLIFE CONSERVATION, SEP-OCT 1993, JOHN THORBJARNARSON, CONSERVATION HOTLINE

"Not a year goes by without the discovery of thousands of new species, whether they are found in the potted plant of a Washington D.C. office building, where a new species of Pheldole ant was discovered just a few years ago, or in remote jungles. Most discoveries are of small creatures -- ants and beetles and invertebrates. But since the start of the 1990's several new species of birds-- the best-known group of animals--have been described, including a Peruvian parrotlet, a flightless rail from the Solomon Islands, and a striped babbler from the mountains of the central Philippines. In addition, three new species of monkey have been discovered, the most recent being a pocket-size marmoset with a koala-like face that was described in October 1992. And just the year before, a new species of whale entered the scientific inventory. . . .

Since 1758, when the biologist Linnaeus first established a classification system for living things, about 1.4 million living species have been discovered and described. Insects constitute more than half of all named species, of which about 40 percent are beetles. . . . Other arthropods, such as spiders and crustaceans, account for another 125,000 species. Flowering plants number about 250,000 and fungi about 70,000. Vertebrates account for about 45,000 species, of which almost half are fish, a quarter are reptiles and amphibians, a quarter are birds, and a tenth are mammals. Algae and microorganisms make up the remaining hundred thousand or so known species. . . .

But whether the total of life on earth is 3 million or 100 million is less important than is the extent of our ignorance. What's important is that the number still to be discovered is greater than the number we've been able to process in the two hundred and fifty years since Linnaeus.

. . . There are as many species of fish in the world as all birds, amphibians, reptiles, and mammals put together. But virtually no protected areas have yet been set up specifically for fish."

- AUDUBON, MAR-APR 1993, NEW-SPECIES FEVER BY PATRICK HUYGHE

- PAGE 15 -

OTHERWISE

SAN DIEGO CACTUS & SUCCULENT SOCIETY, INC.

OFFICERS

President - Joey Betzler
239-0804
Vice President - Michael Buckner
222-3216
Secretary - Amna Cornett
291-6426
Treasurer - Laura DeMerritt
270-5544
Corresponding - Virginia Innis
Secretary 225-1464
Membership - Joyce Buckner
222-3216

BOARD OF DIRECTORS

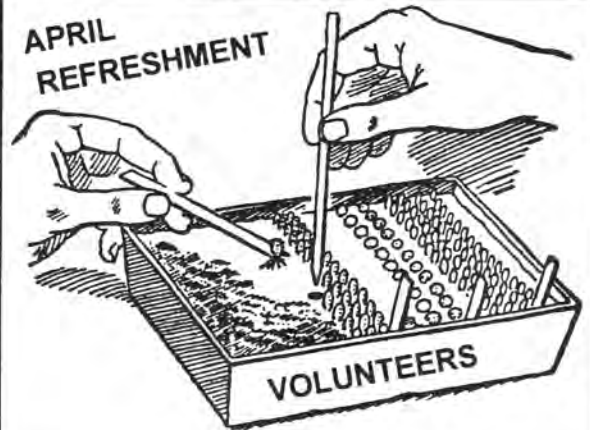
Shirley Berry
Dylan Hannon
Rick Latimer
Ed Nolan
Kay Quijada
Mille Williams

COMMITTEE CHAIRPERSONS

CSSA Affiliate Rep - Michael Buckner
Education Committee - Phyllis Flechsig,
Joey Betzler, Joe Clements,
Dylan Hannon, Beverly Kirkegaard,
Rick Latimer, Shirley Berry.
Historian - Rick Latimer
Librarian - Rick Latimer, Elizabeth Athy
Plant Exchange Table - Marilyn Lemrow,
Dorothy Larberg; Seed - Kelly Griffin
Plant & Supplies Table - Michael Cullen,
George Plaisted, Marylyn Henderson
Program - Joe Clements, Michael Buckner
Picnic - Tom DeMerritt & Rick Plant
Publicity - Kay Quijada, Tom DeMerritt
Reception - Ethel Standish, Elizabeth
Glover, Marylyn Henderson

Regalement - Rudy Lime, Don & Gail
Bamber, Stefy Mangold,
Harold & Mildred Richter
REPRESENTATIVES:
Balboa Park Desert Garden -
Susan Hopkins
Quail Botanical Garden -
Phyllis Flechsig
S.D. Botanical Garden Foundation -
Rick Latimer
S.D. Floral Association -
Elizabeth Glover
Wild Animal Park Baja Hill - Joey
Betzler & Frank Thrombley
Show - Joey Betzler, Phyllis Flechsig
Show Sales - Michael Buckner,

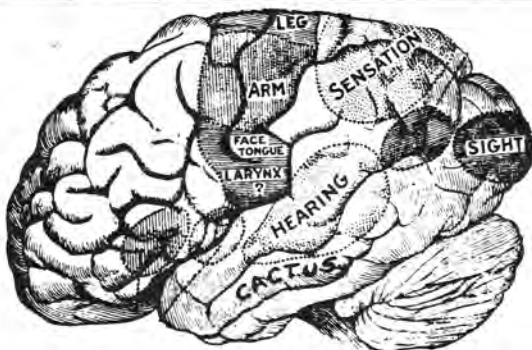
APRIL
REFRESHMENT



Elibet Marshall
Marie Pearce
Joan Fleeer
Peg Hilliard
Mary Ellen Holman
Marlene Evans
Beverly Kirkegaard
Kelly Griffin
Tom DeMerritt
Robyn Natwick

VISITORS WELCOME

San Diego Cactus and Succulent Society, Inc.
P.O.Box 33181
Hillcrest Station 102
San Diego, CA 92163-3181



Editors - Michael & Joyce Buckner
4822 Santa Monica Avenue # 103
San Diego, CA 92107 * (619) 222-3216

The San Diego Cactus and Succulent Society, Incorporated is open to all persons interested in growing cacti or other succulent & exotic plants. Meetings are held the second Saturday of each month at 1:00 PM in room 101, Casa del Prado, Balboa Park. Board of Directors meetings are held at 11:30 AM prior to general meetings. Annual dues are \$10.00 per single member per year, \$5.00 for each additional member within the same household. Single copies of Espinas y Flores are \$1.00 per copy sent within the U.S.A.; foreign subscriptions are \$20.00 - 3 mailings per year. Affiliated with the Cactus and Succulent Society of America, Inc. Fax available - please call editor @ (619) 222-3216

A NON-PROFIT
TAX-EXEMPT
ORGANIZATION