ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

TYDSKRIF VAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA

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COVER / VOORBLAD: A painting of *Encephalartos horridus* by John Donaldson. Numbered prints of the painting are still available from the artist (see advertisement elsewhere in the journal).

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FROM THE PRESIDENT

VAN DIE PRESIDENT

A while ago someone who often talks about our plants on the radio and in newspapers, stated that cycads don't thrive in the Western Cape. Goodness knows where he got that wisdom from. After a wonderfully warm albeit dry summer my plants look better than ever before, and I don't think I have to be ashamed of them. Even tropical species like *Encephalartos kisambo* are beautiful. The main prerequisite is that one should try to understand the needs and limitations of your plants, wherever in the world you may be living.

Something which worries me, is that our cycad people so often are crazy about cycads, but ignore other plants. Our country, and indeed the world, is so rich in interesting and beautiful plants which can profitably be planted with cycads to break the monotony (and here I don't necessarily think [only] of palms). I think we miss a lot by not utilizing the potential of these plants. For this reason I would like our Society to forge closer ties with other societies catering for plant groups such as palms, ferns, orchids, and succulents; to mention only a few.

Our Editor, Isabella Claassen, told me that a *Dioon* (most likely *D. edule* var. *angustifolium*) in her garden produced fertile seed after she leaned a male cone of *D. edule* against the female cone. This is an unusually interesting phenomenon, because it is virtually certain that *Dioon* (like probably all other cycad genera) are pollinated exclusively by genus- and possibly species-specific beetle species which don't occur in South Africa. What could have happened here? I would guess that this cone was pollinated by South African beetles which are naturally associated with *Encephalartos*. Previously I reported how beetles of the genus *Amorphocerus* which in nature occur on only a few specific *Encephalartos* species, under garden conditions moved over to other *Encephalartos* species, and later even relocated to other genera where they even bred in the cones. While there is as yet no proof that *Amorphocerus* plays any part in pollination (even though occurring in both male and female cones), I can imagine that beetle species which do effect pollination could have moved over in the same way from *Encephalartos* to *Dioon* and equally successfully effected pollination. Isabella also mentioned that during previous coning seasons she observed numerous *Porthetes* beetles on and in the male cone of one of her *D. edule* specimens and the next year only a few of them on the male cone of another specimen (Rolf Oberprieler identified the beetle as the same

'n Tyd gelede het iemand wat dikwels oor die radio en in koerante gesels oor ons plante, beweer dat broodbome nie aard in die Wes-Kaap nie. Waar hy daaraan kom, weet nugter alleen. Na 'n wonderlike warm en droë somer, lyk my plante beter as ooit tevore, en ek dink nie ek hoef my vir hulle te skaam nie. Selfs tropiese soorte soos *Encephalartos kisambo* is pragtig. Die hoofsaak is dat mens jou plant se behoeftes en beperkings moet probeer verstaan, waar in die wêreld jy ookal woon.

Iets wat my hinder, is dat ons broodboom-mense so dikwels gek is oor broodbome, maar ander plante ignoreer. Ons land, en trouens die wêreld, is so ryk aan interessante en mooi plante wat met vrug saam met broodbome geplant kan word om eentonigheid te vermy (en hier praat ek nie noodwendig [net] van palms nie), dat mens baie mis deur nie hulle potensiaal te verwesenlik nie. Juis daarom sou ek graag wou sien dat ons Vereniging nouer band smee met verenigings wat voorsiening maak vir plantgroepe soos palms, varings, orgideë, en vetplante; om maar 'n paar te noem.

Ons redaktrise, Isabella Claassen, het vir my vertel dat 'n *Dioon* (heel waarskynlik *D. edule* var. *angustifoilium*) in haar tuin vrugbare saad gelewer het nadat sy bloot 'n manlike keël van *Dioon edule* teen die vroulike keël neergesit het. Dit is 'n buitengewoon interessante gebeurtenis, omdat dit feitlik seker is dat *Dioon* (net soos waarskynlik alle ander brood-boomgenera) uitsluitlik bestuif word deur genus- en moontlik spesie-spesifieke kewersoorte wat nie in Suid-Afrika voorkom nie. Wat het dan hier gebeur? Ek sou raai dat hierdie keël bestuif is deur Suid-Afrikaanse kewers wat natuurlik assosieer is met *Encephalartos*. Voorheen het ek berig hoedat kewers van die genus *Amorphocerus* wat in die natuur slegs op enkele *Encephalartos*-soorte voorkom, onder tuintoestande ook na ander *Encephalartos*-soorte oorgetrek het, en later selfs na ander genera oorgegaan het en selfs op daardie genera gebroei het. Daar is nog geen bewys dat *Amorphocerus* enige rol speel in bestuiwing nie (hoewel hulle in beide manlik en vroulike keëls voorkom), maar ek kan my voorstel dat kewersoorte wat wel bestuiwing bewerkstellig, op dieselfde manier van *Encephalartos* na *Dioon* oorgetrek het en ewe suksesvol bestuiwing uitgevoer het. Isabella het ook berig dat sy tydens vorige seisoene een jaar 'n groot aantal *Porthetes* kewers op en in die manlike keël van een van haar *D. edule* plante waargeneem het en die volgende jaar slegs 'n paar van die kewers op die manlike keël van 'n ander plant (Rolf Oberprieler het die kewers geïdentifiseer as dieselfde *Porthetes* spesie wat algemeen

Porthetes species that favours male cones of *Encephalartos villosus*). Do keep a sharp lookout for beetles on your plants, especially in the cones; and if you find any, send them to me or to Rolf Oberprieler for identification.

Allow me to remind you that the current Council's term of office expires at the end of the year. Do consider it to make yourself eligible to serve our Society, or think of suitable people whom you could nominate. Our Society can only function properly if we are all involved.

Piet Vorster

in en op manlike keëls van *Encephalartos villosus* voorkom). Hou asseblief u plante fyn dop vir die teenwoordigheid van geassosieerde kewers veral in die keëls, en as u sulke kewers kry stuur hulle na my of na Rolf Oberprieler vir identifikasie.

Graag herinner ek u daaraan dat die huidige Raad se dienstermyn verstryk aan die einde van die jaar. Dink asseblief daaraan om u self verkiesbaar te stel om so ons Vereniging te dien, of dink aan geskikte persone wat u kan nomineer. Ons Vereniging kan slegs goed werk as ons self betrokke is.

Piet Vorster

CYCAD SOCIETY OF SOUTH AFRICA
BROODBOOM VERENIGING VAN SUID-AFRIKA

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0793	EVERETT, Mr W A	P O Box 238, CONSTANTIA, 7848
2360	EXLEY, Mnr Schalk	Posbus 1913, RICHARDSBAAI, 3900
2504	FERREIRA, Mnr M P	Weirstraat 413, PRETORIA-TUINE, Pretoria, 0082
2498	FICKER, Dr A B D	Posbus 1986, SOMERSET-WES, 7129
9015	FLORA CONSERVATION COMMITTEE	Botanical Society of SA, Kirstenbosch, CLAREMONT, 7735
1963	FOKKENS, Mr J F	P O Box 14504, NELSPRUIT, 1200
1190	FOUCHÉ, Mnr H P J	Posbus 30873, KYALAMI, 1648
2430	FOURIE, Carl	Granietstraat 1, WILKOPPIES, Klerksdorp, 2571
2044	FOURIE, Mnr J J A	Posbus 908541, MONTANA, 0151
0689	FOURIE, Mnr M J	Hobsonstraat 9, STILFONTEIN, 2551
0542	FRITZ, Mnr G	Posbus 139, HEIDELBERG, 1438
1632	FUGLISTER, Mr F J	P O Box 121, HALFWAY HOUSE, 1685
2238	GARRATT, Dr P J V	71 Myro Drive, Glenmore, DURBAN, 4001
0200	GERBER, Mr Harry	45 Anleno Road, Montclair, DURBAN, 4001
2565	GEYER, Mev Ina	Posbus 20226, NEWCASTLE, 2940
2113	GIELINK, Mr C C	P O Box 3786, DURBAN, 4000
1841	GITTLESON, Mr G	31 Sunnyside Road, ORCHARDS, 2192
1614	GNEITING, C F H	P O Box 72188, LYNNWOOD RIDGE, 0040
1466	GOLDSCHMIDT, Dr R P	P O Box 68332, BRYANSTON, 2021
2273	GOSSMANN, J F	Sultanastraat, Uitsig, WELLINGTON, 7655
1335	GOULD, Mr & Mrs T	P O Box 132, PENNINGTON, 4184
2342	GOUWS, Mnr L C	Posbus 635, FONTAINBLEAU, 2032
1789	GREYLING, Mnr J J	21ste Laan 760, RIETFONTEIN, 0084
1720	GRIESEL, Mnr C L B	Queens Crescent 427, LYNNWOOD, Pretoria, 0081
1400	GROBBELAAR, Mev Hanneke	Tarentaalkloof, Posbus 15357, LYNN-OOS, 0039
0097	GROBBELAAR, Prof N (Erelid)	Tarentaalkloof, Posbus 15357, LYNN-OOS, 0039
2285	GROBLER, Mnr Phil	Posbus 236, PIETERSBURG, 0700
2502	GROENEWALD, Mnr D M	Willsonstraat 161, FAIRLAND, 2195
2563	GROENEWALD, Willem L	Posbus 84571, GREENSIDE, 2034
2520	GRòTE, Mrs Patricia	P O Box 24, GREYMONT, 2035
0420	HANACZECK, Mr H W	P O Box 44, DUIWELSKLOOF, 0835
2505	HANS BAHCIC FAMILIE TRUST	P O Box 76, HEILBRON, 9650
2406	HARRIS, Mrs J B	P O Box 1765, NEW GERMANY, 3620
1178	HARRIS, Mr M V	64 Robertson Road, WARMBATHS, 0480
1600	HARRIS, Mnr R	Posbus 16514, VERWOERDBURG, 0140
0296	The LIBRARIAN, HARRY MOLTENO LLIBRARY	Kirstenbosch, Private Bag X7, CLAREMONT, 7735
0510	HARRISON, E R	P O Box 104, MTUBATUBA, 3935
0601	HART, Mr G B	P O Box 72727, LYNNWOOD RIDGE, 0040
2271	HATTINGH, Mev Elza	Posbus 797, HONEYDEW, 2040
2318	HATTINGH, Mnr J F	Posbus 13717, SINOVILLE, 0129

1964	HEINE, Mnr E W P	Groeneweide 10, STELLENBOSCH, 7600
2437	HEARD, Mr R W	P O Box 17055, BENONI WEST, 1503
2326	HELM, Marius	Posbus 9612, QUEENSTOWN, 5320
0115	HENMAN, Mr Enrico	12 Dhlinza Street, ESHOWE, 3815
2096	HENNING, Dr J C	Posbus 1168, ELLISRAS, 0555
0433	HENNING, Dr N G C	Cantonmentsweg 80, LYTTELTON MANOR, Centurion, 0157
2573	HENSTOCK, Helmut H	Waternooientjiestraat 3, KUILSRIVIER, 7580
1080	HEYNS, Mnr J O	Wenningstraat 115, GROENKLOOF, Pretoria, 0181
2417	HILLS, Mnr G	Posbus 64, HENNEMAN, 9445
2006	HOBBS, Mnr E T	Bosveldweg 157, WONDERBOOM, 0182
1711	HOLLANDER, Prof W J	RAU, Posbus 524, AUCKLANDPARK, 2006
2582	HOLT, M G & SAAYMAN, P	P O Box 74312, TURFFONTEIN, 2140
2556	HOLZTRÄGER, Dr F A	P O Box 29561, SUNNYSIDE, 0132
2546	HOMANN, Andrie C	P O Box 727, GROBLERSDAL, 0470
2063	HOOFDIREKTORAAT NATUURBEWARING	Privaatsak X209, PRETORIA, 0001
1794	HOOG, Mr R J L	22 Douglas Road, KLOOF, 3610
0086	HOOLE, Mr James	P O Box 7958, NEWTON PARK, Port Elizabeth, 6055
1946	HÖRING, Mr H J	12 Leeuwenhof Street, OAK GLEN, Belville, 7530
0295	HORNE, Mnr C	Kommandeurstraat 51, WELGEMOED, Belville, 7530
2236	HOWES, Cobie & Julie	55 Homestead Avenue, HILLCREST, 3610
1983	HORSTHEMKE, Mr R E	P O Box 365, FERNDALE, 2160
0498	HULSHOF, Mr A	P O Box 1526, KLERKSDORP, 2570
1766	HUNTER, Dr J J	Nietvoorbij, Privaatsak X5026, STELLENBOSCH, 7599
1155	ISACKS, Mr G A	8 Medway Road, WESTVILLE, 3630
1168	ISACKS, Mr G R	44 Windham Avenue, HILLARY, 4094
2545	JACOBS, Dr J J	Posbus 2052, GROBLERSDAL, 0470
2178	JANSEN, Mnr Zandberg	Roosweg 8, DAWNVIEW, Germiston, 1401
2593	JANSE VAN RENSBURG, Mev A E	Posbus 39460, MORELETTAPARK, 0044
2448	JANSE VAN RENSBURG, Mr J B	Gen E R Snymanslot 3, WELGELEGEN, 7500
1002	JANSE VAN RENSBURG, Mnr J M	Posbus 92, VRYHEID, 3100
1217	JANSE VAN RENSBURG, Mnr J P	Jopie Fouriestraat 374, PRETORIA-NOORD, 0182
0458	JOHANNES, Mr G	P O Box 215, PIET RETIEF, 2380
0644	JOHANNES, Mrs T A	P O Box 276, PAULPIETERSBURG, 3180
2501	JOHANNESBURG BOTANIC GARDEN FOUNDATION	P O Box 85481, EMMARENTIA, 2029
1501	JOHNSON, L K	P O Box 671, BETHLEHEM, 9700
2350	JORDAAN, Mev A M	Posbus 1059, HEIDELBERG, 2400
1527	JORDAAN, Past Ben	P O Box 55884, PIETERSBURG, 0700
2485	JORDAAN, Mr J A	22 Paradysvink Street, BIRCH ACRES, Kempton Park, 1619
2076	JORDAAN, Dr J B	Posbus 19166, NELSPRUIT, 1200
0146	JORDAAN, Sakkie & Anna	Posbus 104, WARRENTON, 6530
2292	JOUBERT, J J	Posbus 21991, Helderkruin, ROODEPOORT, 1730
1355	JOUBERT, Mnr W	Posbus 376, WARMBAD, 0480
1462	KABLE, Mr A J	12 Orchid Road, TYGERDAL, Goodwood, 7460
0223	KACHELHOFFER, Mr N J	P O Box 2062, BROOKLYN SQUARE, 0075
1791	KADWA, Dr M A	Plastic Surgeon, Parklane Clinic, Private Bag X40500, HOUGHTON, 2041
2270	KANONBERG CYCAD FARM	Posbus 2634, DURBANVILLE, 7551
0010	KEMP, Mev P	51 Constance Road, Broadwood, PORT ELIZABETH, 6070
1482	KEMP, J J & A	Posbus 1135, PIETERSBURG, 0700
2151	KENDALL, L	P O Box 11324, HATFIELD, 0028
0081	KENNEDY, Mnr H C	Blok A-E 17, Huis Vergenoegd, Hoofstraat 188, PAARL, 7646
2596	KIRSTEN, Mnr André	Privaatsak X5, CLOCOLAN, 9735
2518	KLEINHANS, Mnr T E	Posbus 18452, PRETORIA-NOORD, 0116
2394	KLEYNHANS, Mnr P A	Posbus 83419, DOORNPOORT, 0017
0745	KLOPPERS, Mnr John S	Posbus 24, GROBLERSDAL, 0470
1867	KOCKOTT, Mrs C P	P O Box 787002, SANDTON, 2146
1358	KOFMAN Mnr J H	Posbus 1106, Montana Park, PRETORIA, 0159
1939	KORKIE, Mnr E S	Vampirestraat 569, ELARDUSPARK, 0181
1812	KRIEL, Mnr W J	Rupertlaan 34, SOMERSET-WES, 7130
2605	KRUGER, Mnr A P	Posbus 863, PHALABORWA, 1390
1302	KRUGER, Mrs F J	22 Approach Avenue, Selwyn, FLORIDA, 1709
2286	KRUGER, H C	P O Box 1061, HERMANUS, 7200
2469	KRUGER, H J	Posbus 241, NYLSTROOM, 0510
2311	KRUGER, Mnr Johan	Posbus 911343, ROSSLYN, 0200
2547	KRUGER, Mnr J C	Posbus 5552, WINKLESPRUIT, 4145
1373	KRUGER, Mnr N J S	Posbus 46, RANT-EN-DAL, 1751
0853	KRUGER, Dr P W B	Posbus 3173, PRETORIA, 0001
1140	KRUGER, Mnr S R	Monarylaan 10, JORDAANPARK, Heidelberg, 2403
1672	KUSCHKE, Mnr A E	Posbus 54, HAZYVIEW, 1242

1832	KUUN, Mnr P J C	Posbus 39718, MORELETAPARK, 0044
2475	LABUSCHAGNE, D L	Posbus 174, HEILBRON, 9650
2420	LAMBRECHTS, Dr A H D	Amandelweg 51, AMANDAGLEN, Durbanville, 7550
2343	LAMBSON, Mr B	P O Box 411521, CRAIGHALL, 2024
2114	LEEB, Mnr G A R	Posbus 1275, TZANEEN, 0850
2392	LEMMENS, Mr D R	P O Box 15285, LAMBTON, 1414
2627	LESLIE, Mr Bruce D	P O Box 11124, SILVERLAKES, 0054
1532	LESSING, Mnr & Mev J	Oribistraat 30, JEFFREYSBAAI, 6330
1166	LIGHTLEY, Mr C G	Posbus 907, GROBLERSDAL, 0470
1948	LOMBAARD, Mnr J A	Posbus 50689, WIERDAPARK, 0149
2228	LOOTS, Hein	Posbus 2057, VRYHEID, 3100
0645	LOTTER, Mnr W J	Posbus 48520, Hercules, PRETORIA, 0030
0159	LOUBSER, Prof J D	Posbus 11315, QUEENSWOOD, 0121
2219	LOURENS, Mnr A J	Posbus 9455, ELSBURG, 1407
2620	LOURENS, D C J	Hansweg 10, VALHALLA, 0185
2491	LOURENS, Mev S	Posbus 68, PONGOLA, 3170
1676	LOUW, Mr J P	P O Box 21433, VALHALLA, 0137
1272	LOUW, Mnr W H	Posbus 2860, BRITS, 0250
1324	LOVATT, Mr M	P O Box 338, EMPANGENI, 3880
2209	LOVE, Mr C F M	P O Box 2690, DURBAN, 4000
2083	LUCAS, Mr S C	P O Box 22882, HELDERKRUIN, 1733
2487	LUDWICH'S LANDSCAPES & WATER FEATURES	P O Box 739, PAULSHOF, 2056
2543	LURIE, Mr Alan	P O Box 1596, PINEGOWRIE, 2123
2525	MAHER, Alan	P O Box 2311, PIETERMARITZBURG, 3200
2069	MANGA, Mr Vasan	P O Box 1536, BENONI, 1500
0561	MARAIS, Mnr A J	Posbus 28006, SUNRIDGEPARK, 6008
2376	MARAIS, Dr D D	Posbus 13948, HATFIELD, Pretoria, 0028
2568	MAREE, Pastoor	Posbus 31006, TOTIUSDAL, Pretoria, 0134
2425	MARITZ, Mnr Faan	Posbus 60539, VAALPARK, 9573
2203	MARITZ, Mnr H P	Posbus 39156, GARSFONTEIN-OOS, 0060, Pretoria
2588	MARKS, Larissa	89 Blackburn Road, DURBAN NORTH, 4051
2274	MARTEN, Mr M	32 A G Visser Street, Brackenhurst, ALBERTON, 1450
2427	MATTHEUS, Adolf	Posbus 41034, MORELETARIF, 0044
2564	MATTHEYS, Harold H	8 Reed Place, NORTHDENE, 4093
2142	McBEAN, Mr W	8 Louw Avenue, MONUMENT, 1739
2561	McELHONE, Mev Joyce	Posbus 28939, SUNNYSIDE, 0132
2411	McINTOSH, Dr R R	P O Box 1327, PIETERSBURG, 0700
2324	McKINLAY, Mr D F	P O Box 31388, WONDERBOOMPOORT, Pretoria, 0033
2280	MEIRING, Mnr R B	Posbus 438, KLAPMUTS, 7625
1701	MENTZ VAN ZYL, M H	P O Box 600, RAMSGATE, 4285
0205	MEYER, Mnr C C	Ralstonweg 20, FERNGLEN, Port Elizabeth, 6045
2351	MEYER, Mnr Danie	Posbus 12116, ELSPARK, 1418
1575	MEYER, Prof J J M	Dept Plantkunde, Universiteit van Pretoria, PRETORIA, 0002
1109	MEYER, Mr P K	P O Box 435, ST MICHAEL'S ON SEA, 4265
2533	MEYER, Mev M	Posbus 753, GROBLERSDAL, 0470
1107	MIDDELMANN, Mr W J W	402 CPOA, 231 Main Road, RONDEBOSCH, 7700
2534	MIESSNER, August	Posbus 779, GROBLERSDAL, 0470
2048	MILLAR, Mrs R E	P O Box 49300, ROSETTENVILLE, 2130
2150	MINNAAR, Dr & Mev D	Posbus 95597, WATERKLOOF, 0145
2607	MINI, Mr M	P O Box 4324, KING WILLIAM'S TOWN, Eastern Cape, 5600
0006	MINNIE, Dr Ollie J	P O Box 137, MTUBATUBA, 3935
2585	MITCHELL, Ds James R & Thea	Posbus 25256, OOSRAND, 1462
1210	MOODIE, Mnr S T	Posbus 72215, LYNNWOODRIF, 0040
2488	MORRICK, Mnr G	Posbus 25144, MONUMENTPARK, Pretoria, 0105
2375	MORRISON, Bruce	P O Box 1233, SPRINGS, 1560
1957	MOSTERT, Mev Cassandra	Posbus 687, KEMPTONPARK, 1620
2086	MOSTERT, Mnr P J	Keeling Place 6, ESCOMBE, Queensburgh, 4093
2535	MOUTON, J A	Posbus 266, GROBLERSDAL, 0470
0741	MULDER, Mnr I B	Saffraanlaan 10, Weltevredenpark X9, ROODEPOORT, 1709
1965	MULDER, Mnr H F	Kahlerstraat 64, Idasvallei, STELLENBOSCH, 7600
2230	MULDER, Theuns	Posbus 1351, DELMAS, 2210
1722	MULLER, Mnr T I	Posbus 11074, UNIVERSITAS, Bloemfontein, 9321
2550	MULLER, P W J & C J	Posbus 124, MARBLE HALL, 0450
1922	MYBURGH, Mnr & Mev F M	Posbus 268, KAREEDOW, 6400
2304	MYBURGH, Dr Jan G	Victorstraat 43, MURRAYFIELD, Pretoria, 0184
2170	MYBURGH, Mnr J L	Posbus 6455, ONVERWACHT, Ellisras, 0557
0397	MYBURGH, Mej J S	Departement Plantkunde, Universiteit van Pretoria, PRETORIA, 0002
2476	MYBURGH, Mnr L M	Linkstraat 6, TRIOMF, 2092
0523	MYBURGH, Mnr P P	Associationweg 9, Dawnview, GERMISTON, 1401
1620	MYERS, Mev M M	Posbus 401, WITRIVIER, 1240

9011	NATAL HERBARIUM	The Curator, Botanic Gardens Road, DURBAN, 4001
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2191	NATIONAL BOTANICAL GARDEN NELSPRUIT	The Library, P O Box 1024, NELSPRUIT, 1200
0065	NATIONAL BOTANICAL INSTITUTE	Kirstenbosch Horts, Private Bag X7, CLAREMONT, 7735
1232	NATIONAL BOTANICAL INSTITUTE	The Librarian, Private Bag X101, PRETORIA, 0001
1865	NATIONAL BOTANICAL INSTITUTE	THE Nursery, Private Bag X101, PRETORIA, 0001
9018	NATUURBEWARING NOORDELIKE PROVINSIE	(Riaan de Jager), Posbus 494, PIETERSBURG, 0700
0993	NAUDE, Mnr A S B	Posbus 6895, Kanonkop, MIDDELBURG, 1050
1570	NAUDE, Mnr J J	Posbus 157, TZANEEN, 0850
2220	NAUDE, Mnr L J	Durbanweg 90, MOWBRAY, Kaapstad, 7700
2521	NEILL, Stuart W	P O Box 31, AMANZIMTOTI, 4125
0261	NEL, Danie & Avis	P O Box 45, UMLAAS ROAD, 3730
1423	NEL, Mnr J J G	Jan van Riebeeckweg 300, OUDTSHOORN, 6620
0227	NEL, Mnr William	Posbus 87, MTUNZINI, 3867
2124	NELL, Dr Johan	Posbus 2787, RANDBURG, 2125
1943	NELL, Mnr J F	Posbus 100386, MORELETTA PLAZA, 0167
0237	NELL, Mnr J.M.	Danielstraat 60, Lambton Gardens, GERMISTON, 1428
2452	NELSON, Mr S C	P O Box 614, BELLVILLE, 7535
1346	NEWLAND-NELL, Mr T	9 Perth Street, Kabega Park, PORT ELIZABETH, 6025
2530	NIEHAUS, Mev R	Posbus 2071, GROBLERSDAL, 0470
1194	NIEMAND, Mr & Mrs H & D	50 Judges Avenue, Cresta Extention 1, RANDBURG, 2194
2346	NIENABER, Mev H J	Posbus 20045, RICHARDSBAAI, 3900
1192	NIEUWENHUIZEN, Mr R	P O Box 2086, DURBANVILLE, 7551
1503	NIEUWOUDT, J & L	P O Box 292, SKEERPOORT, N W Province, 0232
0829	NIEUWOUDT, Prof C F	Posbus 17129, GROENKLOOF, 0027
2294	NORMAN, Tyrone & Sue	P O Box 3315, Cluster No 1, SUNNINGDALE, 4051
1869	OBERHOLZER, Mr N S	61 17th Street, PARKHURST, 2193
1968	OBERHOLZER, Niël & Thea	Posbus 44622, LINDEN, 2104
1588	OCHSE, Mr A L	P O Box 310, HONEYDEW, 2040
1732	OLIVIER, Mnr H G	Posbus 15057, LAMBTON, 1414
0094	OLIVIER, Mnr L	Posbus 288, KIRKWOOD, 6120
2356	O'NIELL, Miss F M M	29 Welligton Street, IRENE, 0062
0872	OOSTHUYZEN, Mnr J C	Posbus 59911, KARENPARK, 0118
2446	OSMERS, Mev Rita	Posbus 102, TZANEEN, 0850
2257	PAGE, Mnr & Mev C & A	Posbus 32167, GLENSTANTIA, 0100
2589	PANDOR, Mr A M	P O Box 1762, NEWCASTLE, 2940
2215	PARKER, Mr K	Sydneys Hope, Po SIDBURY, 6131
0357	PARSONS, Mr J S	P O Box 41652, CRAIGHALL, 2024
2300	PAUTZ, Mr M J	Cycads for Africa, P O Box 209, KNYSNA, 6570
0024	PIENAAR, Mr Leon	626 Jan Visse Avenue, ROSEVILLE, 0084
2606	PIENAAR, Mev Liné	Lusitaniastraat 6, SALDANHA, 7395
2207	PIENAAR, Mnr M G	Posbus 1300, NELSPRUIT, 1200
2287	PIENAAR, Mnr W J	Posbus 2169, MONTANAPARK, 0159
1323	PIETERSE, Mnr F P	Emus Erasmuslaan 278, ERASMUSRAND, Pretoria, 0181
1354	PILLAI, Mr L	55 Maple Crescent, Circle Park, KLOOF, 3610
0078	PINKER, Mr Colin	P O Box 2115, NELSPRUIT, 1200
2513	POTTER, Neil	P O Box 816, STUTTERHEIM, 4930
1152	POULTON LIBRARY	Durban Parks Department, P O Box 3740, DURBAN, 4000
2185	POWELL, J B	Dowlingweg 2, Warner Beach, KINGSBURG, 4126
0864	PRANGLEY, Mr P R	P O Box 35245, NORTHWAY, 4065
1843	PRETORIUS, Mnr & Mev J	Posbus 327, LEVUBU, 0929
2409	PRETORIUS, Mnr J J	Posbus 13352, LERAATSFONTEIN, 1038
2307	PRETORIUS, Peet	Posbus 2425, DURBAN, 4000
2523	PRETORIUS, Mnr Sarel J	Posbus 5493, KRUGERSDORP-WES, 1742
0166	PRINSLOO, Dr G C	Posbus 523, KROONDAL, 0350
1581	PRINSLOO, Mnr J J	Posbus 25219, MONUMENTPARK, 0105
2542	PRINSLOO, Lucas M S	Franzinastraat 278, ELOFFSDAL, Pretoria, 0084
2443	PRITCHARD, Mr T	306 Delphinus Street, WATERKLOOF RIDGE, 0181
0631	PROZESKY, Mr J G	P O Box 6172, BIRCHLEIGH, 1621
2395	PURDON, Mrs C J	P O Box 815, PHALABORWA, 1390
1917	QUINN, Peter & Linda	P O Box 77, DURBAN, 4000
2439	RADLEY, Mnr & Mev B	Posbus 1838, FLORIDA HILLS, 1716
1112	RAUTENBACH, Mnr M J	Irving Steynstraat 19, South Crest, ALBERTON, 1449
2413	RAWLINS, Mr Greg K	7 Scouts Place, PINELANDS, Cape Town, 7405
1197	REINACH, Dr Norman	Posbus 1834, GEORGE, 6530
2599	RENTON, Gordon & Jill	The Claims, P O Box 24, KOMGA, 4950

2623	REYNEKE, Dr D J	P O Box 4976, MIDDELBURG, 1050
0759	RIDGE, Mr Bruce	22 EstuaryView, Beacon Bay, EAST LONDON, 5241
1222	RIORDAN, Mr S	Risk Engineering, P O Box 61689, MARSHALLTOWN, 2107
1654	ROBBERTSE, Prof P J	Astridstraat 167, MEYERSPARK, Pretoria, 0184
1253	ROBINSON, Mr Ken	P O Box 1587, KELVIN, 2054
1699	ROOS, Mr C A	P O Box 7186, ALBEMARLE, 1410
2005	ROOS, Mnr P B	Posbus 664, ELLISRAS, 0555
2175	ROOSENDAL, Mr S	29 Bamboes Street, KILNER PARK, 0186
0187	ROSS, Mr W D	35 Kew Gardens, Kew Avenue, WESTVILLE, 3630
0973	ROSSOUW, Mr N B	P O Box 39419, QUEENSBURGH, 4070
2171	ROUSSEAU, Mnr Robert	Posbus 32416, GLENSTANTIA, 0010
1853	ROUWENHORST, Erik	Posbus 620, NEWCASTLE, 2940
1442	ROUX, Mnr J J	Graphitestraat 64, WILROPARK, Roodepoort, 1724
0415	RUDMAN, Mr R R	3 Dunn Road, Jansendal Township, UITENHAGE, 6229
2301	SCHELHASE, Fred	Posbus 61596, PIERRE VAN RYNEVELD, 0045
1984	SCHMIDT, Mr E V	4 Lauriston Lanes, 55 Viking Road, GLEN LAURISTON, 0185
2410	SCHNETLER, Mnr André M	Posbus 1916, WITBANK, 1035
1881	SCHOEMAN, Mnr J	Posbus 38448, GARSFONTEIN, 0042
2204	SCHOEMAN, Mnr M D	Posbus 409, MONTANA, 0151
2524	SCHOEMAN, Mnr P J	Posbus 1475, WINGATE PARK, 0153
2283	SCHUTTE, Mr H P	P O Box 12596, JACOBS, Durban, 4026
1880	SCHUTTE, Mev J E	Posbus 146, VILJOENSKROON, 9520
2202	SCHUTTE, Mnr M	Buhrmannstraat 30, Horison, ROODEPOORT, 1724
1077	SCHUTTE, Dr R L	P O Box 650580, BENMORE, 2010
0647	SCHWELLNUS, Mnr M R	Posbus 7045, Newton Park, PORT ELIZABETH, 6055
0477	SCRIBA, Mr J H	P O Box 1708, GEORGE, 6530
2186	SCRIBANTE, Mnr J C E	Christolaan 5, Birchleigh, KEMPTON PARK, 1618
2407	SRIBANTE, Mr L F	101 Haygarth Road, KLOOF, 3610
1249	SEEDAT, Hassim	P O Box 407, DURBAN, 4000
2579	SENEKAL Mnr Anton D	Adelaideweg 15, DOONSIDE, 4126
2256	SIM, Mnr Henry	Posbus 239, KROONSTAD, 9500
0254	SLABBERT, Mnr J F	Diazweg 122, Adcockvale, PORT ELIZABETH, 6001
1650	SLAVIERO, Mr L	2 Pierneef Road, Elma Park, EDENVALE, 1609
1959	SMALBERGER, Mnr H C	Posbus 17190, PRETORIA-NOORD, 0116
2572	SMIT, Mev Annatjie	Burensingel 3, STELLENBERG, Durbanville, 7550
2399	SMIT, Mnr C A	Posbus 48114, HERCULES, Pretoria, 0030
0534	SMIT, Mnr D D	Posbus 11126, HATFIELD, 0028
0903	SMITH, Prof G F	NBI, Privaatsak X101, PRETORIA, 0001
2462	SMITH, Mnr J	Posbus 1449, DUNDEE, 3000
1356	SMITH, Mr J D	P O Box 210, WINKELSPRUIT, 4145
1830	SMITH, Mr T D	6 Uve Road, KLOOF, 3610
2378	SMOOK, Dr Gustav J	Posbus 107, KIEPERSOL, 1241
0698	SMUTS, Mnr M N	Posbus 13682, SINOVILLE, 0129
2536	SNYDERS, Mnr P H	Posbus 629, GROBLERSDAL, 0470
2537	SNYDERS, Mev S	Posbus 4115, JOHANNESBURG, 2000
2120	SNYMAN, Mnr A D	Posbus 520, UTRECHT, 2980
1481	SNYMAN, Mr A J	P O Box 5450, Panorama Park, WINKELSPRUIT, 4145
1815	SNYMAN, Dr P H R	Posbus 565, MONTANAPARK, 0159
2391	SNYMAN, Mnr S	Posbus 434, MAGALIESKRUIN, Pretoria, 0150
2249	SOLE, Terry	P O Box 634, EDENVALE, 1610
2401	SOPP, Willie	Posbus 758, MALELANE, 1320
0992	SPICER, Mr B E J	23 West Riding Road, HILLCREST, 3610
9003	STAATSBIBLIOTEEK	Die Direkteur, (Afd Pligeksemplare), Posbus 397, PRETORIA, 0001
2510	STADLER, Mev N	Posbus 1627, NOORDHEUWEL UIT 3, 1756
2456	STANDER, Dr H F M	Posbus 17238, PRETORIA-NOORD, 0116
2503	STANTON, Mr J H	P O Box 977, HONEYDEW, 2040
2560	STARK, Piet W	Posbus 3128, MATIELAND, 7602
2508	STEENKAMP, Mnr Gawie	Posbus 336, MOOINOOI, 0325
2381	STEENKAMP, Dr Gerhard	Posbus 42144, MORELETAPARK, 0044
2584	STEENKAMP, Jakie	Posbus 336, MOOINOOI, 0325
2331	STEENKAMP, Mnr J H	Posbus 34, BRITS, 0250
0911	STEENKAMP, Mnr & Mev K	Posbus 218, LOUWSBURG, 3150
2205	STEENKAMP, Mnre P & W	Posbus 17257, GROENKLOOF, 0027
1576	STEP, Mnr E O	Van Riebeecklaan 133, LYTTELTON MANOR, Centurion, 0157
1110	STEYN, Glen	P O Box 5125, PIETERSBURG NORTH, 0750
2575	STEYN, G Christo	Posbus 2568, THE REEDS, Centurion, 0158
2464	STOFBERG, Mnr P	Posbus 99812, GARSFONTEIN-OOS, Pretoria, 0060
2484	STOLTZ, Danie	Hoof Tegniese Dienste, Tabazimbi Stadsraad, Posbus 90, THABAZIMBI, 0380
2254	STOLZ, A H G	Moultonlaan 1176, WAVERLEY, Pretoria, 0186

1004	STRANEX, Philip	P O Box 53235, KENILWORTH, 7745
1117	STRANG, Mrs C	P O Box 69212, BRYANSTON, 2021
2538	STRAUSS, W J A	Posbus 1595, GROBLERSDAL, 0470
2341	STROBOS, Mev J M L	Posbus 1732, LINK HILLS, 3652
2384	STRONACH, Mr Laurie	P O Box 644, GRAAFF-REINET, 6280
2625	STRONG, Peter D	P O Box 276, KLOOF, 3640
2210	STRUYF, Wim & Martie	Posbus 1954, NELSPRUIT, 1200
0213	STRYDOM, Dr Dawid	32 Louie Avenue, NORTHCLIFF, 2195
2553	STRYDOM, J J	Posbus 151, KIEPERSOL, 1241
9006	SUID-AFRIKAANSE BIBLIOTEEK	Die Direkteur, (Afd Pligeksemplare), Posbus 496, KAAPSTAD, 8000
2422	SWANEPOEL, Andy & Elize	Bezuidenhoutstraat 9, GLENMARAIS, Kempton Park, 1619
2515	SWANEPOEL, Gideon & Elsa	Posbus 87, PATERSON, 6130
0139	SWANEPOEL, Mnr Johan	Posbus 911, BLOEMFONTEIN, 9300
2611	SWANEPOEL Mnr J J	Posbus 28127, DANHOF, Bloemfontein, 9310
1879	SWANEPOEL, Mnr Louis	Posbus 6093, BIRCHLEIGH, 1620
1890	SWART, Dr I J	Posbus 1006, WITRIVIER, 1240
0651	SWART, Mnr M L	Privaatsak X9906, WITRIVIER, 1240
0265	TARR, Dr A A	14 St Matthews Road, EAST LONDON, 5201
0147	TATE, Mr D M	P O Box 8099, DIE HEUWEL, 1042
1708	TERBLANCHE, Prof J	Mimosalaan 448, LYNNWOOD, 0081
2602	TERBLANCHE, Pierre	P O Box 912817, SILVERTON, 0127
( )	THERON, Prof G K	Posbus 1790, GROENKLOOF, 0027
1555	THERON, Dr H S	Posbus 1645, BRITS, 0250
2514	THERON, Laura	Posbus 551, POTGIETERSRUS, 0600
2078	THEUNISSEN, Mnr P	Sheffield Laning 72, BLUFF, 4052
2567	THOMBSON, Mr Norman	209 Cadogan Ave, MONDEOR, Johannesburg, 2091
2246	THORPE, Mr Robin P	P O Box 1797, MOUNT EDGECOMBE, 4300
2581	THURGOOD, Mike	5 Nerina Street, MILNERTON, 7441
2552	TONKING, Mr M J H	P O Box 4137, WHITE RIVER, 1240
0304	TOPHAM, Mr André	P O Box 44, HOEDSPRUIT, 1380
0178	TOPHAM, Mnr C W	Posbus 54478, NINAPARK, 0156
2058	TOWNSEND, Mrs F A	8 Spray Street, Farrarmere, BENONI, 1500
2237	UDEMANS, Mr Willie L	P O Box 90711, BERTSHAM, Johannesburg, 2013
0678	UNGERER, Mr H	P O Box 279, MELVILLE, 2109
1760	UYS, Mev A G	Posbus 2399, PANORAMA LANDGOED, 1718
0322	VALLABH, Mr P D	373 Mink Street, Laudium, PRETORIA, 0037
2134	VAN DAM, Mev H C	Posbus 8496, NEWCASTLE, 2940
2597	VAN DEN BERG, Mnr D J H	Posbus 6138, BIRCHLEIGH, Kempton Park, 1621
2451	VAN DEN BERG, Mnr D S	Vavell Gardens 10, Cavell Place, SARNIA, 3610
1836	VAN DEN BERG, Mnr T	Posbus 477, MESSINA, 0900
1144	VAN DEN HEEDE, Mr A M P	P O Box 2031, PINETOWN, 3600
1283	VAN DER MERWE, Mnr C H	Posbus 993, Rant-en-Dal, KRUGERSDORP, 1751
2539	VAN DER MERWE, E M	Posbus 556, GROBLERSDAL, 0470
1918	VAN DER MERWE, Mnr F A	Posbus 679, BARBERTON, 1300
0136	VAN DER MERWE, Mnr J F	Jack's Cycads, Posbus 39, DUIWELSKLOOF, 0835
0490	VAN DER MERWE, Mnr W D	P O Box 13655, SINOVILLE, 0129
2540	VAN DER NEST, Andrew	Posbus 207, GROBLERSDAL, 0470
2566	VAN DER VYVER, Mev Sarie J	Posbus 785, GANSBAAI, 7220
2181	VAN DER WALT, Mnr A J (Snr)	Blackberry 85, ZWARTKOPS X4, Centurion, 0157
0203	VAN DER WALT, Mnr A S J	Posbus 77720, Fontainebleau, RANDBURG, 2032
2400	VAN DER WALT, D J A	Posbus 105, MALELANE, 1320
0038	VAN DER WALT, Mev Ita	Cycad Kwekery, Posbus 15251, LYNN-OOS, 0039
2453	VAN DER WALT, Mnr J J	Theunsweg 225, MURRAYFIELD X1, Pretoria, 0184
2608	VAN DER WESTHUIZEN, Mnr L C H	Posbus 81, SKEERPOORT, 0232
2127	VAN DER WESTHUIZEN, Mnr M G	Posbus 424, MAGALIESKRUIN, 0150
2590	VAN DER WESTHUIZEN, Mnr P D	Posbus 12559, STELLENBOSCH, 7599
1728	VAN DEVENTER, J C	Bluebellstraat 7, WELGEDACHT, 7530
2472	VAN EEDEN, Mnr B W	Posbus 3489, TYGERPARK, 7536
1987	VAN ELST, Mr Deon	P O Box 89201, LYNDHURST, 2106
2297	VAN GEEMS, Mnr J J	Walnutstraat 26, KUILSRIVIER, 7580
2010	VAN HEERDEN, Mnr F J	Posbus 90678, MAGALIESKRUIN, Pretoria, 0150
1185	VAN HEERDEN, Dr H G	P O Box 237, STRAND, 7140
2105	VAN JAARSVELD, Dr W J	Posbus 28283, DANHOF, 9310
2519	VAN NIEKERK, Mr Andrew	82 Glen Avenue, HIGHWAY GARDENS, Edenvale, 1609
2070	VAN NIEKERK, Dr A R	Posbus 252, SOUTHBROOM, 4277
2272	VAN NIEKERK, Mev Cecilia	Posbus 262, IRENE, 1675
2397	VAN NIEKERK, Mnr G A	Posbus 32, UMBOGINTWINI, 4120
2213	VAN ONSELEN, Mnr R L	Posbus 82680, DOORNPOORT, Pretoria, 0017
2293	VAN RENSBURG, Mnr Johannes	Posbus 3270, DAINFERN, 2055

2240	VAN RENSBURG, Mr P F J	54 Kosmos Avenue, WILROPARK, 1724
1258	VAN ROOY, Mnr Leon	Posbus 1019, WITRIVIER, 1240
2470	VAN ROOYEN, Mnr A L	Posbus 1795, VRYHEID, 3100
1924	VAN ROOYEN, Mnr H C	Posbus 2690, WELKOM, 9460
1903	VAN ROOYEN, Prof H G	Dept Kurrikulumstudies, R.A.U., Posbus 524, AUCKLANDPARK, 2006
1925	VAN ROOYEN, Ds J C	Posbus 2752, MIDDELBURG, 1050
0060	VAN ROOYEN, Dr & Mev R A	Posbus 646, WITRIVIER, 1240
2527	VAN STADEN, Mnr P H	Posbus 549, GROBLERSDAL, 0470
2492	VAN SITTERT, Mev E J	Posbus 11, PONGOLA, 3170
2332	VAN VUUREN, Mnr Henco	Posbus 11954, ERASMUSKLOOF, 0048
1819	VAN VUUREN, Mr J A	P O Box 13474, CLUBVIEW, 0014
0229	VAN WYK, Mev G	Posbus 11306, HATFIELD, 0028
2610	VAN WYK, Mnr N R	Posbus 522, VRYHEID, 3100
2629	VAN WYK, Mr N W	P O Box 16328, NELSPRUIT, 1200
1267	VAN WYK, Mnr P L	Stasiestraat 658, PRETORIA-NOORD, 0182
1891	VAN WYK, Mnr R J	Posbus 113, MOOINOOI, 0325
2516	VAN ZIJL, Mnr Eugene	Posbus 11888, HATFIELD, 0028
2604	VAN ZYL, Mnr Daan	Posbus 1998, TZANEEN, 0850
1756	VAN ZYL, Elkie	Posbus 115, MOOKETSI, 0825
0910	VAN ZYL, Mr J H	P O Box 1822, BROOKLYN SQUARE, 0075
2601	VAN ZYL, Mnr P C	Posbus 17, GROOT BRAKRIVIER, 6525
2060	VELDKAMP, Mnr J A	Jim Versterlaan 42, PIERRE VAN RYNEVELDPARK, Centurion, 0157
0681	VENTER, Mnr F F C	Ontdekkersweg 367, Florida Park, Uitbr 3, FLORIDA, 1709
2320	VENTER, Mev Marlene	Posbus 854, PHALABORWA, 1390
2466	VENTER, Mnr M M	Avrilstraat 643, ELOFFSDAL, Pretoria, 0084
2057	VERMAAK, Mnr E de J	Perskeblomweg 9, Pelissier, BLOEMFONTEIN, 9301
1033	VICE, Dr A R	P O Box2053, BEACON BAY, 5205
1945	VILJOEN, Mr Frank	P O Box 261, FERNDALE, 2160
1825	VILOEN, Mnr G T R	Tugelaweg 1, DUNDEE, 3000
1607	VILJOEN, Mnr Jaap	Posbus 1735, MULBARTON, 2059
2123	VILJOEN, Mnr J H	Minervastraat 8, Amanda Glen, DURBANVILLE, 7550
1949	VILJOEN, Mr Norman	28 Cheviot Road, THE HILL, Johannesburg, 2197
0071	VISSER, Mnr Ben	Posbus 3538, BRITS, 0250
2013	VISSER, Mr George	39 Rouxton Road, LANSDOWNE, 7780
1770	VISSER, Mnr W P	Windhoekweg 2, Arauna, BRACKENFELL, 7560
0917	VORAJEE, Mr R	P O Box 222, LADYSMITH, 3370
2600	VORSTER, Mnr A D	Benitalaan 660, LES MARAIS, Pretoria , 0084
2626	VORSTER, Mev L L	Posbus 48554, ROOSEVELTPARK, 2129
0016	VORSTER, Dr Piet	Dept Plantkunde, Universiteit van Stellenbosch, Privaatsak X1, MATIELAND, 7602
2531	WAHL, Danië C J	Posbus 429, GROBLERSDAL, 0470
0051	WALTERS, Mr George	198 Torquay Avenue, BLUFF, 4052
0847	WALTERS, Mr J W	P O Box 6150, DUNSWART, 1508
2594	WATTS, S C	P O Box 15070, FARRARMERE, Benoni, 1518
2119	WEBB, Mr A R F	25 Anemone Road, PRIMROSE, 1401
2172	WELKEN, Mnr Pieter A (Jnr)	Posbus 398, PONGOLA, 3170
0175	WELLS, Mr B K	P O Box 7068, Newton Park, PORT ELIZABETH, 6055
0039	WENTZEL, Mr B	19 Rietfontein Road, Primrose, GERMISTON, 1401
1380	WENTZEL, Mnr P	Posbus 1016, KROONSTAD, 9500
0047	WENTZEL, Mr Stephanus	P O Box 1653, BROOKLYN SQUARE, 0075
2144	WESSELS, Mnr A P	Posbus 3110, KENMARE, 1745
0448	WESSELS, Dr F H	P O Box 7, PHALABORWA, 1390
1318	WESSELS, Dr J W	Posbus 31, HEIDELBERG, 6665
9017	WESTERN CAPE NATURE CONSERVATION BOARD	D L Hignett, Flora Permit Section, Private Bag X100, VLAEBERG, 8018
2322	WESTLAND, Mnr Chris	Posbus 837, HUMANSDORP, 6300
1441	WIGGILL, Mr D L	P O Box 6260, FLAMWOOD, 2572
2551	WILLEMSE, Mnr T S	Posbus 53741, WIERDAPARK, Centurion, 0149
2408	WINTOUR, Mr A F	P O Box 1881, ALBERTON, 1450
0008	WOHLBERG, Mr H Edgar	10 Stephens Avenue, WESTVILLE, 3630
2541	WOLMARANS, P P	Posbus 27, GROBLERSDAL, 0470
9008	WORLD WILDLIFE FUND, DIRECTOR OF COMMUNICATION	P O Box 456, STELLENBOSCH, 7599
1164	WUNDERLIN, Mr P	9 Monarch Road, WESTVILLE, 3630
9009	WWF SOUTH AFRICA	(Att Dr Ian McDonald), P O Box 456, STELLENBOSCH, 7599

FOREIGN MEMBERS (ALPHABETICAL)

AUSTRALIA

0620	ADELAIDE BOTANICAL GARDEN	The Librarian (Karen Saxby), North Terrace, ADELAIDE, South Australia 5000
1209	BALKENHOL, Mr R	10 Pinoak grove, MENAI, New South Wales 2234
1997	BEAUMONT, Mr G	P O Box 22, KATHERINE, Northern Territory 0851
0432	BRYANT, Mr D	Palmworld, 504/510 Parkridge Road, PARKRIDGE, Queensland 4125
1996	CASEY, Mr David	98 Groth Road, BOONDAL, Queensland 4034
2447	CHADWICK, Mr C E	9-2 Francis Road, ARTARMON, NSW 2064
1731	DAVIE, Mr Ian	P O Box 2632, PALMERSTON, Northern Territory 0831
1753	ELKADI, George	c/o 5 Drew Street, WESTMEAD, New South Wales 2145
2357	ELLISON, Elmer	15 Balwarra Ave, DIANELLA, Western Australia 6059
1516	FORSTER, Dr P I	P O Box 2171, ASHGROVE WEST, Queensland 4060
2211	GAYNOR, Bill	4A Haig Road, ATTADALE, Western Australia 6156
2598	GROSAS, Rev Michael J	17 Commercial Street, WALA WALLA, NSW 2659
1205	GUMMOW, Mr G P	74 Solway Crescent, CARBROOK, Queensland 4130
2630	HALL, John	Asthally, Carool Road, BILAMBIL, NSW 2486
1347	HEIBLOEM, Mr P	P O Box 700, NAMBOUR, Queensland 4560
1148	JONES, Dr D	13 Saville Close, MELBA, Australian Capital Territory 2615
1995	KEEN, Mr Alan	Cycad Gardens Nursery, 777 Teviot Road, NORTH MACLEAN, Queensland 4280
0411	KENNEDY, Mr Paul	21 Sierra Road, ENGADINE, New South Wales 2233
1215	KRAA, Mr W	45 Van Dieren Rd, PALLARA, Queensland 4110
1673	LYLE, Mr J L	P O Box 99, TEWANTIN, Queensland 4565
1518	MACHIN, Mr P	111 Dorrington Drive, ASHGROVE, Queensland 4060
0975	OBERPRIELLER, Dr Rolf G	CSIRO-Entomology, GPO Box 1700, CANBERRA, ACT 2601
0012	OSBORNE, Roy & Angela (HON)	P O Box 244, BURPENGARY, Queensland 4505
9013	PALM & CYCAD SOCIETIES OF AUSTRALIA	(Newsletter Editor), P O Box 1134, MILTON, Queensland 4064
1553	PALM & CYCAD SOCIETY OF MACKAY (PACSOA)	P O Box 6639, MC WEST MACKAY, Queensland 4741
2173	PALM & CYCAD SOCIETY OF SUNSHINE COAST (PACSOA)	P O Box 1007, NAMBOUR, Queensland
9012	PALM & CYCAD SOCIETY OF WESTERN AUSTRALIA	P O Box 170, COMO, Western Australia 6162
0505	PERNER, Mr J	P O Box 435, KATHERINE, Northern Territory 0850
1471	RANDALL, Mr L M	54 Cockatoo CT., CABOOLTURE, Queensland 4510
2118	RICE, Susan	13 Sundance Way, RUNAWAY ILDS, Queensland 4216
1658	RIEDL, Mr R W	1 Coorabell Road, COORABELL, New South Wales 2479
1287	ROCH, Mr D E	7 Sublime Glade, NEERABUP, Western Australia 6031
1710	ROYAL BOTANIC GARDENS	Mrs Macquaries Road, SYDNEY, New South Wales 2000
1367	STEWART, Ms L R	13/46 Fontenoy Road, NORTH RYDE, New South Wales 2113
0610	THOMPSON, Mr C	P O Box 140, SYLVANIA, New South Wales 2224
2308	THURGOOD, Mr Bill	22 Eastment Street, RAINWORTH, Queensland, 4065
1445	VENAMORE, Mr P D	Pringles Road, Kobble Creek, Samsonvale, BRISBANE, Queensland, 4520
0251	WALKLEY, Mr & Mrs Stan	281 Buckley Road, BURPENGARY, Queensland 4505
1515	WILSON, Mr G W	1/15 Golf Links Road, ATHERTON, Queensland 4883

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0906	BRUNNER, Mr Julius	Postfach 4, A-2326 MARIA LAZENDORF

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2618	MULLER, Christian B	Rua Almeida Garrett 27, P-9560 LAGOA, Portugal

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2631	CHASSOT, Pedro P	Rua Fernandes Vieira 449 AP.1104, PORTO ALEGRE, 90035-091

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2330	WANG, Dr Dingyue	P O Box 303, Building 33, Yitian Village, Futian, SHENZHEN 518038, GUANGDONG

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0574	BOTAN CENTRALBIBLIOTEK KOBENHAVEN	Solvgade 83 OPGS, DK-1307

EGYPT

2323	EL-SHAMY, Ibrahim S	7 Mohamrd Talaat St, Agouza-Giza, CAIRO

FRANCE

2146	GONZALES, Jean Phillippe	45 Rue Hippolyte Desprès, PERPIGNAN 66000
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1709	PELLISIER, Robert	CD-2 Rue de Germenos, AUBAGNE 13400
0346	SCLAVO, Jean-Pierre	Villa La Finca, Plateau du Mont Boron, NICE 06300

GERMANY

2382	BOHNE, Peter	Buchstrasse 40, 91217 HERSBRUCK
1827	BUNDESAMT FÜR NATURSCHUTZ	Dok./Bibliothek, Herr Fischer, Konstantinstrasse 110, 53179 BONN
0804	SCHLEGEL, Dr Helmut	Wulfsdorferweg 112C, HAMBURG D-22359
1446	SCHMID, Mr R	Postfach 26, ADELSDORF D-91323
0544	SCHOTT, Mr E	Augustenburgstrasse 7, FRANKFURT-AM-MAIN 60488
1596	STORBECK, Mr G	Alt Westerhusen 151, MAGDEBURG D-39122
1490	WAGNER, Mr S	Immergrunweg 6, HEIDENHEIM 89522

GREECE

2522	LAMPROPOULOS, Mrs E	Spyrou Merkouri 58, Pagrati, 11634 ATHENS

INDIA

1332	DHAR, Mr Shri	20 Ballygunge Park Road, CALCUTTA 700019
9032	PANT, Prof D D (HON)	106, Tagore Town, ALLAHABAD 211 002
2544	SHAOO, Soumen	Vill.+P.O.-Kulakash, P.S.-Jangipara, Dist-Hooghly-712404, WEST BENGAL

INDONESIA

2569	KUESNO, Soetjipto	Raya Kendangsari 45-47, SURABAYA, 60292

ISRAEL

2089	REGEV, Mr Moshe	Kibbutz GIVAT-BRENNER 60948

ITALY

1826	D E A	002048/Ortobo, Via Lima 28, ROMA 00198 RM
0482	GARGIULO, Sig Mario	Via Vocale 27, META (N/A) I-80062
1070	LOTTI, Dr M	Via Tasso 630, NAPOLI 80127
1680	SANTAGATA, Mr Luigi	Via Sanfelice 25, AVERSA (CE) I-81031
0609	STAINER, Mr O	Via Lisbona 25, Treporti, VENEZIA 30010

JAPAN

2088	KONDO, Prof Dr K	Lab Plant Chromosone & Gene Stock, Faculty of Science, Hiroshima University, 1-4-3 Kagamyama, HIGASHI-HIROSHIMA CITY 739
1691	SHIMIZU, Mr Hideo	Atagawa Tropical & Alligator Garden, Atagawa, Higashi Izu Machi, Kamo Gun, SHIZUOKA 413-0302

NAMIBIA

2609	PIETERS, Mnr A J	Posbus 1516, WINDHOEK
2310	LOUW, Mev E	Posbus 832, OTJIWARONGO

NETHERLANDS, THE

2121	HORTUS BOTANICUS	Jan M Visser, Plantage Middenlaan 2A, 1018DD AMSTERDAM
1969	VAN DE PEST, Mr P	Molenstraat 55, 3905AN VEENENDAL
1703	VELDHOEN, Gerrit	Looiwinkelstraat 42, SPAUBEEK 6176 ED
0500	VISSERS, Mr H	Griend 38-22, LELYSTAD 8225 TS

NEW MEXICO

1300	FRANCIS-ERHARD, Dr Doris	38 Tano Alto Road, SANTA FE, 87501

NEW ZEALAND

0325	BOYER, Mr Keith	70 Opanuku Road, RDI Henderson Valley, AUCKLAND
2570	LOK, John W D	P O Box 212, DARGAVILLE, 3000
1781	LONG, Mr M	Hiltop Enterprises, 38 Grammar Road, RDI KATIKATI, Bay of Plenty
0718	LAUGHLAND, Bryan	20 Vic Butler Street, Mt Roskill, AUCKLAND
2628	PEPPERELL, Bill	42 Enderley Avenue, HAMILTON, 2000

SPAIN

2025	GIRONA, Mr J A	Plaza Porta de la Mar 4, VALENCIA 46004

SWAZILAND

2517	SWAZILAND NATIONAL TREE SEEDBANK	Malkerns Research Station, P O Box 4, MALKERNS

THAILAND

2385	AKAPANTHANON, Chakapan	84 Sawanwithi Rd, TB Nakhonsawan Tok, AP MUANG, NAKHONSAWAN, 60000
2365	CHAROEN-RAJAPARK, Dr Chatchawin	7 Soi Yagsoisammitr, Sukhumvit 16, BANGKOK, 10110
2165	SANGSAWANG, Tanomwong	209 Prasung Road, Takli District, NAKORNSAWAN 60140
2348	TANSACHA, Kampon	Nong Nooch Tropical Garden, Sukumvit K.M. 163, Nachomtien, CHONBURI, 20250

TURKEY

1792	ESSENER, Dr Ragip	Posta Kutusu 33, Koycegiz, MUGLA, 48800

UNITED KINGDOM

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2309	GRAHAM, Mr C D	142 Canley Road, CANLEY, Coventry CV5 6AQ
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0929	NATURAL HISTORY MUSEUM	Acq Section, Cromwell Road, LONDON SW7 5BD
0734	PLATFORD, Mr R J	9 Waycross Road, CRANHAM, Upminster, Essex RM14 1LZ
2001	ROYAL BOTANIC GARDENS	Library, Kew, RICHMOND, Surrey TW9 3AE

9004	ROYAL BOTANIC GARDENS	Threatened Plant Unit, Kew, RICHMOND, Surrey TW9 3AE
1912	SPENCER-JONES, Mr A	12 The Brooklands, TARBOCK ROAD, Liverpool L36 5YD
1437	WASKIN, Mr S	65 Parc Brynmawr, Llanelli, CARMARTHENSHIRE, Wales SA15 4PG
2250	WATT, Mr Ian	25 Treves Road, DORCHESTER, Dorset DT1 2HE

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1292	BERGMAN, Mr W P	3233 Brant Street, SAN DIEGO, California 92103
1052	BESSE, Dr & Mrs B	6729 Peacock Road, SARASOTA, Florida 34242
1747	BIAGI, Louis	2000 Hoover Avenue, OAKLAND, California 94602-1924
1734	BLAUER, John	418 Pirate Road, NEWPORT BEACH, California 92663
1895	BOBICKS PALM GROWERS	3744 Lake Drawdy Drive, ORLANDO, Florida 32820-1443
2334	BRESSLER, R M	999 Third Ave. Suite 2300, SEATTLE, WA 98104
2613	BROWN, Bruce	9292 Hudson Dr, HUNTINGTON BEACH, CA 92646
1394	BROWN, Mr E D	10712 Lippizan Drive, JACKSONVILLE, Florida 32257
2313	BUCKLEY, Robert	32005 Pleasant Glen Road, TRABUCO CANYON, CA 92679-3228
1288	BURNETT, Mr W L	P O Box 17908, NORTH LITTLE ROCK, Arkansas 72117-0908
2438	CAMPBELL, Thomas R	P O Box 721, METARIE, Louisiana70004
1771	CARLSON, E J	485 Nieuport Drive, VERO BEACH, Florida 32968
0844	CARNEY, Mr Jack	411 Indianapolis Avenue, HUNTINGTON BEACH, California 92648
2499	CARPER, Mark A	Cherokee Hammock, DELAND, FL 32720
0598	CAUDRY, Mr J	264 Almyra Drive, LAKE MARY, Florida 32746
0709	CHEEK, Mr Bane W	2813 Country Club Rd North, WINTER HAVEN, Florida 33881
1595	CHEMNICK Mr J	114 Conejo Road, SANTA BARBARA, California 93103
2617	CORTNER, Mark E	18218 Knotty Green, HOUSTON, TX 77084
2258	DAVIES, Stanton W	444 Tustin Avenue, NEWPORT BEACH, CA 92663
2511	DE LAUBENFELS, David J	107 Will-O-Wind Dr, JAMESVILLE, NY 13078
1954	DELEVORYAS, Dr Ted	1740 South El Camino Real J204, ENCINITAS, California 92024-4961
2259	DOUGHTY, Severn C Jr.	4212 Forrest Le Blanc Rd, NEW IBERIA, LA 70560
1801	DOWDY, Mr T V	1018 Hayes Avenue, SAN DIEGO, California 92103
`1568	DUDENHOEFFER, Mr J	P O Box 1391, BONSALL, CA 92003
1591	ECKEL, Mr D	2119 Victoria Drive, FULLERTON, California 92631
1772	ERICKSON,B	5408 Santa Teresa Avenue, SANTA ROSA, California 95409
2615	EXOTIC SPECIMEN PALMS & CYCADS	Dick Johnson, 20843 Cienega Ave, COVINA, CA 91724
9005	FAIRCHILD TROPICAL GARDEN	Library, 11935 Old Cutler Road, MIAMI, Florida 33156
2335	FOSTER, Phillip A	11521 Augusta Dr, BALCH SPRINGS, TX 75180
1736	FRITZ, William H	114 Willow Creek Rd, UNION, MO 63084
1748	FROEHLICH, Mr D	13219 Stern Avenue, LA MIRADA, California 90638-2454
2157	GARDNER, Ted	1550 Mountain Drive, SANTA BARBARA, CA 93103
2507	GORDIN, Frank	1451 S. Rimpau #214, CORONA, CA 92879
2217	GORDIN, Scott	1451 S. Rimpau #214, CORONA, CA 92879
2614	GRAS, Roger	P O Box 1066, WOLFFORTH, TX 79382
0471	GREGORY, Dr T J	414 Pinehill Road, HILLSBOROUGH, California 94010
1594	GUILIANO, Merle	3115 Grove Road, PALM BEACH GARDENS, Florida 33410
1634	HAZEN, Dr S J	5700 SW 35 Lane, OCALA, FL 34474
1860	HENNELL, Mr Ken	38555 Harris Trail, FALLBROOK, California 92028
2158	HODDS, William C W	5492 N Palm Avenue Suite B, FRESNO, CA 93704
1773	HOLTON, D F	5221 Third Road, LAKE WORTH, Florida 33467
2098	HOWARD, Mr Bob	2514 North Lanchmont Ave, SANTA ANA, Ca 92706
1051	HUNTINGTON LIBRARY	Acquisitions Dept/Bot/, 1151 Oxford Road, SAN MARINO, CA 91108
2020	IRONMONGER, Bruce & Suzanne	P O Box 754, BONSALL, CA 92003
1878	JAEGGI, Mr Fred	3064 E. LaMarche Ave, SCOTTSDALE, AZ 85254
1920	KATZ, Mr M	10419 Troon Ave, LOS ANGELES, CA 90064
1427	KOPFSTEIN, Mr R	6903 Kellyn Lane, VISTA, CA 92084
2160	KURTH, Dr Donald J	10569 Apple Lane, RANCHO CUCAMONGA, CA 91737
0918	LEWIS, Mr H W	P O Box 195, FORT OGDEN, Florida 34267-0195
1737	LOWE, Mr Dan	44 Buena Vista Drive, DANVILLE, California 94526
1738	LUTHER, Harry	The Marie Selby Botanical Gardens, 811 S Palm Avenue, SARASOTA, Florida 34236
1635	McDANIEL, Mr I	4034 Crest Heights, FALLBROOK, California 92028
1750	MAEROWITZ, Mr Todd	472 Tiller Lane, REDWOOD CITY, CA 94065
2557	MARTIN, Robert E	1118, 26 Street, SANTA MONICA, CA 90403
1777	MEDLOCK, Mr E	420 15th Street, MANHATTEN BEACH, CA 90266
2396	MISSOURI BOTANICAL GARDEN	The Library, P O Box 299, ST LOUIS, Missouri 63166
0570	MOLDOCH, Mr W	1544 Shipview Road, ANNAPOLIS, Maryland 21401
2366	NGUYEN, Andrew	1076 Horseshoe Bend, WALNUT, CA 91789
0483	NORSTOG, Dr K (HON)	4598 Spade Rd, SAGLE, ID 83860
2616	PACHECO, Art	4442 W. Plantation St, TUCSON, AZ 85741
2386	PEDERSEN, Daniel W	1806 Old Topanga Canyon Rd, TOPANGA, CA 90290

2099	PENCALL, Mr Ed	13636 Mulberry Dr, WHITTIER, CA 90605
0562	PERRY, Mr M	1631 Columbia Drive, ENGLEWOOD, Florida 34223-1517
2387	POULSEN, Chris	8749 Almond Rd, LAKESIDE, Ca 92040
2512	PROKOPIJ, John	16422 Paseo de Rocha, HACIENDA HEIGHTS, CA 91745
1813	REID, Stewart	5051 Westminster Ter, SAN DIEGO, California 92116-2104
2164	RICE, David A	4851 Marguerita Ln, LA MESA, CA 91941
2434	RIEDLER Mark	1045 Via Marbrisa, ENCINITAS, CA 92024
1627	ROSENGRANT Ken/ENIMOTO Joyce	6945 W 77 St, LOS ANGELES, CA 90045
2196	ROSS, Mary Jo & Terry	2579 Brust Court, EL CAJON, CA 92019
2558	SCHELLENBERG, Hans K	18420 Wayne Rd, ODESSA, FL 33556-4744
1814	SHAFFER, Richard	82-751 Boston Court, INDIO, California 92201
2101	SLAVINSKI, Mr A J	1403-R Bedford St, CUMBERLAND, MD 21502-1004
1898	SMITH, Mark & Linda	P O Box 622, RANCHO SANTA FE, California 92067
1899	STERNBERG, Karen & Paul	2124 Camino Cantera, VISTA, California 92084
2080	TALLEY, Mr H Ray	133 Eagle Rock Avenue, SILVER STRAND BEACH, CA 93035
0188	TANG, Mr Willie	Fairchild Tropical Garden, 11935 Old Cutler Rd, MIAMI, Florida 33156-4299
2587	TERRY, Irene & Roemer, Robert	University of Utah, Dept of Biology, 257 South 1400 East, SALT LAKE CITY, UT 84112
2458	TETLEY NURSERIES	20350 Winton Rd, NC CORONA, CA 91719
2167	TRACY, Michael S	1131 South Grand Avenue, DIAMOND BAR, CA 91765
0919	TURLO, Mr A	5521 Towers Street, TORRANCE, California 90503
1668	US CYCAD SOCIETY SEED BANK	1417 Hilgard Avenue, SIMI VALLEY, California 93065
1439	WAGNILD, Mr Gary	405 Olive Street, INGLEWOOD, California 90301-2217
0657	WALSKA, GANNA LOTUSLAND FOUNDATION	695 Ashley Road, SANTA BARBARA, CA 93108
1552	WALTERS, Dr T	Montgomery Botanical Center, 11935 Old Cutler Road, MIAMI, Florida 33156
2251	WARD, Dr F Prescott	500 Orlando Blvd, INDIALANTIC, Florida 32903
2574	WARNEY, Tony M	492 Dewane Drive, EL CAJON, CA 92020
0284	WHITELOCK, Mr Loran M	4524 Toland Way, LOS ANGELES, California 90041
2412	WILLIAMS, Glen	742 E Palm Ave, MONROVIA, CA 91016
0989	WILLIAMSON, Mr Eddie	433 66th Avenue South, ST PETERSBURG, Florida 33705
0485	WRINKLE, Mr G	11610 Addison Street, NORTH HOLLYWOOD, California 91601

ZIMBABWE

1626	ALOE & CACTUS SOCIETY OF ZIMBABWE, (The Cycad Branch)	P O Box CY 300, Causeway, HARARE
1409	COETZEE, Mrs H M	Estelle Farm, P O Box 12, MHANGURA
1991	GILLESPIE, Mr M D	128 Larmenier Village, 4 Ridgeway North, P.O. CHISIPITE, Harare
1315	LAPHAM, Mrs E	P O Box H.G. 960, Highlands, HARARE
2295	McLAUGHLAN, Miss G M	1 Lloyd Close, Ballantyne Park, HARARE
1218	MÜLLER, Mr D	P O Box 246, RUSAPE
2380	RIVRON, B D	4 Shiri Road, Greendale, HARARE
2281	SCHLACHTER, Brian	Box B E 174, Belvedere, HARARE
0096	TURNER, Mr I S	P O Box CH613, Chisipite, HARARE
2068	WATERS, Mr I R	29 Ridge Road, Avondale, HARARE

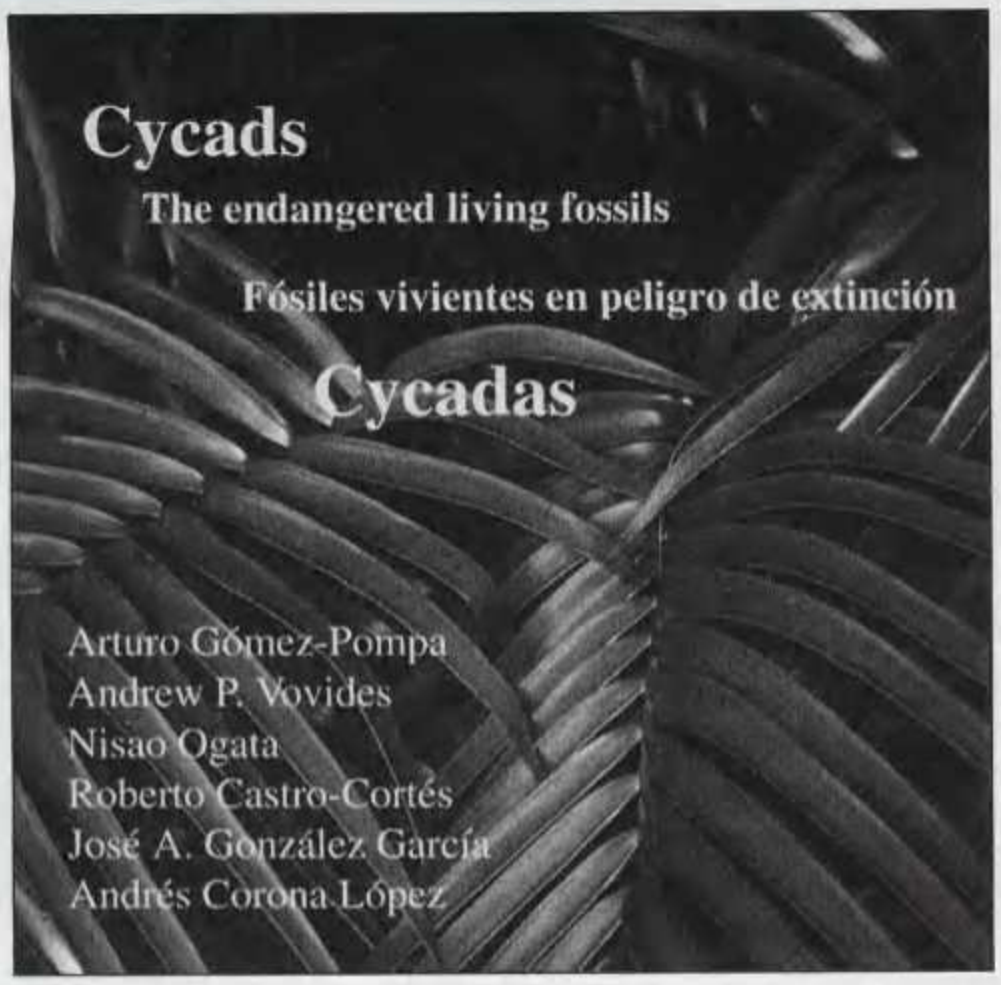
CD REVIEW / BESPREKING

Gómez-Pompa, Arturo, Vovides, Andrew P., Ogata, Nisao, Castro-Cortés, Roberto, Garcia, José A. González, & López, Andrés Corona. (2000).

Cycads: The endangered living fossils.

This is an interactive CD-ROM that tells you more about the cycads of Mexico, the Caribbean and the United States. The CD presents the material in Spanish and English and has many photographs, maps and pictures. Many of the key words in the text have hyperlinks to navigate to an explanation of a technical term or a picture. The presentation is, however, too sophisticated for the amount of information supplied and that makes navigating the data confusing.

The CD has information on the cycad fossil record, biology, distribution and history. The reader is introduced to cycads with a general overview of the plants and their history. The general vegetation types are briefly discussed



to give the reader an idea of the habitat of the different species. Identification keys are provided for identification

of *Dioon, Ceratozamia, Zamia* and *Microcycas* species. This is useful for those unfamiliar with the cycads of Central America. Although the list is not 100% complete, it has a description of the species with information like plant and cone structure, distribution and habitat. Unfortunately no specific information is provided on cultivation and the program mainly deals with the plants in habitat. An atlas shows where in the world cycads are found and a more detailed distribution map is provided for the different areas, showing the genera and species for that area.

The program requires Windows 95, 98 or NT running on at least a Pentium computer with a graphics card capable of at least 256 colours and 640 x 480 resolution. The program accesses data on the CD and it is therefore advisable to have a fast CD-ROM drive. The CD-ROM is currently available from the University of California Riverside Bookstore for US$24.00 plus shipping and handling.

Wynand van Eeden
P.O. Box 3489, 7536 Tygerpark, R.S.A.

FOCUS ON ...

In each edition of *ENCEPHALARTOS*, we focus on one cycad species, in the form of an in-depth article in layman's language. In this edition the spotlight falls on:

FOKUS OP ...

In elke uitgawe van *ENCEPHALARTOS* fokus ons op een broodboomsoort, in die vorm van 'n in-diepte-artikel in leketaal. In hierdie uitgawe val die kollig op:

BOWENIA SERRULATA (W. Bull) Chamberlain

Gary W. Wilson
Department of Tropical Plant Sciences, James Cook University, Smithfield, Cairns, Queensland 4870, Australia e-mail: Gary.Wilson@jcu.edu.au

INTRODUCTION

This species is one of two in the genus and is restricted to an area near Byfield in Central Queensland (Figure 1). The genus was named after Sir George Ferguson Bowen, first Governer of Queensland, in 1863 by Joseph Dalton Hooker. This species was described by Charles J. Chamberlain in 1912; the specific epithet referring to the serrated margins of the leaflets.

Bowenia are distinct in the extant cycads in their bipinnate foliage or sometimes tripinnate (Wilson 1996) foliage. Also characteristic of the genus is the circinate vernation that gives rise to the distinct "crozier" or fiddlehead structure of the emerging leaf (Figure 2), the Ω distribution of the vascular bundles in the stele, the high levels of the

toxic methylazomethanol glycosides, and a chromosome number of 2n = 18.

Bowenia serrulata is widely known as the "Byfield Fern" and is harvested and sold under permit in Queensland using that name. It appears on the coat of arms of Central Queensland University whose principal campus is in the nearby city of Rockhampton.

HABITAT AND ENVIRONMENT

Jones (1993) notes that *B. serrulata* grows in "open forest sometimes extending into moderately dry situations". Whilst this is true, the species is also found and grows to its best expression in wetter riverine and Simple Evergreen Vine Forest (Colour Figure 1 on p. 23). Plants growing in these habitats produce fewer cones, and fewer but taller leaves and larger and thinner leaflets, than those growing in less mesic environs. This species also grows well in *Pinus* plantations that now occupy much of its previous habitat. The species grows in alluvia and the nutrient-poor Bayfield mineral sands and whilst frequently growing on stream margins requires a well-drained substrate.

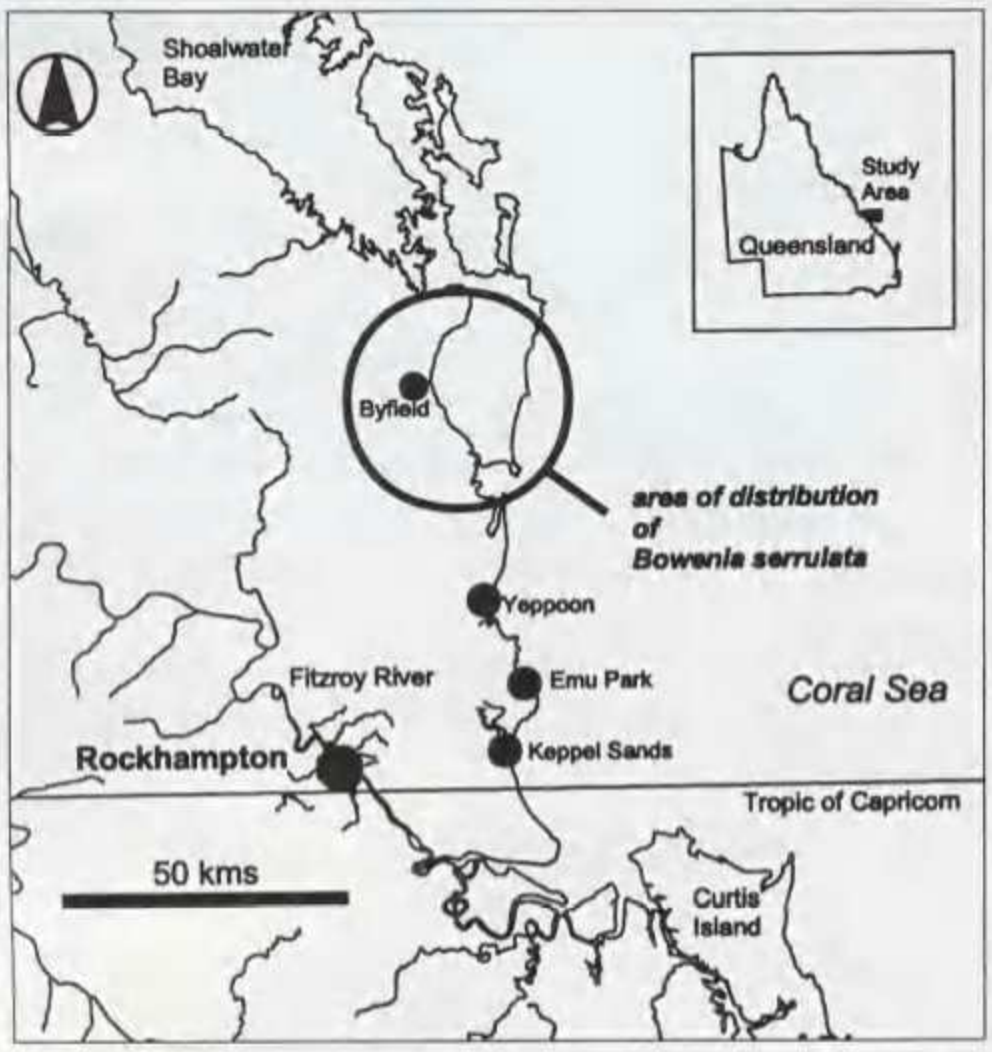


Figure 1 Distribution of *Bowenia serrulata* in Central Queensland.

Bowenia serrulata occurs in coastal Central Queensland in an area with a pronounced Wet and Dry Season climatic regime. The area of distribution has average annual rainfall in the range 1500–1750 mm. Wet Season daytime temperatures average 30°C with high humidity levels prevailing, particularly in the afternoons. Dry Season (Austral Winter) daytime temperatures range from 22 through 30°C with a lowest monthly average minimum of 10°C, frosts do not occur. Wildfires are infrequent and rarely affect the core areas of the habitat; however, the species is fire tolerant and plants growing in the pine plantations survive regular fuel reduction burns.

Figure 2 Juvenile leaf showing the circinate vernation and acropetalar growth habit.

The area of distribution of *B. serrulata* is a mesothermal refugium, being more tropical than elsewhere on the Central Queensland Coast and including flora and fauna species otherwise found further to the north. The species occurs 1000 km south of *Bowenia spectabilis* and is separated from it by the dry and megathermal "Marlborough" and "Burdekin Gaps". Whilst the area of rainforest in eastern Australia was fragmented and reduced to its minimum extent during the last glacial maximum (about 18 000 years ago) it is likely that the separation of the species of *Bowenia* occurred much earlier and probably in the Miocene.

DESCRIPTION

1. STEM

Subterranean, fleshy, much-branched and growing to about 500 mm in length and 250 mm in diameter (Colour Figure 2 on p. 23) with a substantial taproot extending a metre or

toxic methylazomethanol glycosides, and a chromosome number of 2n = 18.

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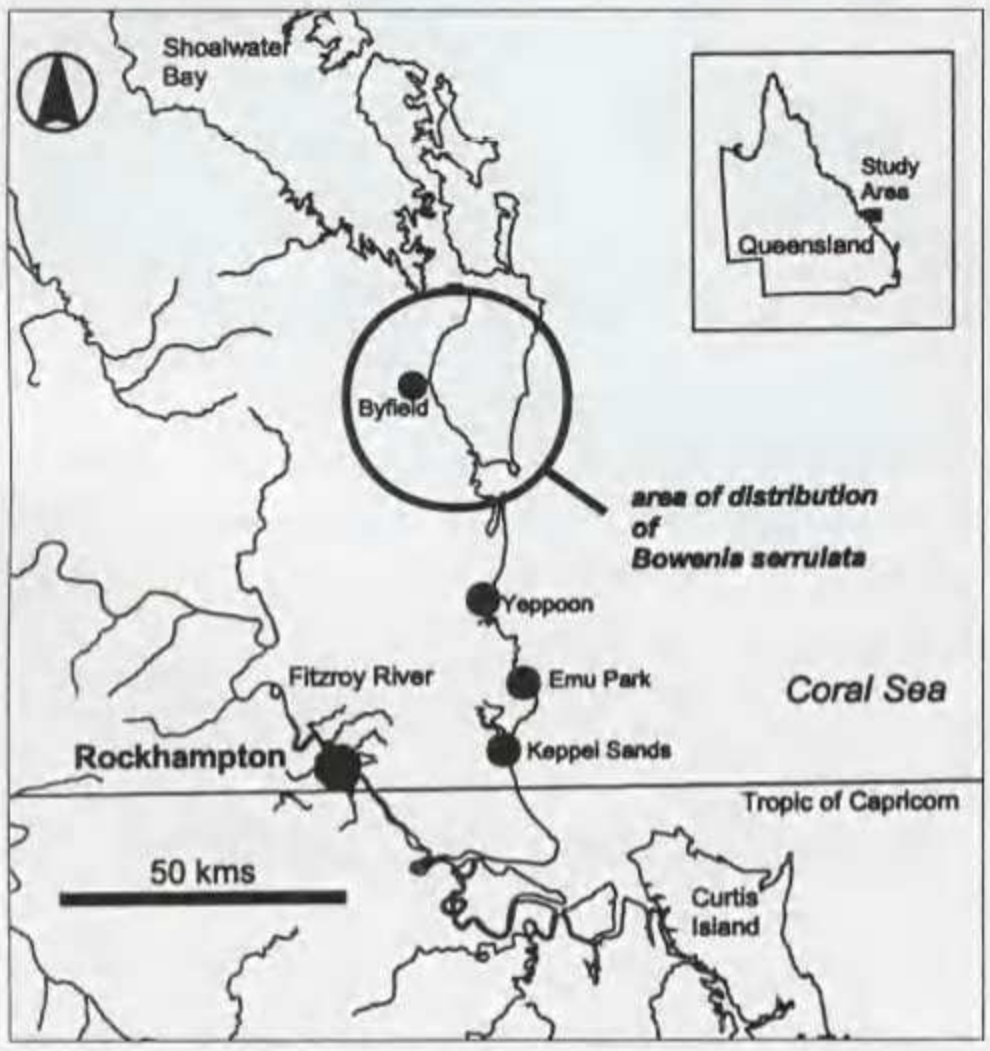

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more into the substrate and "coralloid" roots commonly extending to the soil surface. The leaves and cones are borne on separate short branches.

2. LEAVES

These are erect and vary in number from 1–7 per branch with lower numbers (1–3) being more common; the leaf bases are not persistent. The leaves are generally bipinnate with 5–13 pinnae (1st Order leaflets) per leaf and 5–30 opposite or non-articulate pinnules (2nd Order leaflets) on each.

In mature leaves the petiole is bulbous at the base, woolly on the lower portion and thereafter glabrous and up to 1200 mm in length. The rachis, pinnule rachilla and pinnules are hairy when juvenile but glabrous when mature.

The leaflets have serrate margins and slightly raised and divergent veins on the lower surface. Leaflet length, width and length/width ratio is highly variable between both leaves and plants with the former up to 150 mm and 40 mm respectively; those on plants growing in higher light intensities are smaller and more robust than those on plants in lower light intensities. Leaflet shape is also variable, ranging from sword to sickle shaped with many having a sharp "drip tip" apex. The leaflet structure is indicative of the mesic and relatively stress-free habitat in which the species occurs; stomata are found only on the lower face of the pinnule and they are superficial simple in structure without any adaptations for a stressful environment.

Cataphylls are regularly present around cone stalks and partially cover emerging cones but are reduced and irregularly present about leaf bases (Wilson 1996). The cataphylls on emerging leaves are often not obvious when present and are frequently covered by soil or leaf litter.

3. CONES

Like all cycads *Bowenia serrulata* is dioecious with male and female cones on separate plants. It is difficult, without excavating about each plant, to determine the frequency of cone production by plants due to the subterranean nature of the stem and leaf bases. The smaller, shorter lived and less energy demanding male cones are produced more frequently, both on cultivated plants and in the population, than the larger, longer lived and more energy expensive female cones. Plants of both sexes can produce cones in successive years but whilst this often occurs in male plants it is unusual in female plants and some may not cone more often than once in a decade. There is insufficient data to determine any sex bias in the population but a 10 year survey by the author of 40 plants yielded a male/female ratio of 3.5 : 1.

Mature cones are thermogenic, males more so than females, with temperatures being raised 4–6°C above ambient on a cyclical diurnal basis (Wilson *unpubl. data*) during pollen shedding in the male and ovule receptivity in the female. Mature male cones (Colour Figure 3 on p. 23) are about 80 mm in height but rapidly expand an additional 30% in height whilst dehiscing pollen. The microsporophylls are wedge-shaped, yellow-brown in colour when mature and sparsely covered with short hairs. Female cones (Colour Figure 4 on p. 23) grow up to 200 x 100 mm and are barrel to ellipsoid in shape and green-brown in colour; the megasporophylls are about 50 x 30 mm in size, and the faces are sparsely hairy, particularly when young. Two ovules are borne on each megasporophyll. The seeds are radiospermic, up to 25 x 35 mm in size, ovoid to oblong in shape and the sarcotesta is lilac to blue-purple in colour when mature.

Coning phenology is regular and closely correlated with season. Cone growth is initiated in mid year, during the Dry Season, and males dehisce pollen in late November and early December, immediately before the onset of the Wet Season. The seeds in the female cones mature with the onset of the following Dry Season and the seeds are dispersed when the cones fragment or are disturbed by animals, the identity of which has not been determined, during the period May through September. The animals strip the flesh from the seed kernel but rarely broach the stony sclerotesta. Greenhouse trials by the author indicate that the removal of the sarcotesta facilitates seed germination. A "post-ripening" period, during which embryo growth and maturation continues, extends several months after the seed is dispersed and germination occurs in December and January at the commencement of the Wet Season. A small percentage of seeds remain viable for a second year.

POLLINATION BIOLOGY

Studies by the author (Wilson 1993, Wilson *In press*) show that pollination in *B. serrulata* is entomophilic; the pollination vector is the molytine weevil *Miltotranes subopaca* (Lea). The weevil feeds on and breeds in the starch-rich tissue of the male cones and aestivates in the final larval instar stage in the leaf litter and soil between reproductive events of the plants. They do not utilise the female cone but do visit them, either in confusion for the male cone, or more likely to partake of the sugar and amino acid-rich pollination drop offered by the ovules, and in doing so effect pollination of them. Weevils collected from female cones and examined under the microscope are observed to carry only pollen from male cones of *Bowenia*. The weevil has a close and possibly coevolutionary association with the plant.

AFFINITIES

Whilst geographically removed by a distance of 1000 kms

Bowenia serrulata is most closely related to *B. spectabilis* of north-east Queensland. It is not closely related to any other Australian cycad. Fossil taxa of *Bowenia*, including the named species, *B. eocenica* and *B. papillosa* (R.S. Hill 1978), are known from a number of early and mid-Eocine and Miocene sites in southern Australia, and another has recently been found in Miocene deposits at Baralaba in Central Queensland (D. Christophel *pers.comm* 1999). The leaflet margins of all the fossil specimens are serrate (a condition that R.S. Hill considers derived) but no direct relationship between them and *B. serrulata* has been inferred.

CLASSIFICATION AND PHYLOGENY

Prior to its recognition as a discrete species, the plant was known as *Bowenia spectabilis* var. *serrulata* (W. Bull) - being first described in "A retail List of New Beautiful & Rare Plants" offered by William Bull (1878) Volume 4. The type was not cited but an accompanying illustration was noted as having been drawn from a cultivated plant. (The status of serrate-margined *Bowenia* in North Queensland will be discussed in a forthcoming "Focus on *Bowenia spectabilis* Hook ex J.D. Hook.)

The relation of the genus *Bowenia* to other cycads has proven difficult to resolve; the genus was initially included in the family Zamiaceae but whilst sharing some characteristics with genera of that family it did not sit conformably with them. In a seminal revision in 1959 of the Australian cycads, Johnson erected the subfamily Bowenioideae for *Bowenia* within the family Stangeriaceae which also includes the monotypic *Stangeria eriopus* (in the subfamily Stangerioideae). Both genera are basal to a clade that includes all extant cycads except *Cycas*. Stevenson (1985) briefly proposed the creation of a new family, Boweniaceae, for *Bowenia*, but on consideration of an expanded data set for his 1992 "A Formal Classification of the Extant Cycadales" returned to Johnson's classification. Work is continuing on the resolution of the problems in the classification of the cycads in general and the relationship of *Bowenia* and *Stangeria* in particular. The use of molecular analysis techniques is proving particularly useful in these deliberations.

HORTICULTURAL USE AND POTENTIAL

Limited harvesting of *Bowenia serrulata* leaves and seed is allowed under permit; leaves are harvested only from plants where more than one is present and leaflets are often selectively "snipped" from leaves. The leaves, particularly those from plants growing in dryer habitat, are robust and remain in good condition for periods of two weeks out of water and longer in water. They are sold in the "cut flower" market and are widely used as foliage in flower arrangements and particularly bridal bouquets. In previous decades leaves were used under displays of meat in butcher shops in the same way as fronds of Bracken Fern (*Pteridium esculentum*). This practice has ceased but plastic imitation leaves are sometimes still used for the purpose.

The species has an obvious horticultural appeal but is surprisingly rarely encountered in nurseries although it is more frequently found in private collections and gardens. The seeds are easy to clean and germinate readily and after a slow start the plants grow well and males will cone in four years. The plant does well in pots, although their size is limited by them, and is often used as an "indoor plant". Cycad fanciers find *B. serrulata* more cold tolerant than *B. spectabilis*, not a surprising observation considering the respective habitats of the two species, and some grow several plants in one container for a better display of foliage. A variegated form is known in a private Queensland collection. A fine display of over 50 plants can be seen at the Rockhampton Botanic Gardens.

CONSERVATION STATUS

All cycads in Queensland are protected under Queensland Nature Conservation legislation and *Bowenia serrulata* is listed as COMMON. The species is included in CITES Appendix II.

ACKNOWLEDGEMENTS

The data presented here are a distillation of those in the literature cited below, from my own field work and from discussions with fellow botanists. I particularly thank Lou Randal and Roy Osborne for assistence in the production of this note.

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Top Left: Colour Figure 1 ***Bowenia serrulata*** **in habitat at Byfield, Central Queensland (note bipinnate foliage). Photo: Gary Wilson.**

Centre Left: Colour Figure 2 Stem and root mass of ***Bowenia serrulata.*** **Photo: Gary Wilson.**

Below Left: Colour Figure 3 ***Bowenia serrulata*****, male cone dehiscing pollen (note the amount of pollen on the leaf litter). Photo: Gary Wilson.**

Colour Figure 4 ***Bowenia serrulata*****, mature female cone. Photo: Gary Wilson.**

Colour Figure 5 ***Dioon edule*** **planted in the Palm and Cycad section of the UC Botanical Garden. Photo: Willie Tang.**

Colour Figure 6 *Ceratozamia* **sp.** *robusta* **complex in the Palm and Cycad section (UC Botanical Garden). Photo: Willie Tang.**

Colour Figure 7 *Macrozamia communis* **in the Palm and Cycad section overlooking Strawberry Creek (UC Botanical Garden). Photo: Willie Tang.**

Colour Figure 8 This *Zamia floridana***, grown in a plastic pot in one of the research greenhouses, has been slipped into a decorative clay pot on the terrace of the Conference Center of the UC Botanical Garden for the summer. It does particularly well in this situation. Photo: Willie Tang.**

Colour Figure 9 Judith Finn, curator of the cycad collection at the UC Botanical Garden poses next to a prized specimen of *Zamia lindenii.* **Photo: Willie Tang.**

Kleurfiguur 10 *Encephalartos transvenosus* **manlike plant in 'n Pretoriase tuin. Let op die twee kranse keëls waarvan die onderste krans later as die boonste krans verskyn het. Foto: Johan van Zyl.**

Colour Figure 10 *Encephalartos transvenosus* **male plant in a Pretoria garden. Note the two sets of cones of which the lower one appeared about two months after the first set. Photo: Johan van Zyl.**

Colour Figure 11 *Zamia fairchildiana* **in the Tropical House of the UC Botanical Garden. Photo: Willie Tang.**

Colour Figure 12 *Macrozamia moorei* **in the Australasian section of the UC Botanical Garden. Photo: Willie Tang.**

Colour Figure 13 This magnificent specimen of *Cycas revoluta* **is located near the Hertz Building on the main campus of the University. Landscaped with an enormous variety of plants, the entire campus of the University of California at Berkeley can be considered a botanical garden in itself. Photo: Willie Tang.**

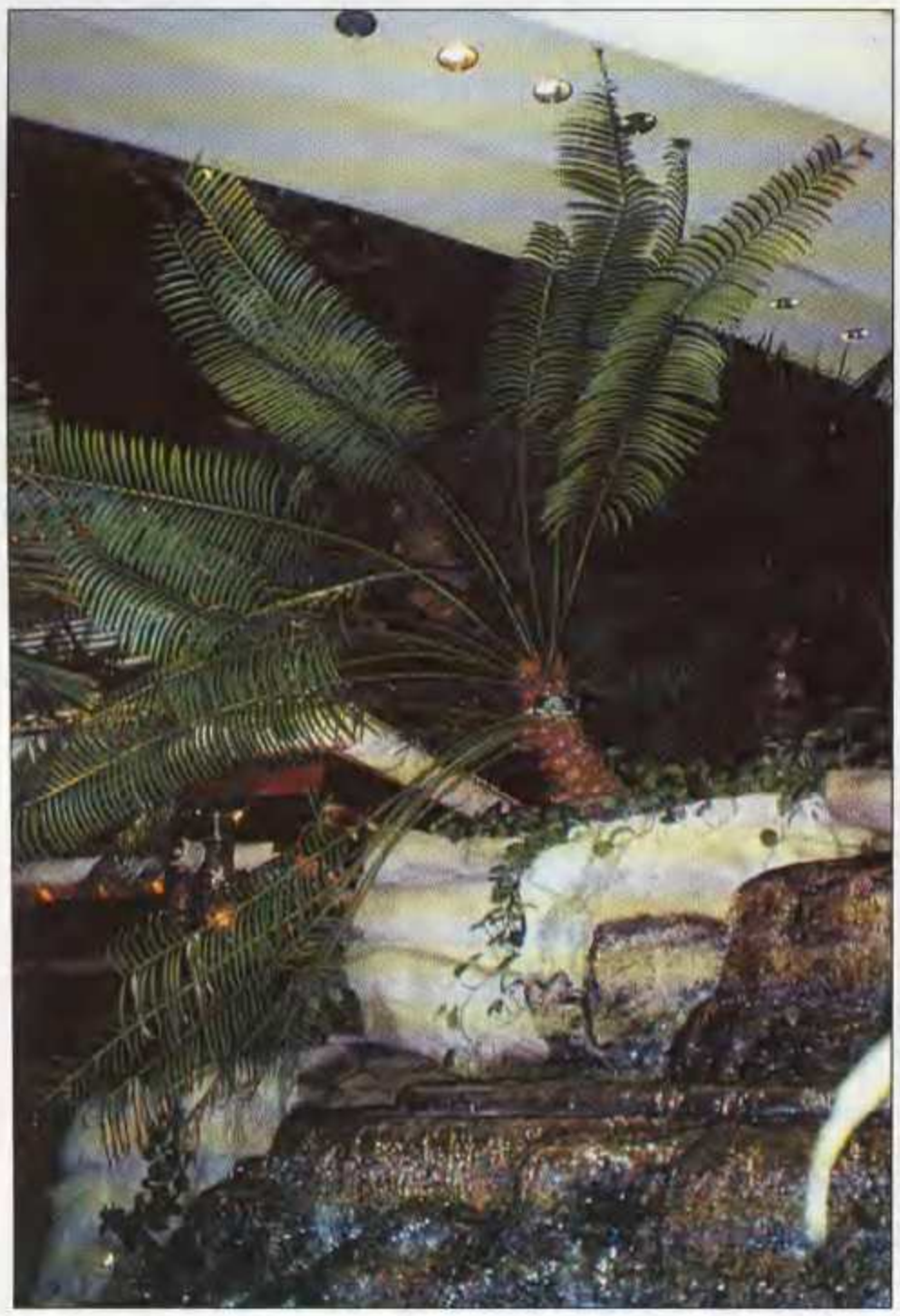
Kleurfiguur 14 Foto van 'n *Cycas revoluta*-**plant waarvan die blare twee en 'n half jaar gelede gevrek het na oorvloedige reëns. Foto: Chum van Zyl.**
Colour Figure 14 Photo of a *Cycas revoluta* **plant of which the leaves have died two and a half years ago after abundant rains. Photo: Chum van Zyl.**

Kleurfiguur 15 Foto van dieselfde *Cycas revoluta*-**plant nadat dit twee behandelings met M5 (50 ml per behandeling) vir twee jaar agtermekaar ontvang het. Foto: Chum van Zyl.**
Colour Figure 15 Photo of the same *Cycas revoluta* **plant after it was treated with M5, at 50 ml per treatment, for two successive years. Photo: Chum van Zyl.**

Colour Figure 16 Dick Johnson stands next to some of his rare *Encephalartos* specimens including an *E. latifrons* used to produce seeds. Photo: Willie Tang.

Colour Figure 17 Dick's assistant Craig stands next to some of the blue *Encephalartos* in the collection. Photo: Willie Tang.

Colour Figure 18 Female of an undescribed *Dioon* sp. (affectionately called "Dickii") from Guatemala near the border with Mexico. It is the only source of this rare cycad available in cultivation. Photo: Willie Tang.



Colour Figure 19 *Cycas* sp. *rumphii* complex planted in the atrium of the Mirage hotel, Las Vegas by Dick Johnson Photo: Willie Tang.

Colour Figure 20 Tropical cycad seedlings that require more heat than the local desert climate can provide are raised in a greenhouse. Photo: Willie Tang.

Colour Figure 21 This heated Styrofoam box is used to germinate seeds and reroot cycad stems. Photo: Willie Tang.

ARTICLES / ARTIKELS

CYCADS AT THE U.C. BOTANICAL GARDEN

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The University of California Botanical Garden is located in *Berkeley, California* on the Berkeley campus of the University of California system. Known commonly as the U.C. Botanical Garden by staff members and locals, it is situated in the hills above the city overlooking San Francisco Bay. It was established on it's present location in the 1920's. Although only encompassing 34 acres, a small space by most botanical garden standards, it contains nearly 13,000 species or subspecies of living plants in 324 families! Several factors account for this close-packing of live plants in one spot. The first is climate. The entire California coast has Mediterranean climate, similar to that experienced in the Western Cape of South Africa. Within this climate zone the Garden is situated in a microclimate known as zone 18. Fogs sweeping in from the Golden Gate buffer the area from extremes of heat and cold and the slopes drain destructive frigid air during the occasional freeze. With judicious selection of sun and wind exposure and air and moisture drainage a tremendous diversity of plants can be grown, from temperate to subtropical. The second most important factor contributing to the Garden's diversity of plants is its collections policy. From its inception the Garden's goal has been to develop displays representing the floras of many geographical regions and climates.

Among the Garden's diverse collection of plants are cycads. The main public display of the Garden's cycads is in the Palm and Cycad section located by the Tropical House. Planted in the ground are *Macrozamia communis, Lepidozamia peroffskyana, Cycas revoluta, Ceratozamia hildae, Ceratozamia* sp. *robusta* complex, and *Dioon edule* (See Colour Figures 5 on p. 23, and 6–7 on p. 24) Experimentation at the garden over the years has shown that the climate is marginal for cycads, being too cool most of the year. Most cycads planted in the ground grow very slowly, unless they are situated next to a heat source, such as a greenhouse. Of various species tested, those listed above appear among the most tolerant. Most of the planted cycad specimens were nurtured in the Garden's greenhouses for many years prior to being planted out. In December 1989, the Garden suffered its worst freeze. Although defoliated, the outdoor cycads survived and are still growing today.

Some specimens are placed outdoors temporarily. Potted *Zamia floridana* specimens are placed within terra-cotta pots on the terrace of the Conference Center (Colour Figure 8 on p. 24). Exposed to sun for most of the day, the pots concentrate enough heat to keep these specimens happy.

In the Tropical House next to the main outdoor cycad plantings, are some magnificent specimens. Reaching more than 2 storeys high, the Tropical House accomodates a large specimen of *Cycas madagascariensis* (currently recognized as *C. thouarsii*) as well as *Zamia fairchildiana* (Colour Figure 11 on p. 25) and *Encephalartos lebomboensis*. A few other cycads are planted outdoors in other sections of the Garden by geographical region. For example, a fine specimen of *Macrozamia moorei* (Colour Figure 12 on p. 25) is located in the Australasian section of the Garden.

Due to the limitations of climate and lack of display houses, the bulk of the garden's cycads are maintained in research greenhouses not open to the public (Colour Figures 9 on p. 24, and 12 on p. 25). In total there are over 50 species of cycads in the garden's collection, representing 10 of the living genera. Some of these plants, including the rare *Ceratozamia zaragosae*, have been successfully propagated. For the most part the potted plants are used for education and research. Like all its plants, the cycads are accessioned with details of the collection locality and other pertinent scientific data. These potted specimens are taken out periodically for educational displays and for public shows. For instance, the Garden won top prize at a recent horticultural show which incorporated some of its cycad specimens in its display. The potted cycads are also regularly taken out for use in the University's botany classes, so that over the years many generations of budding biologists have been able to examine cycads firsthand.

The Garden and its cycads have a personal significance for me. I first noticed these amazing plants in my freshman paleontology class, while a student at U.C. Berkeley. Potted specimens from the Garden were brought to the class-room and I marvelled at these living fossils. Back then, in 1978, the U.C. Botanical Garden was a little known gem with few visitors and I could while away my afternoons among splendid succulent plantings, conifer groves and other secluded spots. It was a great way to study botany, within spectacular views of the bay and the Golden Gate. Today, the general public has discovered the Garden, and it is now a popular attraction in the San Francisco Bay area. The weekend draws many visitors

from avid plant hobbyists to couples who merely want to enjoy a scenic spot. The U.C. Botanical Garden has also become an education center and resource to the local community. Volunteers are trained to give tours on a variety of topics, including the native flora, plant pollination, and food plants. Each year over 8000 schoolchildren visit the Garden and benefit from these educational tours. Recently the Garden announced its intention to create a Center for the Study of Plant Conservation, which will focus on ways to, preserve floras in Mediterranean-type-climate areas of the world. This is in keeping with the University's tradition of being a leader in research and conservation.

The U.C. Botanical Garden is within easy access of most of the San Francisco Bay area. It is approximately a one hour drive from the San Francisco Airport. Located on Centennial Drive between the University's football stadium and Grizzly Peak Blvd., it is situated in Strawberry Canyon, a wooded preserve within the U.C. Berkeley campus. For those who like nature, it can be reached after a brisk hike through native vegetation. Most visitors who do not wish to drive, however, may take the campus shuttle (weekdays only) that begins conveniently in downtown Berkeley next to major bus stops and the subway (BART) station and winds its way through the University campus. Admission to the garden is US$3. You can visit the Garden on the internet at:
http://www.mip.berkeley.edu/garden/

ACKNOWLEDGEMENTS

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BEHEER VAN WORTELSIEKTE BY BROODBOME: PROEFONDERVINDELIKE GEBRUIK VAN M5

Chum van Zyl
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Ontvang 2 Januarie 2001

Aan die einde van Augustus 1994 is 234 moederplante van *Cycas revoluta* by Tzaneen uitgehaal om op die kusplato naby Groot-Brakrivier (tussen George en Mosselbaai) te hervestig. Die ouderdom van die broodbome het tussen 18 en 30 jaar gewissel. Nadat die bome uitgehaal is, is hulle by 5°C gestoor om somergroei te vertraag voordat hulle einde November 1994 hervestig is. 85% van die plante het gedurende die volgende twee jaar blare gestoot. Na oorvloedige reëns, 155 mm tot en met November 1996, het 54% van die plante se blare begin vergeel.

Die eerste vermoede was dat 'n plantsiektetoestand die oorsaak van die vergeling kon wees. Om die probleem van die vergeling op te los is van kundige hulp gebruikgemaak, naamlik van die kundigheid van dr Joe Darvas, 'n plantpatoloog wie oor die wêreld hoog aangeskryf is vir sy ontwikkeling van M5, wat 'n wortelswam (*Phytophthora cinnamomi*) op avokadobome baie suksesvol beheer. Daar is besluit om die plante met M5 te behandel teen 'n toedieningsdosis van 50 ml op die kroon van die plante. Sorg is gedra dat waar daar nuwe blare uitkom, die middel nie die jong groei raak nie omdat dit jong blare brand. Daar is egter gevind dat blare wat enkele dae na toediening verskyn het nie gebrand is nie. Omdat daar geen gegewens beskikbaar was vir toediening nie is twee plante op dieselfde manier as avokados 'n staminspuiting toegedien teen 20 ml per meter boom driplyn-deursnee. Dr Piet Vorster, huidige president van die Broodboom Vereniging van S.A. het gewaarsku dat sommige broodbome waar gekodeerde mikroskyfies ingeplant is gevrek het. Gevolglik is die inspuitings gestaak. Die 10 mm gat waar die plante ingespuit is is met 'n houtprop verseël. Daar was nie enige opmerklike reaksie tussen die plante wat kroonbehandeling of staminspuiting ontvang het nie. Plant 1 wat ingespuit is het 23 blare gedurende 1999 en 27 blare in 2000 gestoot. Plant 2 het 36 blare in 1999 en 45 blare in 2000 gestoot.

Die foto (Kleurfiguur 14 op p. 25), geneem op 1 Julie 1998, toon 'n plant wat vir 'n veldproef gebruik is nadat die blare gevrek het. Die volgende foto (Kleurfiguur 15 op p. 25), geneem op 26 Desember 2000, toon dieselfde plant na 'n staminspuiting van 20 ml M5 op 1 Julie 1998; 'n kroontoediening van 50 ml op 20 Desember 1998 en weer op 12 Februarie 1999.

Evaluasie na twee behandelings M5:

Datum:	Toestand van blare:		
	Groen	Geel	Geen blare
1998-12-18	31%	54%	15%
1999-12-02	93%	6%	1%

Die vergeling van blare kan in die algemeen aan vier oorsake toegeskryf word, naamlik: droogte, versuiping as gevolg van swak dreinering, een of ander plantsiekte toestand bv. Swamsiektes, en 'n gebrek aan een of meer plantvoedingstowwe. Die gevolgtrekking wat op grond

van hierdie resultate gemaak word is voor-die-hand liggend, ongelukkig is al die plante behandel en daar is nie uitgehou vir kontrole nie.

Elke keer na oorvloedige reëns ondervind is het die plante vergeel. Prof. Theo van Rooyen, 'n grondkundige, se hulp is in die verband gebruik. Na voorlopige grondondersoeke m.b.v. 'n grondboor is gevind dat in laagliggende posisies, waar die bome hervestig is, dupleksgrond teenwoordig is. 'n Dupleksgrond is grond met 'n relatief goed deurlaatbare bogrond wat skielik onderlê word deur 'n baie stadig-deurlaatbare diagnostiese horison soos bv. 'n digte kleilaag. Met oormaat watertoediening tydens besproeiing of oormatige reën, tree versuipingstoestand dan in. Water beweeg stadig deur die kleilaag met gevolglike versuiping in die bogrond waar die meeste wortels teenwoordig is. Langdurige versuiping van plante kan aanleiding gee tot vergeling a.g.v. 'n swaminfeksie en uiteindelike vrekte.

'n Dreineringsloot en 5 tot 6 dreineringsgate om elke plant is met 'n grondboor gemaak van 'n gebied waar 10 broodbome vergeel het na uitermate hoë reënval gedurende Oktober 1999. Foto's is van hierdie plante geneem om in die toekoms vergelykings te kan maak nadat die plante behandel is. Al hierdie hervestigde plante word aan die begin van die somer en ses maande later weer behandel met 'n toediening van M5. Op hierdie stadium kan daar nog nie met sekerheid vasgestel word of die verbeterde dreinering 'n voordelige invloed op die plante gehad het nie. Daar sal op 'n latere stadium meer hieroor berig word.

M5, geregistreer deur dr Darvas, Reg. Nr K 5309 Wet 36/1947, is 'n mengsel van chemikalieë vir die behandeling van avokadobome teen *Phytophthora* wortel-vrot en voorsiening van essensiële plantvoedingselemente vir optimale groei en verhoogde oeste. M5 is in die vorm van kristalle en word vervaardig en versprei deur Farming Services, Posbus 684, 0850 Tzaneen, Tel.: (015) 307 6402 en kos R100 vir 'n konsentraat waarmee 25 liter oplossing aangemaak kan word.

Proewe word gedoen met behandeling van 20 ml kroonaanwending op plante nadat hulle uitgeplant is, 3-maandelikse toediening vir onderhoud en 2-maandeliks vir korrektiewe behandeling. Saad word tans 2-maandeliks behandel met opvolging van saailinge. Daar word met kontrole korrektiewe behandeling gedoen met stam-inspuitings van plante wat vergeel het.

Summary

CONTROL OF ROOT-DISEASE IN CYCADS

In August 1994 Chum van Zyl dug up 234 18 to 30 year old *Cycas revoluta* plants at Tzaneen (Northern Province to replant on the coastal plateau near Great Brak River (between George and Mossel Bay in the Western Cape). Before he replanted the cycads at the end of November 1994 he kept them at 5°C to delay summer summergrowth. During the following two years 85% of the plants produced leaves. After lavish excessive rainfall of 155 mm up to November 1996 the leaves of 54% of the plants became yellow.

He made use of the technology of Dr. Joe Darvas, a plant pathologist worldwide noted for his development of M5 that successfully controls the root fungus *Phytopthora cinnamomi* in avocados. He decided to treat the *Cycas revoluta* plants by applying 50 ml M5 on the crown of each plant, making sure that the M5-solution does not come in contact with new leaves as it burns young growth. However, he found that leaves that appeared a few days after the application of M5 were not affected by it. Because no information on treating cycads with M5 was available he decided to inject M5 into the stems of two of the cycads using 20 ml per metre of stem diameter at the base of the cycad (the injecting of M5 into the stems was afterwards discontinued because he learned that some cycads died after being microchipped). The 10 ml hole into which the stems were injected was sealed with a wooden plug. There was no noticeable differences between plants treated at their crowns and those that received stem injections. The two plants that were injected with M5 produced 23 and 36 leaves respectively in 1999 and 36 and 45 leaves respectively in 2000.

The plant in Colour Figure 14 on p. 25 (photographed on 1 July 1998) was used in the experiment after its leaves died off. The same plant (Colour Figure 15 on p. 25), photo-graphed on 26 December 2000, shows the plant after a stem injection of 20 ml M5 on 1 July 1998, and crown treatments of 50 ml on 20 December 1998 and 12 February 1999.

The evaluation after two treatments with M5 is as follows: 1998-12-18: green leaves 31%, yellow leaves 54%, no leaves 15%, and 1999-12-02: green leaves 93%, yellow leaves 6%, no leaves 1%. Unfortunately all the plants were treated with M5 and therefore controls are not available for comparative purposes.

The rest of the article deals with treatment with M5 of plants after yellowing of their leaves due to waterlogging. A drainage ditch and 5 to 6 drainage holes around each plant were made with a spiral dril in an area where leaves of 10 of the cycads turned yellow after excessive rainfall in October 1999. All these plants are treated with M5 in the beginning of summer and again after six months. However, results are unavailable as yet.

M5, registered by Dr. Darvas, Reg Nr K 5309 Act 36/1947, is a mixture, in crystalline form, of chemicals and essential nutritional elements for optimal growth, for the treatment of avocados and can be obtained from Farming Services, P.O. Box 684, 0850 Tzaneen, Tel. (015) 307 6402 at R100 for a quantity of concentrate to make up a 25 litre solution.

CALIFORNIA CYCADS: A VISIT WITH DICK JOHNSON

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Although there are no cycads native to Southern California, cycad cultivation and expertise is more established here than in any other place in the United States. Recently, I had the opportunity to visit with one of the most experienced and knowledgeable cycad enthusiasts in Southern California, Dick Johnson. Dick's business, Exotic Specimen Palms, is operated from his residence in Covina, at the eastern side of the Los Angeles area, near the desert. Dick began his interest in cycads in the 1960's and has built up considerable skill in cultivating these plants in more than 30 years of experience.

Every cycad garden is different. When I first walked into Dick's collection I was struck by the density of the cycads and the health of the foliage. Most of his plants are potted, closely spaced, and grown under 64% shade cloth (Colour Figures 16, 17, 20 on p. 26). He moves and reorganizes his plants often, since he uses them in plant shows and displays. His success in cultivating cycads depends on techniques developed for every stage of growth. His greatest skill and the one for which his services are in high demand is the rooting of pups and stems. He places unrooted pups into a specially constructed box made from panels of 4 inch thick highly compressed Styrofoam (Colour Figure 21 on p. 26). Temperature in the box is kept at a constant 85°F. Experience has shown that this is the optimum temperature to germinate seeds and to encourage root development in unrooted stems of most cycads. A small fan is placed inside to maintain air circulation.

It is difficult to recommend a standard soil mix for cycads. Every climate and growth situation requires slightly different soil mixes. Dick uses equal parts of the following ingredients in his mix: small western bark, the best size is called mini nuggets, washed ¼" pumice, #12 silica sand, peat moss, plus an equal part of a soil mix called Super Soil. This mix works very well for most grean-leafed cycads. For grey-leafed cycads, that like it dryer, he leaves out the peat and uses double the amount of pumice. Both mixes work well for all sizes of container plants including newly germinated seedlings. Pumice, a porous rock derived from volcanic material is the preferred amendment for cycad potting soil in Southern California. Excellent drainage and aeration is essential, especially with potted plants. Dick prefers wooden boxes over plastic pots, especially on the large specimen plants because of the superior drainage. When transplanting plants from one pot size to the next or into the ground, Dick is almost religious in the use of a product called "Superthrive", a vitamin B1 product with a number of useful ingredients to promote vigorous growth and reduce shock. He pours a diluted solution around every plant he repots and into the soil around each plant he places in the ground. Normally, after transplanting, the rough treatment of a cycad's roots and the sudden change in soil conditions sends a cycad into shock. Most often this will delay any new growth for months as the plant recovers and resumes root growth. In some cases the shock of transplantation will kill the plant. Dick's observations indicate that this treatment will almost eliminate shock in the transplanted cycad and growth continues uninterrupted. This allows more rapid growth of plants in his nursery and superior establishment and growth of cycads in his landscape projects. Considering the relatively slow growth rate of cycads, this treatment may be a good investment. Dick also attributes the lush growth of his palms and cycads to his own blend of fertilizer. It is all organic and contains all the important minerals that are needed for good root and leaf growth and colour. He spent six years developing and perfecting it. In his experience cycads prefer organic food; long term feeding of nitrate type fertilizers can make them grow too fast and suckers and tap roots can split wide open. The slow feeding with organic food makes healthier and happier palms and cycads. He feeds twice a year in early spring and late summer.

Dick has extensive experience in transplanting cycads and palms. He has transplanted collections of large cycads in Southern California, including the Greenburg collection, which was amassed in the 1970's before the advent of CITES. Many of these plants are now growing in wooden tubs or other gardens and serve as the parents for many of the seeds and seedlings of rare cycads, including *Encephalartos latifrons*, now available in the U.S. He was also involved with installing the indoor gardens at the Mirage hotel in Las Vegas, considered the tallest indoor garden of its kind in the world. He supplied a large number of specimen palms as well as a variety of cycads that were planted during the construction of the hotel (Colour Figure 19 on p. 26). During the installation of the gardens, he advised the placement of a thick layer of charcoal at the base of the planting beds to prevent the soil from becoming sour. Often in pots and enclosed situations such as this, improper drainage and air circulation leads to the build up of bacteria, toxic organic compounds, and other waste products of biological activity. Charcoal will absorb much of these waste products and lower bacterial activity.

Another activity that Dick excels at is hand-pollination of cycads. One novel technique for which he has had great

success, when pollinating *Encephalartos* cones, employs the use of high-pressure air and stretch wrap. He tightly wraps the receptive female cone with plastic stretch wrap (such as Glad-Handi wrap) leaving a spot open on the top and bottom, this leaves a path through the entire cone so the pollen can spread completely through the cone rather than just spraying out around the point where it's applied. After the wrap has been applied, he blasts the pollen in the cone using high pressure air up to 125 psi. He does this by inserting a small amount of pollen into a standard drinking plastic straw. The tip of the straw is flattened to a tight oval shape, allowing it to be inserted between the cone scales without pinching off the flow. When inserting the straw into the cone, he finds the most open scale on the top of the cone, gently inserts the oval tip of the straw while holding his finger over the other end of the straw, so as not to spill out the pollen. Making sure that the tip of the straw contacts the cone axis, he then pulls the straw back just a little so as not block the pollen's escape. Once inserted, he completely closes the stretch wrap around the straw, leaving only the bottom of the cone open, and then he blows the pollen in by using an air blowing tip held tight against the straw opening. This can be accomplished in the field by using portable air tanks. He recommends repeating this process daily if possible during the period that the cone is open. For female *Dioon* cones (Colour Figure 18 on p. 26), which only open at the bottom when receptive, he uses just the high-pressure air to deliver pollen; the stretch wrap is not necessary. The high-pressure air vigorously circulates pollen inside the cone lodging pollen on to micropyles of ovules deep in the recesses of the cone. The proportion of fertile seeds produced from available ovules is very high with this method.

Skills such as Dick Johnson's are rare in the world of cycad horticulture and they need to be spread and taught to others. If you are in the Southern California area, he can be visited by appointment. Always willing to chat and share his knowledge, you can learn some of his growing secrets and maybe even pick up a seedling or two.

ACKNOWLEDGEMENTS

I thank Dick Johnson and his son for their help in the preparation of this article. His special fertilizer mix and the product "Superthrive" mentioned in this article are available from Dick Johnson's nursery; he is willing to ship. More information is available on the internet at:
www.palms-cycads.com
His e-mail is: www.palms.cycads@prodigy.net

CYCADS OF THE WORLD FOR THE LAYMAN

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Bowenia

1. *B. serrulata* — Queensland, Australia
2. *B. spectabilis* — Queensland, Australia

Ceratozamia

1. *C. alvarezii* — Chiapas, Mexico
2. *C. euryphyllidia* — Oaxaca and Veracruz, Mexico
3. *C. hildae* — San Luis Potosi and Queretaro, Mexico
4. *C. kuesteriana* — Tamaulipas, Mexico
5. *C. latifolia* — San Luis Potosi, Querataro and Hidalgo, Mexico
6. *C. matudae* — Chiapas, Mexico
7. *C. mexicana* — Hidalgo, Puebla, San Luis Potosi and Veracruz, Mexico
8. *C. microstrobila* — San Luis Potosi, Mexico
9. *C. miqueliana* — Chiapas and Veracruz, Mexico
10. *C. mixeorum* — Oaxaca, Mexico
11. *C. morettii* — Veracruz, Mexico
12. *C. norstogii* — Chiapas, Mexico
13. *C. robusta* — Oaxaca and Veracruz, Mexico; Belize; Guatemala
14. *C. sabatoi* — Hidalgo and Queretaro, Mexico
15. *C. whitelockiana* — Oaxaca, Mexico
16. *C. zaragozae* — San Luis Potosi, Mexico

Chigua

1. *C. bernalii*	Colombia
2. *C. restrepoi*	Colombia

Cycas

1. *C. aculeata*	Vietnam
2. *C. angulata*	Northern Territory, Australia
3. *C. apoa*	New Guinea; Indonesia
4. *C. arenicola*	Northern Territory, Australia
5. *C. armstrongii*	Northern Territory, Australia
6. *C. arnhemica* subsp. *arnhemica*	Northern Territory, Australia
7. *C. arnhemica* subsp. *muninga*	Northern Territory, Australia
8. *C. arnhemica* subsp. *natja*	Northern Territory, Australia
9. *C. badensis*	Queensland, Australia
10. *C. balansae*	Vietnam
11. *C. basaltica*	Western Australia
12. *C. beddomei*	India
13. *C. bougainvilleana*	New Britain, Solomon Islands
14. *C. brachycantha*	Vietnam; Laos; Thailand; China
15. *C. brunnea*	Northern Territory and Queensland, Australia
16. *C. cairnsiana*	Queensland, Australia
17. *C. calcicola*	Northern Territory, Australia
18. *C. campestris*	Papua New Guinea
19. *C. canalis* subsp. *canalis*	Northern Territory, Australia
20. *C. canalis* subsp. *carinata*	Northern Territory, Australia
21. *C. chamaoensis*	Thailand
22. *C. chamberlainii*	Philippines
23. *C.changjiangensis*	Hainan Island
24. *C. chevalieri*	Vietnam
25. *C. circinalis* var. *circinalis*	South India
26. *C. circinalis* var. *orixensis*	Northern eastern Ghats, Indian State of Orissa
27. *C. circinalis* var. *swamyii*	India, Hassan District of Karnataka
28. *C. clivicola* subsp. *clivicola*	Thailand
29. *C. clivicola* subsp. *lutea*	Thailand
30. *C. collina*	Vietnam
31. *C. condaoensis*	Con Dao Islands
32. *C. conferta*	Northern Territory, Australia
33. *C. couttsiana*	Queensland, Australia
34. *C. curranii*	Philippines
35. *C. debaoensis*	China
36. *C. desolata*	Queensland, Australia
37. *C. diannenensis*	China
38. *C. dolichophylla*	China; Vietnam
39. *C. edentata*	Philippines
40. *C. elephantipes*	Thailand
41. *C. elongata*	Vietnam
42 *C. falcata*	Sulawesi and Kabaena Island
43. *C. ferruginea*	China
44. *C. fugax*	Vietnam
45. *C. furfuracea*	Western Australia
46. *C. guizhouensis*	China
47. *C. hainanensis*	China
48. *C. haobinhensis*	Vietnam
49. *C. hongheensis*	China
50. *C. inermis*	China
51. *C. javana*	Java; Indonesia
52. *C. lane-poolei*	Western Australia
53. *C. lindstromii*	Vietnam
54. *C. litoralis*	Myanmar; Thailand; Malaysia; Sumatra; Vietnam

55. *C. maconochiei* subsp. *maconochiei*	Northern Territory, Australia
56. *C. maconochiei* subsp. *lanata*	Northern Territory, Australia
57. *C. maconochiei* subsp. *viridis*	Northern Territory, Australia
58. *C. macrocarpa*	Malaysia; Thailand
59. *C. media* subsp. *media*	Queensland, Australia
60. *C. media* subsp. *banksii*	Queensland, Australia
61. *C. media* subsp. *ensata*	Queensland, Australia
62. *C. megacarpa*	Queensland, Australia
63. *C. micholitzii*	Vietnam; China
64. *C. micronesia*	Mariana Island; Guam
65. *C. miquelii*	China
66. *C. multipinnata*	China
67. *C. nathorstii*	Sri Lanka
68. *C. nongnoochiae*	Thailand
69. *C. ophiolitica*	Queensland, Australia
70. *C. orientis*	Northern Territory, Australia
71. *C. pachypoda*	Vietnam
72. *C. panzhihuaensis*	China
73. *C. papuana*	Papua New Guinea
74. *C. parvulus*	China
75. *C. pectinata*	S.E. Asia; N.E. India; China
76. *C. petraea*	Thailand
77. *C. platyphylla*	Queensland, Australia
78. *C. pranburiensis*	Thailand
79. *C. pruinosa*	Western Australia & Northern Territory
80. *C. revoluta*	China; Japan
81. *C. riuminiana*	Philippines
82. *C. rumphii*	S.E. Asia; Pacific Islands
83. *C. seemannii*	Fiji; Tonga; Vanuata; New Caledonia
84. *C. segmentifida*	China
85. *C. semota*	Australia
86. *C. sexseminifera*	China, Northern Vietnam
87. *C. scratchleyana*	New Guinea
88. *C. schumanniana*	Papua New Guinea
89. *C. siamensis*	S.E. Asia; China
90. *C. silvestris*	Queensland, Australia
91. *C. simplicipinna*	S.E. Asia
92. *C. spherica*	North-eastern India
93. *C. szechuanensis*	China
94. *C. taitungensis*	Taiwan; China
95. *C. taiwaniana*	China
96. *C. tanqingii*	China
97. *C. tansachana*	Thailand
98. *C. thouarsii*	Madagascar; Africa
99. *C. tropophylla*	Vietnam
100. *C. tuckeri*	Queensland, Australia
101. *C. wadei*	Philippines
102. *C. xipholepis*	Queensland, Australia
103. *C. yorkiana*	Queensland, Australia
104. *C. yunnanensis*	China
105. *C. zeylanica*	Sri Lanka; Andaman Islands; Nicobar

Dioon

1. *D. califanoi*	Oaxaca, Mexico
2. *D. capitoi*	Puebla, Mexico
3. *D. edule* var. *edule*	Mexico
4. *D. edule* var. *angustifolium*	Nuevo Leon and Tamaulipas, Mexico
5. *D. holmgrenii*	Oaxaca, Mexico
6. *D. mejiae*	Honduras
7. *D. merolae*	Chiapas, Mexico

8. *D. purpusii*	Oaxaca, Mexico
9. *D. rzedowskii*	Oaxaca, Mexico
10. *D. sonorense*	N.W. Coast, Mexico
11. *D. spinulosum*	Vera Cruz and Oaxaca, Mexico
12. *D. tomasellii*	S.W. Coast, Mexico

Encephalartos

1. *E. aemulans*	KwaZulu-Natal, South Africa
2. *E. altensteinii*	E. Cape, South Africa
3. *E. aplanatus*	Swaziland
4. *E. arenarius*	E. Cape, South Africa
5. *E. barteri* subsp. *barteri*	Benin; Ghana; Nigeria; Sudan; Togo
6. *E. barteri* subsp. *allochrous*	Nigeria
7. *E. brevifoliolatus*	Northern Province, South Africa
8. *E. bubalinus*	Tanzania; Kenya
9. *E. caffer*	E. Cape, South Africa
10. *E. cerinus*	KwaZulu-Natal, South Africa
11. *E. chimanimaniensis*	Mozambique; Zimbabwe
12. *E. concinnus*	Zimbabwe
13. *E. cupidus*	Northern Province, South Africa
14. *E. cycadifolius*	E. Cape, South Africa
15. *E. delucanus*	Tanzania
16. *E. dolomiticus*	Northern Province, South Africa
17. *E. dyerianus*	Northern Province, South Africa
18. *E. equatorialis*	Uganda
19. *E. eugene-maraisii*	Northern Province, South Africa
20. *E. ferox*	KwaZulu-Natal, South Africa; Mozambique
21. *E. friderici-guilielmi*	E. Cape, South Africa
22. *E. ghellinckii*	KwaZulu-Natal, South Africa
23. *E. gratus*	Malawi; Mozambique
24. *E. heenanii*	Swaziland; Mpumalanga, South Africa
25. *E. hildebrandtii*	Kenya; Tanzania
26. *E. hirsutus*	Northern Province, South Africa
27. *E. horridus*	E. Cape, South Africa
28. *E. humilis*	Mpumalanga, South Africa
29. *E. inopinus*	Northern Province, South Africa
30. *E. ituriensis*	Dem. Rep. Congo (the former Zaire)
31. *E. kisambo*	Kenya
32. *E. laevifolius*	Mpumalanga, South Africa; Swaziland
33. *E. lanatus*	Mpumalanga, South Africa
34. *E. latifrons*	E. Cape, South Africa
35. *E. laurentianus*	Angola; Dem. Rep. Congo
36. *E. lebomboensis*	KwaZulu-Natal and Mpumalanga, South Africa; Swaziland; Mozambique
37. *E. lehmannii*	E. Cape, South Africa
38. *E. longifolius*	E. Cape, South Africa
39. *E. macrostrobilus*	Uganda
40. *E. manikensis*	Zimbabwe; Mozambique
41. *E. marunguensis*	Dem. Rep. Congo
42. *E. middelburgensis*	Mpumalanga, South Africa
43. *E. msinganus*	KwaZulu-Natal, South Africa
44. *E. munchii*	Mozambique
45. *E. natalensis*	KwaZulu-Natal, South Africa
46. *E. ngoyanus*	KwaZulu-Natal and Mpumalanga, South Africa; Swaziland
47. *E. nubimontanus*	Northern Province, South Africa
48. *E. paucidentatus*	Mpumalanga, South Africa; Swaziland
49. *E. poggei*	Angola; Dem. Rep. Congo
50. *E. princeps*	E. Cape, South Africa
51. *E. pterogonus*	Mozambique
52. *E. schaijesii*	Dem. Rep. Congo

53.	*E. schmitzii*	Dem. Rep. Congo; Zambia
54.	*E. sclavoi*	Tanzania
55.	*E. senticosus*	Mpumalanga and KwaZulu-Natal, South Africa
56.	*E. septentrionalis*	Sudan
57.	*E. tegulaneus*	Kenya
58.	*E. transvenosus*	Northern Province, South Africa
59.	*E. trispinosus*	E. Cape, South Africa
60.	*E. turneri*	Mozambique
61.	*E. umbeluziensis*	Swaziland; Mozambique
62.	*E. villosus*	E. Cape, KwaZulu-Natal and Mpumalanga, South Africa
63.	*E. whitelockii*	Western Uganda
64.	*E. woodii*	KwaZulu-Natal, South Africa

Lepidozamia

1.	*L. hopei*	Queensland, Australia
2.	*L. peroffskyana*	N.S.W. and Queensland, Australia

Macrozamia

1.	*M. cardiacensis*	Queensland, Australia
2.	*M. communis*	N.S.W., Australia
3.	*M. concinna*	N.S.W., Australia
4.	*M. conferta*	Queensland, Australia
5.	*M. cranei*	Queensland, Australia
6.	*M. crassifolia*	Queensland, Australia
7.	*M. diplomera*	N.S.W., Australia
8.	*M. douglasii*	Queensland, Australia
9.	*M. dyeri*	Western Australia
10.	*M. elegans*	N.S.W., Australia
11.	*M. fawcettii*	N.S.W., Australia
12.	*M. fearnsidei*	Queensland, Australia
13.	*M. flexuosa*	N.S.W., Australia
14.	*M. fraseri*	Western Australia
15.	*M. glaucophylla*	N.S.W., Australia
16.	*M. heteromera*	N.S.W., Australia
17.	*M. humilis*	N.S.W., Australia
18.	*M. johnsonii*	N.S.W., Australia
19.	*M. lomandroides*	Queensland, Australia
20.	*M. longispina*	Queensland, Australia
21.	*M. lucida*	Queensland, Australia
22.	*M. macdonnellii*	Northern Territory, Australia
23.	*M. machinii*	Queensland, Australia
24.	*M. miquelii*	N.S.W. and Queensland, Australia
25.	*M. montana*	N.S.W., Australia
26.	*M. moorei*	Queensland, Australia
27.	*M. mountperriensis*	Queensland, Australia
28.	*M. occidua*	Queensland, Australia
29.	*M. parcifolia*	Queensland, Australia
30.	*M. pauli-guilielmi*	Queensland, Australia
31.	*M. platyrachis*	Queensland, Australia
32.	*M. plurinervia*	N.S.W. and Queensland, Australia
33.	*M. polymorpha*	N.S.W., Australia
34.	*M. reducta*	N.S.W., Australia
36.	*M. riedlei*	Western Australia
37.	*M. secunda*	N.S.W., Australia
38.	*M. spiralis*	N.S.W., Australia
39.	*M. stenomera*	N.S.W., Australia
40.	*M. viridis*	Queensland, Australia

Microcycas

1. *M. calocoma*	W. Cuba

Stangeria

1. *S. eriopus*	E. Cape and KwaZulu-Natal, South Africa

Zamia

1. *Z. acuminata*	Nicaragua; Panama
2. *Z. amazonia*	Brazil; Colombia; Venezuela
3. *Z. amazonum*	Brazil; Colombia; Peru; Venezuela
4. *Z. amblyphyllidia*	Cuba; Jamaica; Puerto Rico
5. *Z. amplifolia*	Colombia
6. *Z. angustifolia*	Bahamas; Cuba
7. *Z. boliviana*	Bolivia
8. *Z. chiqua*	Colombia; Panama
9. *Z. cremnophila*	Mexico
10. *Z. cunaria*	Panama
11. *Z. disodon*	Northern Colombia
12. *Z. dressleri*	Panama
13. *Z. encephalaroides*	Colombia
14. *Z. fairchildiana*	Costa Rica; Panama
15. *Z. fischeri*	Mexico
16. *Z. furfuracea*	Mexico
17. *Z. gentryi*	Ecuador
18. *Z. herrerae*	Mexico; Guatemala
19. *Z. hymenophyllidia*	South Eastern Amazonian Colombia
20. *Z. inermis*	Mexico
21. *Z. integrifolia*	Florida and Georgia (U.S.A.); Bahamas; Cuba; Caiman Islands
22. *Z. ipetiensis*	Panama
23. *Z. lacondona*	Eastern Chiapas, Mexico
24. *Z. lacondonis*	Mexico
25. *Z. lecointei*	Brazil
26. *Z. lindleyi*	Panama
27. *Z. loddigesii*	Mexico
28. *Z. lucayana*	Bahamas
29. *Z. manicata*	N. Colombia; S. Panama
30. *Z. melanorrhachis*	North-central Colombia to Amazonian Colombia
31. *Z. montana*	Colombia; Venezuela
32. *Z. muricata*	Venezuela
33. *Z. neurophyllidia*	Panama
34. *Z. obliqua*	Colombia; S. Panama
35. *Z. paucijuga*	W. Mexico
36. *Z. poeppigiana*	Peru; Ecuador
37. *Z. polymorpha*	Mexico; Belize
38. *Z. portoricensis*	Puerto Rico
39. *Z. prasina*	Southern Belize
40. *Z. pseudomonticola*	Costa Rica
41. *Z. pseudoparasitica*	Panama; Costa Rica
42. *Z. pumila*	Dominican Rep.; Florida (U.S.A.); Cuba
43. *Z. purpurea*	Mexico
44. *Z. pygmaea*	Cuba
45. *Z. roezlii*	Colombia
46. *Z. skinneri*	Panama
47. *Z. soconuscensis*	Mexico
48. *Z. spartea*	Mexico
49. *Z. splendens*	Mexico
50. *Z. standleyi*	Honduras
51. *Z. tuerckheimii*	Guatemala

52. *Z. ulei*	Brazil
53. *Z. urep*	Peru
54. *Z. variegata*	Guatemala; Belize; Mexico
55. *Z. vazquezii*	Mexico
56. *Z. wallisii*	Colombia

The compilers wish to thank **Ken Hill** for his assistance.

The following species are excluded from the list due to the following reasons:

Ceratozamia parcifica

Ceratozamia "parcifica" is a distinct form that occurs in the Sierra Madre del Sur, on the southern or Pacific coast of Oaxaca state of Mexico. It is another of the "robusta complex", which probably includes about 5 or 6 taxa all currently known as *C. robusta* forms.

Cycas bellefonti and *C. tonkinensis*

The description of these plants by L. Linden & Rodigas (1886), cannot be matched with any known species, and in the absence of a type specimen the names are thus excluded.

SHORT COMMUNICATIONS / KORT MEDEDELINGS

ENCEPHALARTOS APLANATUS

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In an article by Dr. Piet Vorster "The plight of *Encephalartos aplanatus*" (*Encephalartos* **62**: 9–10, June 2000) he warns of the possible extinction of the species in its natural habitat.

I reside in the country referred to in his article and have previously done my own bit of botanical exploration, also with little luck in finding self-sustaining populations of *E. aplanatus*.

Dr. Vorster's article, however, prompted me to once again set off in search of these plants. Unfortunately I have no knowledge as to the localities that were visited during the 1960's and 1970's, nor am I aware of the location at which he later found half a dozen or so of these plants.

At first my attempt yielded a dismal two plants which grew in an area being cleared for cultivation and which had little hope of surviving. My second attempt was undertaken in the same area but closer to a ravine. Along the stream of water a further twenty or more plants were found within a 60-metre radius. Imagine my joy when I even encountered a few seedlings as well as a number of immature plants. A third visit, which involved an even more thorough search of the area, exceeded my wildest expectations and I am now happy to report that a healthy self-sustaining population has been found. During my last visit coning had not yet taken place. Seedlings, however, indicate that natural pollination and seed production has taken place unhindered.

The highest concentration of plants is at the lowest point where the stream flows, becoming more sparse towards the summit. I found the latter more robust with leaves reaching up to three metres in comparison with the two and a half metre leaf length of those lower down. On average each plant has between four and seven leaves, with one exceptional specimen boasting 12 healthy looking curved leaves. Median leaflets on average measures 30–36 cm x 3–4 cm. Plants exposed to a fair degree of sunlight have broad green, glossy leaflets, while those growing in full shade tend to be somewhat darker and leaflets are narrower.

It would thus appear that human stupidity and greed has not yet entirely taken its toll as far as this species is concerned. I have notified the relevant conservation authorities of my find although I have not yet had any

positive response. I would so dearly wish to take an active role in the conservation of these plants but sometimes wonder if the announcement of such a find will not once again result in the depletion of the population. Please therefore bear with me that I have been absolutely vague when referring to the locality

GEOLOGICAL AGE AND EVOLUTION OF CYCADACEAE

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Received 12 December 2000

A. INTRODUCTION

Many people don't know the origin and geological age of the ancestors of our cycads. So in *Bothalia* VII(4) on page 411 one can read: Survival, alinea 1.: "For cycads to have propagated themselves for over 50 million years, with little change in basic character, is something to be marvelled at." In "Cycads of South Africa" by Cynthia Giddy on page 17: "Cycads have survived for over 50 million years with little change in their basic structure." The same statement is found in writings and websites of several other writers. But without any doubt the origin of this error is *Bothalia*.

B. SITUATION IN THE GYMNOSPERM FAMILIES

Gymnosperms (Gymnos = naked and sperma = seed): ovules not enclosed in an ovary (unlike the Angiosperms). Microsporangia and ovules are often placed in a ramification system which forms cones or strobili. Four classes are known:

I. Cycadopsida

a. Fossil Pteridospermales (seedferns).
b. Bennettitales: from the Permian to the Upper Cretaceous; tending to form flowerlike structures and maybe the ancestors of the angiosperms (flowering plants).
c. Cycadaceae, Stangeriaceae and Zamiaceae are the survivors out of the Order Cycadales.

II. Coniferopsida

a. Ginkgoales: with the China survivor *Ginkgo biloba*.
b. Cordaitales.
c. Coniferales: Pine trees.

III. Taxopsida: a single family with the very poisonous *Taxus baccata*.

IV Gnetopsida

a. *Ephedra*
b. *Gnetum*: In rainforest, mainly climbing plants, also some trees.
c. *Welwitschia*: a Namib desert plant with only two leaves for all its long life and placed here because scientists did not find a better place.

C. ORIGIN AND EVOLUTION

Cycadales probably originated from late Permian times 240 million years ago, with fossil remains not giving 100% certainty. They are descending, together with the Bennettitales, from the Pteridospermales (seedferns). This origin is not sure also.

In the Trias era (200 million years ago) their existence is absolutely proved by fossil remains and their evolutioin continued throughout the Jurassic increasing their territory and number. In the Jurassic era they reached their maximal expansion with cycads all over the world. The Jurassic cycads were small plants with a stem of 1 m maximum height; it is better to speak of cycad fields than to call them cycad woods or forests. This climax continued in the early Cretaceous times and by the middle Cretaceous (± 100 million years ago) they began their decline. Unlike the decline, and for some species extinction, at the end of the Cretaceous, there was no apparent reason for the decline of the world's cycad populations. Seventy million years ago the extinction of the giant Dinosaurs on the land (and the one in the seas and oceans), Ammonites and Nautili (apart from *Nautilus pompilius* still living in the Pacific) was caused, most probably, by the impact of a giant meteorite causing an enormous disturbance of the climate producing clouds of dust. This made the temperature drop and also made photosynthesis of the plants impossible. This is proved by a thin dust layer, containing Iridium, at the end of the Cretaceous all over the globe.

For the decline of the cycads, some 100 million years ago, there is no climatological nor geophysical reason, but at that moment started an explosive evolution of the gymnosperm trees. Cycads battled till 80 million years ago when most species became extinct.

This way we have a transgression from a cycad dominated landscape to a Xenozoic flora picture: from a treefern and

Lycopodium cover, which dit not allow enough sunlight to penetrate their leafcover, there was a change into a leaftree dominated flora, forming a canopy that prevented most of the sunlight to penetrate and very few plants adapted to this semi-darkness.

So cycads became gradually overgrown by dicotyledonous trees, from these a lot of fossils are found in the Cretaceous layers, e.g. maples, cinnamon, holly, oak, poplar trees, etc.

So, without the necessary light for photosynthesis, cycads could only persist in places like those where they grow today - places without competition from other plants.

A NOTE ON THE TYPIFICATION OF *CYCAS MIQUELII* WARB.

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Received 16 January 2001

Typification of *C. miquelii* has certainly been confused, firstly by Chinese botanists (Wang 1996), and later in a quite different manner by de Laubenfels & Adema (1998), and again in a different manner by de Laubenfels (2000).

The illustration by Miquel (1851) under the name *C. inermis* was made from specimens that are now held in the herbarium in Utrecht. This is indubitably the material under discussion by Warburg in his erection of the name *C. miquelii*, and must be regarded as the type of *C. miquelii*. These specimens show two critical diagnostic characters in the tomentose ovules and the deeply encrypted stomata, both characters known only in *C. revoluta* and *C. taitungensis* (discussed by Hill & Chen 1994). The material in fact matches so closely *C. revoluta* that it can only be regarded as an aberrant individual lacking spines on the petiole. The name *C. miquelii* must therefore fall into the synonymy of *C. revoluta*.

Cycas inermis is a quite separate matter. Firstly, *C. inermis* is a validly published name, published by Louriero, Fl. Cochinch. 2: 632 (1790). Doubt was cast on the validity of the species by including it in the synonymy of *Cycas revoluta* in the 2nd edition of this work (ed. 2, 2: 776–777, 1793), but this does not invalidate the name. The type specimen preserved in the British Museum of Natural History is of leaf material only, with flat leaflets 14 mm wide. This clearly does not match the type specimen of *C. miquelii* discussed above (and see Table 1), and Warburg was quite correct in asserting that the type material of *C. miquelii* does not represent the same species as that of *C. inermis*. The identity of *C. inermis* remains unclear, but the leaf material most closely matches recent collections from southern and central Vietnam that are allied to *C. macrocarpa*.

The material from southern China to which the Chinese botanists (e.g Wang 1996) had misapplied the name *C. miquelii* is a distinct and different taxon for which a number of names become available. The earliest of these appears to be *C. sexseminifera*. *C. guizhouensis* is another distinct and different taxon from another part of China, although allied to *C. sexseminifera*. These are both treated in more detail in the recently published Flora of China (Chen & Stevenson 1999), although these authors also misapply the name *C. miquelii* to *C. sexseminifera* and include *C. guizhouensis* in an erroneously broad concept of *C. szechuanensis*.

In their superfluous neotypification of *C. miquelii*, de Laubenfels and Adema (1998) chose a specimen from Thailand allied to *Cycas clivicola*. The type material of *C. miquelii* is clearly separated from the *C. clivicola* group by the tomentose ovules and encrypted stomata. The *C. sexseminifera* group of species are separated from the *C. clivicola* group by the possession of a rugose sclerotesta and non-fibrous sarcotesta (Table 1).

Table 1. Distinguishing characters of *Cycas miquelii* and species confused with it.

	C. miquelii	*C. inermis* type	sp. aff. *C. macrocarpa* Vietnam	*C. sexseminifera*	*C. clivicola*
ovules	tomentose		glabrous	glabrous	glabrous
stomata	encrypted	open, shallow	open, shallow	open, deep	open, shallow
megasporophylls	pectinate		dentate	pectinate	pectinate
sclerotesta			smooth	rugose	smooth
sarcotesta			fibrous	not fribrous	fibrous
leaflet	5–7 x 150	14 x 330	13–18 x 290–350	6–13 x 70–260	5–11 x 90–250
leaflet margins	strongly recurved	flat	flat	weakly recurved	flat

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NUUS OOR DIE TRANSVAALSE STREEKTAK VAN DIE VERENIGING

Derik Minnaar
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Ontvang 12 Januarie 2001

Afsluitingsfunksie 2000

Op 4 November 2000 is die afsluitingsfunksie van die Transvaalse streektak by Velcich-huis in die Botaniese Tuin in Pretoria gehou.

Daar is besluit om uitstappies te reël sover dit moontlik mag wees na die natuurlike lokaliteite van *Encephalartos middelburgensis, E. paucidentatus, E. humilis, E. heenanii* en *E. transvenosus*. Daar sal ook gepoog word om gassprekers te betrek en tuinbesoeke te reël en lede word versoek om enige voorstelle of kontakpersone deur te gee.

Bemarking van die Vereniging is bespreek, aangesien baie potensiële nuwe lede nie weet hoe om kontak te maak met die Vereniging nie. 'n Voorstel was om moontlik 'n inskrywing in die algemene telefoongids te hê waardeur die Vereniging bereik kan word.

Na 'n jaar se proeftyd is besluit om 'n saadbankbeampte aan te stel, met die opdrag om 'n prakties werkbare beleid te formuleer en toe te pas.

Die twee-jaarlikse verkiesing is gehou om die nuwe komitee aan te wys. Derik Minnaar is eenparig herkies tot voorsitter. Lynette Minnaar is as sekretaresse verkies, John Kloppers as tesourier en Manie Maritz as saadbankbeampte.

Die vergadering is afgesluit om die braaivleisvuur waar daar tot laat gekuier is.

Manie se besonderhede is: Manie Maritz, Posbus 39156, 0060 Garsfontein-Oos, Tel: (012) 998 9667.

BROODBOME: INTERESSANTE WAARNEMINGS

Isabella Claassen
Posbus 25688, 0105 Monumentpark, R.S.A.

8 Januarie 2001

Kleurfiguur 10 op p. 24 toon 'n manlike *Encephalartos transvenosus* wat gedurende 2000 twee kranse keëls gestoot het. Johan van Zyl (persoonlike mededeling) het die plant in 'n tuin in Pretoria waargeneem. Volgens Johan het die plant 'n krans keëls en kort daarna ook 'n stel blare gestoot. Twee maande nadat hierdie keëls hul verskyning gemaak het, het die plant 'n tweede stel keëls onderkant die eerste stel gestoot. Toe die eerste stel keëls begin stuifmeel vrystel, het die tweede stel, wat toe nog baie kleiner as die eerste stel was, ook begin stuifmeel

vrystel.

Ek het 'n soortgelyke geval by 'n manlike *E. paucidentatus* by die Universiteit van Pretoria waargeneem. Die plant het 'n stel keëls gestoot en later 'n tweede stel keëls ook onderkant die eerste stel geproduseer. Ek het die plant egter nie besigtig toe die keëls stuifmeel vrygestel het nie.

Leon Myburgh het foto's gestuur van 'n *E. transvenosus* vroulike plant in 'n Johannesburgse tuin, waar blare op die punte van die keëls ontwikkel het. Die blaartjies was egter baie klein en daar is besluit om nie die foto's te plaas nie.

Mev. G. van Wyk van Brooklyn, Pretoria berig dat sy 'n *E. manikensis vroulike* keël met blaartjies (ongeveer 20 mm lank) in haar tuin het.

Nat en Hanneke Grobbelaar het 'n *E. nubimontanus* vroulike keël met drie mooi blare in hulle tuin.

Summary

CYCADS: INTERESTING OBSERVATIONS

Colour Figure 10 on p. 24 shows an *Encephalartos transvenosus* male plant in a Pretoria garden with two sets of male cones. Johan van Zyl (personal communication) observed that the plant produced a set of male cones and shortly afterwards a set of leaves. Two months after those cones appeared another set of cones was produced but below the first ones. When the first set of cones started to shed pollen, the second set, then still much smaller than the first set, also started to shed pollen.

I observed a similar phenomenon where an *E. paucidentatus* male at the University of Pretoria, produced one set of cones and later on a second set of cones below the first ones. Unfortunately I did not visit the plant at the time of pollen shedding.

Leon Myburgh sent some photos of an *E. transvenosus female* plant in a garden in Johannesburg, where the cones had leaves on their apices. Unfortunately the leaves were very small and it was decided not to use the photographs.

Mrs G. van Wyk of Brooklyn, Pretoria reported that she has an *E. manikensis* female cone with small leaves (about 20 mm long) in her garden.

Nat and Hanneke Grobbelaar have an *E. nubimontanus* female cone with three pretty leaves in their garden.

LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Letter to the Secretary-treasurer:

Dear Prof. Theron

I NEED ADVICE ON HOW TO GROW YOUNG CYCADS

As I am an enthusiastic amateur cycads grower kindly advise me on how to grow young cycads in my garden. My newly planted plants show/have leaves which turn brown and fall off and I suspect a fungus disease, also advise me what fertilizer should I use to feed them (*Encephalartos altensteinii*).

M. Mini, *P.O. Box 4324, 5600 King William"s Town, R.S.A.*

Reply by ***Nat Grobbelaar****, P.O. Box 15357, 0039 Lynn East, R.S.A.*

1. Start with healthy seedlings preferably grown from seed in your vicinity. Seedlings often take a long time to adapt to new conditions especially when the new conditions are much less optimal than those under which the seed was germinated.
2. Do not plant the seedlings in the garden before they are quite strong - have a stem with a diameter of about 40 mm subtending several healthy leaves. Grow very young seedlings in plastic bags or pots in shade. All cycad seedlings require shady conditions for at least the first several years. Some require partial shade throughout their life if they are to grow well. In the garden plants are exposed to much more competition for water and nutrients than in a container that is watered regularly and is kept free of weeds. The container can also be moved from one locality to another to establish a suitable niche for the plant. Regularly check that the drainage holes are not clogged.
3. Cycads must always be planted in humus-rich soil through which water will percolate fast (soil that drains fast). Exposure to muddy soil conditons for a protracted period usually leads to fungal and bacterial infection of the roots and consequent death of the plant. More cultivated cycads probably die from too much water than from drought.

   If your garden soil drains poorly, make a mound with suitable soil and plant the cycads on the mound. There is no point in digging a hole in clay or a soft rock and filling the hole with suitable soil. During heavy rains the hole will become water-logged and your cycad will rot.
4. When the plant is transferred to the garden, select a suitable site and do not disturb the roots of the

seedling unnecessarily. Try to remove the plant from the bag or pot without breaking up the sod in which the roots are embedded and transfer the sod to the hole in the garden. Use compost-rich sandy soil below and around the sod in the hole.

6. If your plants suffer from root rot, you may try the M5 preparation which is highly recommended by Chum van Zyl in a report that is published elsewhere in this issue of "*Encephalartos*". In another article in this issue written by William Tang, it is said that Dick Johnson strongly recommends the use of "Superthrive" when transplanting seedlings or suckers.

[Re Fertilizer: "Multifeed" is highly recommended by several growers, others prefer fertilizers that contain slow release nitrogen, and 2:3:4 is also recommended. – **Editor.**]

.....

Geagte Redaktrise

ENCEPHALARTOS FEROX

Ek het gedurende Julie 2000 op die strand van Jangamo Baai in Mosambiek hierdie groot vroulike *Encephalartos ferox*-plant gesien (Figuur 1). Die lengte van die stam was 1,2 meter en die blare was 2,2 meter lank.

Daar is nog heelwat plante wat in kolonies groei op die eerste duine, sowat 150 meter van die see af. Baie vroulike plante het nog keëls op gehad en interessant was dat die vroulike keëls in kleur wissel van donkergeel, tot oranje tot helderrooi.

Die vraag ontstaan: waarom kom daar so 'n kleurvariasie by die keëls voor?

***Gerrie de Haas**, Privaatsak X9474, 0700 Pietersburg, R.S.A.*

Ontvang 24 Oktober 2000

Summary

Gerrie de Haas observed this large specimen of a female *Encephalartos ferox* (Figure 1) on the beach of Jangamo Bay in Mozambique during July 2000. It had a stem length of 1.2 m and the leaves were up to 2.2 m long.

Several of the female plants in the colony were in cone, and the colour of the cones varied between dark yellow, to orange, to bright red. He asks the question: Why this variation in colour of the cones?

Figuur 1 Gerrie de Haas staan by die besondere groot *Encephalartos ferox*-plant te Jangamo Baai, Mosambiek.

Figure 1 Gerrie de Haas standing next to the exceptionally large specimen of *Encephalartos ferox* at Jangamo Bay, Mozambique.

.....

Correspondence between Thomas R. Campbell (U.S.A.) and Piet Vorster.

Dear Sir

OPERATIONAL SEED BANKS

To recruit more members in the United States, it would help to have an operational seed bank. It is totally impractical for an individual to import small quantities of cycad seeds for his own use, due to government regulations. It is, however, practical for one person to do the paperwork (much as Willie Tang does for membership processing), and then distribute the seeds domestically within the U.S.A. by mail. Unfortunately, I am not in a position to take on this chore. Perhaps Mr. Tang would be willing to do it, or perhaps another U.S. member could be found. Airmail delivery of the seeds from South Africa to the U.S. distributor is essential, and a list of what is coming via telephone or internet should be sent in advance so that the U.S. distributor can prepare.

The Cycad Society in the United States has a seed bank (for members only), but the seed list is sent separately by mail from the distributor directly to those members who have supplied him with self-addressed stamped envelopes for that purpose. Therefore, the seeds do not get stale waiting for the magazine to be published. Perhaps this method would work for the South African Cycad Society, both inside South Africa and in any other country with sufficient members and a member willing to act as a distributor.

The distributor would collect payment in domestic currency, and remit the amount due to the Cycad Society in South Africa perhaps two or three times a year (to minimize losses due to bank charges).

***Thomas R. Campbell**, P.O. Box 721, Metairie, Louisiana 70004, U.S.A.*

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Dear Thomas

Your letter touches a sore point. Together with ENCEPHALARTOS, it is the most important function of the society to help members to obtain plants, and what can be better than to promote growing one's own plants from seed?

Unfortunately there are obstacles which have all but killed our seedbanks:

1. Growers who produce seed, do not make it available to seedbank because they can make handsome amounts of money by selling the seeds or resulting seedlings, or by swopping their seeds or seedlings for other species to expand their own collections.
2. Nature conservation authorities absolutely refuse to allow the collecting of any seed from wild plants.
3. Nature conservation authorities define cycads as "plants or parts thereof", which means that seeds are subject to the same permit system as plants. While in theory it is possible to obtain the necessary permits to distribute seeds, in practice the amount of work and the length of time taken by the severely understaffed authorities to issue permits, mean that the seeds would have perished by the time permits have been issued.
4. The same applies to exportation of seeds outside South Africa. *Encephalartos* species all are, rightly or wrongly, listed in CITES Appendix 1 and attempts to have it downlisted to Appendix 2 have been unsuccessful. Again it is possible to get a CITES export permit for cycad seed, but experience has demonstrated that under South African conditions it is too expensisve and takes too long to be a practical option.

Of course we could just mail seeds in padded envelopes to South African and overseas members. However, conservation is one of the cornerstones of our society's constitution, and we cannot indulge in any illegal action, however irrational the laws may be, because we have to maintain the image of the Society.

***Piet Vorster**, Botany Department, University of Stellenbosch, Private Bag X1, 7602 Matieland, R.S.A.*

Received 9 January 20001

FROM COUNCIL / VAN DIE RAAD

ERRATUM

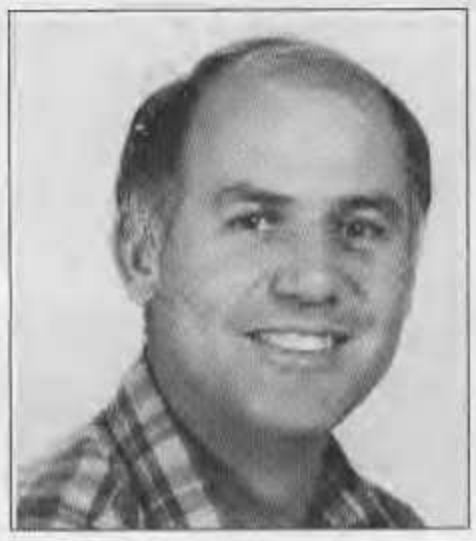
Re: "Travels in search of Mexican cycads" by Jeff Chemnick in *Encephalartos* **63**: 14–16 (September 2000).

The following note was received from Jeff Chemnick: "The author wishes to correct the impression that a putative new species of *Dioon* from Juchatengo is an already described, valid species. Rather, it is currently under investigation, as a putative new species from the Pacific slope of Oaxaca with a close affinity with *Dioon holmgrenii*, and has not been the subject of any publication. The name, Juchatengo, is simply the locality and should have been in quotation marks to indicate as such. Furthermore, this population was not visited during the ecotour. Instead, the Dioons on top of the spiritually-endowed flat-top hill were those known in cultivation as "El Camaron". I regret any misapprehension about the taxonomic/biogeographic status of this population."

[I apologize to Jeff Chemnick and readers that I mistook the word "Juchatengo" (*Encephalartos* **63**: 15) as the specific epithet of a new species, as well as the mistaken habitat thereof. I should have cited *Dioon* "Juchatengo", and Figure 1 on p. 15, on p. 11, in the first paragraph, second column of Jeff Chemnick's article "The Dioons of Mexico" (*Encephalartos* **63**: 10–14). – **Editor.**]

SOMMIGE VAN ONS RAADSLEDE / SOME OF OUR COUNCIL MEMBERS

Leon van Rooy



Gerrie de Haas

Derik Minnaar

Diekie de Klerk

Leon van Rooy (Streeksverteenwoordiger van die Laeveldse Streektak)

Hy is te Aliwal-Noord gebore en matrikuleer by die Sentrale Hoërskool in Bloemfontein. Hy boer met sitrus in die Plaston omgewing, distrik Wirivier. Hy het in 1965 by die Suid-Afrikaanse Koöp Sitrusbeurs te Nelspruit aangesluit en was daar werksaam tot en met sy aftrede in 1994.

Sy belangstelling in broodbome het aanvanklik in 1969 begin met die aankoop van 'n *Encephalartos lebomboensis*-saailing te Skukuza. Toe die plant die eerste keer in 1991 gekeël het, het die gogga hom gebyt. Sedertdien het hy plante aangekoop soos sy finansies dit toegelaat het. In 1997 het daar by'n paar broodboom-entoesiaste, toe hulle 'n broodboom identifikasie kursus in Nelspruit bygewoon het, die gedagte ontstaan dat daar 'n plaaslike tak van die Broodboom Vereniging van Suid-Afrika gestig behoort te word. 'n Stigtingsvergadering is op 20 April 1997 gehou. Tans is hulle ledetal 55. Hulle vergader vier keer per jaar en hou gereeld uitstappies, veral na waar broodbome in habitatgebiede voorkom.

Gerrie de Haas (Streeksverteenwoordiger van die Noordelike Provinsie Broodboom Werkgroep)

Hy versamel broodbome sedert 1978. Sy vader was ook 'n versamelaar en hy glo dat sy voorliefde vir broodbome vandaar ontstaan het.

Hy woon sedert 1974 in Pietersburg waar hy as geneesheer praktiseer.

Hy het in 1994 begin om vroulike broodboomkeëls te bestuif en hou die afgelope vyf jaar jaarliks 'n verkoping van saailinge saam met ander kwekers in die Verre Noorde.

Hy is die voorsitter van die Noordelike Provinsie Broodboom Werkgroep en sy spesiale belangstelling is die grysblaar broodbome van die Noordelike Provinsie en Mpumalanga.

Derik Minnaar Streeksverteenwoordiger van die Transvaalse Streektak)

Hy is in Krugersdorp gebore en het ook daar gematrikuleer. Hy behaal 'n graad in elektroniese ingenieurswese in 1983 en later sy honneurs-, meesters- en doktorsgrade by die Universiteit van Pretoria.

Sy weermagopleiding ondergaan hy in die leër- en lugmag, waar hy navorsing doen op vyandige stelsels. Hy verlaat die lugmag as kaptein en is sedert 1990 in diens van Grintek, waar hy aangestel is as senior ingenieur en later hoofingenieur in elektroniese oorlogvoering.

Derik het van jongs af 'n besondere liefde vir die natuur. Sy pa en oom het sedert die sestigerjare met eksotiese orgideë geboer. Hy volg egter sy ma se belangstelling in broodbome en ontwikkel 'n besondere belangstelling in die verskillende vorme en mutasies van broodbome, asook die kloning van skaars spesies.

Gedurende sy studies ontmoet hy vir Lynette, wat haar bekwaam in rekenaarwetenskap en plantkunde en in 1994 word die groot knoop deurgehaak. Lynette is tans projekbestuurder by Dimension Data en ook sekretaresse van die Transvaalse Streekstak van ons Broodboom Vereniging. Hulle het self 'n versameling broodbome op hul kleinhoewe net buite Pretoria, waar die span Dobermans wat die tuin oppas sorg dat die lewe baie interessant bly.

Diekie de Klerk (Stuifmeel- en saadbankbeampte van die Noordelike Provinsie Broodboom Werkgroep)

Hy is reeds vir ongeveer 20 jaar in Pietersburg woonagtig, waar hy as ortopediese chirurg praktiseer.

Hy het sy eerste broodboom in 1984 aangekoop, naamlik 'n *Encephalartos transvenosus*. Dié plant se stam was toe die grootte van 'n tennisbal. Tans is dit 'n spogplant met 'n

stamhoogte van 45 cm. Dit het in 1998 vir die eerste keer gekeël en een vroulike keël gevorm het. In sy tuin spog hy met 'n groot verskeidenheid *Encephalartos* spesies.

Sedert 1984 het hy en Gerrie de Haas 'n aktiewe projek aan die gang om vroulike keëls te bestuif en saailinge uit die sade te kweek, veral van die Noordelike spesies. Hulle is trots om te kan sê dat hulle al 'n paar duisend saailinge gekweek het wat jaarliks op 'n verkoping in Pietersburg aangebied word.

Summary

Leon van Rooy (Regional officer of the Lowveld Regional Branch of the Society)

He was born in Aliwal North and matriculated at the "Sentrale Hoërskool" in Bloemfontein (Free State). He farms with citrus near Plaston in the district of White River (Mpumalanga). He was employed by the South African Co-op Citrus Exchange in Nelspruit from 1965 until his retirement in 1994.

His interest in cycads started in 1969 when purchasing an *Encephalartos lebomboensis* in Skukuza (Kruger National Park). This plant coned for the first time in 1991.

In 1997, while attending a cycad identification course in Nelspruit, some of the cycad enthusiasts decided to institute a local branch of the Cycad Society of South Africa and on 20 April 1997 they held the inaugural meeting of the Lowveld Regional Branch.

Gerrie de Haas (Regional officer of the Northern Province Cycad Working Group).

He collects cycads since 1978. He inherited his interest in cycads from his father who also was a collector.

He is resident in Pietersburg since 1974 where he is a medical practitioner.

He started pollinating female cycad cones in 1994, and for the past five years he, together with other cycad growers, participates in selling cycad seedlings yearly in September.

His special interest is the blue-leaf *Encephalartos* species of the Northern Province and Mpumalanga.

Derik Minnaar (Regional officer of the Transvaal Regional Branch of the Society)

He was born in Krugersdorp and also matriculated there He obtained a degree in electronic engineering in 1983 and subsequently to that his honours, master's and doctor's degrees at the University of Pretoria. He underwent his defence force training in the army and air force where he did research on hostile systems. He quitted the air force as a captain. Since 1990 he is employed by Grintek, at first as a senior engineer and later on as chief engineer in electronic warfare.

He inherited his mother's interest in cycads and developed a special interest in the different forms and mutations of cycads, as well as the cloning of rare species.

He is married to Lynette, who qualified in computer science and botany, and is at present in the employ of Dimension Data as a project manageress, and she is also the lady secretary of the Transvaal Regional Brance. They have a cycad collection on their small holding just outside of Pretoria.

Diekie de Klerk (Pollen- and seedbank officer of the Northern Province Cycad Working Group)

He he has been residing in Pietersburg for about 20 years where he practices as an orthopaedic surgeon.

He bought his first cycad, an *Encephalartos transvenosus*, in 1984. At that time the size of the plant's stem was about that of a tennis ball. Nowadays it is a prize specimen with a stem length of 45 cm. It coned for the first time in 1998 and produced one female cone. His collection consists of a large variety of *Encephalartos* species.

Since 1984 he and Gerrie de Haas actively pollinate female cycad cones and propagate seedlings from seed, especially of the Northern species. They are proud to say that they have propagated several thousands of seedlings which are offered for sale at the yearly cycad sale in Pietersburg.

NEW CYCAD PUBLICATIONS

CHEMNICK, J. 2000. **The future of Mexican cycads in the wild.** *The Cycad Newsletter* 23(2): 16–19.

[Unfortunately an abstract is not available.]

Author's address: 114 Conejo Road, Santa Barbara, CA 93103, U.S.A.

CHEMNICK, J. 2000. **Travels in search of Mexican cycads. A review of Mexico Cycad Ecotour March, 2000.** *The Cycad Newsletter* 23(2): 20–21.

[Unfortunately an abstract is not available.]

Author's address: 114 Conejo Road, Santa Barbara

CA 93103, U.S.A.

CHUBB, H. 2000. **Off-site preservation of *Microcycas calocoma*: Current status of the work of the Montgomery Botanical Center in Miami.** *The Cycad Newsletter* 23(2): 4–6.

[Unfortunately an abstract is not available.]

Author's address: The Center for Cycads, 65 Johnson Road, West Cornwall, CT 06796, U.S.A.

DHIMAN, M., MOITRA, S., SING, M.N. & BHATNAGAR, S.P. 2000. **Organogenesis in female gametophyte and embryo cultures of cycads: *Cycas circinalis* and *Zamia integrifolia*.** *Journal of Plant Biochemistry and Biotechnology* 9(2): 111–113.

[Female gametophyte of *Cycas circinalis* and *Zamia integrifolia* and embryo of *C. circinalis* were cultured in vitro on MS medium supplemented with various auxins and cytokinins. In female gametophyte cultures of *C. circinalis* and *Z. integrifolia*, auxins (NAA, 2,4-D) alone resulted in callus formation. However, when auxin was used in combination with BAP or Kn, nodulation was observed. Embryos of *C. circinalis* grown on a medium containing 2,4-D and BAP showed organogenic response and bulbil-like structures.]

First author's address: University of Delhi, Miranda House, Delhi, 110 007, India.

JIMÉNEZ, L., AL, J. & PÉREZ, O. 2000. **Mycorrhizization of vasticular-arbuscular mycorrhizae fungi on *Cycas revoluta* in the nursery.** *Palms & Cycads* no. 67: 16–21.

[An experiment is described in which *C. revoluta* seedlings of two ages were inoculated with one of three inoculae which each consisted of fungal spores, mycelium and infected roots from 6 months old Sudan grass pot cultures. After 8 months all three the inoculae had successfully established a mycorrhizal association with 55% to 72% of the 12 month old seedlings. The 3 month old seedling and uninoculated seedlings were not colonized when the experiment was terminated.]

First author's address: Departamento de Investigacion y Desarrollo, Jardineria Huerto del Cura S.A. C/Prolongacion Curtidores s/n 03203, Elche, Alicante, Spain.

KYBURZ, R. 2000. **Three Panamanian Zamias.** *Palms & Cycads* No. 67: 3–15.

[The paper deals mainly with the habitat of *Zamia skinneri, Z. dressleri* and *Z. pseudoparasitica* and contains splendid colour photographs of the three species.]

Author's address: P.O. Box 90, Browns Plains, Queensland, Australia.

NAZOR, C. 2000. **The cycad collection at the Brackenridge Field Laboratory in Austin, Texas.** *The Cycad Newsletter* 23(2): 13–15.

[Unfortunately an abstract is not available.]

Author's address: 11803 Hyacinth Drive, Austin, TX 78758, U.S.A.

PANT, D.D. & SRIVASTAVA, P.C. 2000. **Branched female cones of *Zamia*.** *Palms & Cycads* No. 67: 28–30.

[Branched female cones of *Zamia inermis* with 2 to 4 apices are reported from the garden of the Botany Department of Ewing Christian College in Allahabad India. The report contains several clear coloured photographs of the cones.]

First author's address: Department of Botany, University of Allahabad, Allahabad, India, 211 002.

REYNOLDS, E.A. & JOHN, P. 2000. **ACC oxidase is found in seedlings of two (Coniferales, Gnetales) of the four gymnosperm orders.** *Physiologia Plantarum* 110(1): 38–41.

[Leaf material and seedlings of species representing all gymnosperm orders were tested for 1-aminocyclopropane-1-carboxylate (ACC) oxidase activity. Seedlings of *Pinus nigra, Pinus radiata, Pseudotsuga menziesii, Cupressocyparis leylandii, Ephedra major* and *Ephedra nevadensis* showed high levels in vitro ACC oxidase activity. The enzyme from seedlings of *Pinus nigra* var. *nigra* (Arnold) was shown to resemble the angiosperm enzyme in a requirement for ascorbate, carbon dioxide and Fe(II). In contrast, seedlings of *Ginkgo biloba, Dioon edule, Zamia furfuracea* and *Cycas revoluta* showed no detectable ACC oxidase activity. Leaf material from species representing all orders of gymnosperms was also tested for ACC oxidase activity in vitro, but none could be demonstrated. The results presented here support an origin of ACC oxidase in a common ancestor of the angiosperms, Gnetales and Coniferales.]

First author's address: Department of Agricultural Botany, School of Plant Sciences, University of Reading, Reading, RG6 6AS, UK.

Compiled by ***Nat Grobbelaar****, P.O. Box 15357, 0039 Lynn East, South Africa.*

DONATIONS RECEIVED / DONASIES ONTVANG

1 JANUARY/JANUARIE 2000 TO/TOT 8 JANUARY/JANUARIE 2001

THE FOLLOWING DONATIONS TO THE CYCAD SOCIETY OF SOUTH AFRICA (AS WELL AS UNLISTED DONATIONS BY FOREIGN MEMBERS) ARE ACKNOWLEDGED WITH THANKS:

DIE VOLGENDE DONASIES AAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA (ASOOK ONGELYSTE DONASIES ONTVANG VAN BUITELANDSE LEDE) WORD MET DANK ERKEN:

Number Nommer	NAME / NAAM	Amount Bedrag	Number Nommer	NAME / NAAM	Amount Bedrag
2591	Alberts, B.C.	R 35.00	1428	Du Rand, L.	R 44.00
2264	Allen, Jane E.	20.00	1064	Du Toit, H.J.	35.00
2261	Arnold, Hein & Marnel	44.00	0971	Du Toit, K.P.	15.00
1578	Avenant, S.F. du Toit	14.00	2040	Du Toit, P. & Van der West-	
2201	Barnard, E.	85.00		Huizen, J.	79.00
2390	Berga, A.S.	24.00	2571	Edwards, A.J.	44.00
2370	Berry, Edward H.	29.00	2148	Elliot, V.	44.00
0776	Besseling, J.	35.00	0817	Erasmus, C.S.	30.00
2586	Bester, Stefan F.	35.00	2360	Exley, Schalk	79.00
2624	Bester, S.F.	4.00	1963	Fokkens, J.F.	106.00
1541	Bezuidenhout, L.	50.00	1190	Fouché, H.P.J.	15.00
0399	Bischofberger, Karl	29.00	2044	Fourie, J.J.A.	94.00
0947	Booysen, J.J.	54.00	0689	Fourie, M.J.	14.00
2577	Bossy, M.C.E.	100.00	0542	Fritz, G.	14.00
0276	Botha, T.J.R.	4.00	2238	Garratt, P.J.V.	5.00
2042	Bothma, C.S.M.	35.00	2113	Gielink, C.C.	79.00
0848	Bothma, J.W.	14.00	1614	Gneiting, C.F.H.	35.00
1142	Brits, M.C.	10.00	1335	Gould, T.	5.00
2265	Brooks, F.A.	85.00	2309	Graham, C.D.	110.00
1807	Brumme, D.	14.00	1789	Greyling, J.J.	79.00
1191	Bruwer, P.C.	5.00	2285	Grobler, Phil	14.00
0616	Buhr, E.W.	59.00	2502	Groenewald, D.M.	44.00
2576	Byleveldt, G.	94.00	2563	Groenewald, Willem L.	15.00
2087	Cavanagh, Kent	35.00	2520	Grotè, Patricia	35.00
1436	Clarkson, S.P.	94.00	0420	Hanaczeck, H.W.	79.00
2312	Coetzee, Derick F.	14.00	1178	Harris, M.V.	20.00
1206	Coetzee, S.D.	24.00	0601	Hart, G.B.	20.00
2389	Coetzer, Ed & Jossie	35.00	0433	Henning, N.G.C.	94.00
1910	Cowley, V.W.	20.00	2573	Henstock, H.H.	55.00
1930	Cronjé, J.A.S.	5.00	2582	Holt, Michael G. & Saayman,	
2549	Cronjé, J. Chris	85.00		Pieter	65.00
2029	Crous, Dirk	35.00	2236	Howes, Cobie & Julie	94.00
2583	Curle, A.I.	35.00	2593	Janse van Rensburg, A.E.	35.00
2429	Curling, C.A.	35.00	2448	Janse van Rensburg, J.B.	35.00
2612	Daniel, A.N.	29.00	1002	Janse van Rensburg, J.M.	14.00
2267	De Beer, C.	35.00	0644	Johannes, T.A.	44.00
1956	De Beer, H.J.	35.00	2620	Jordaan, D.L.J.	9.00
0410	De Haas, G.N.	14.00	2485	Jordaan, J.A.	49.00
1956	De Jager, Lourens	135.00	1462	Kable, A.J.	79.00
1962	De Jager, S.	14.00	1791	Kadwa, M.A.	95.00
0080	De Jong, J.J.	24.00	1482	Kemp, J.J. & A.	35.00
2034	De Klerk, J.C.	79.00	0745	Kloppers, John S.	194.00
0452	De Kock, C.V.	35.00	1867	Kockott, C.P.	35.00
1374	De Kock, K.N.	10.00	1812	Kriel, W.J	35.00
2603	De Lapelin Dumont, S.J.A.L.	35.00	2605	Kruger, A.P.	35.00
1186	Delhove, G.G.C.H.	200.00	2311	Kruger, Johan	35.00
2039	Diedericks, W.J.	5.00	0853	Kruger, P.W.B.	14.00
1403	Doddemeade, P.W.	30.00	1140	Kruger, S.R.	15.00
2419	Du Plessis, J.H.	5.00	1672	Kuschke, A.E.	44.00
2377	Du Plessis, J.P.	10.00	2475	Labuschagne, D.L.	35.00
1854	Du Preez, Japie	35.00	2420	Lambrechts, A.H.D.	9.00
1577	Du Preez, J.C.	14.00	2392	Lemmens, D.R.	49.00

	NAME / NAAM	Amount Bedrag	Number Nommer	NAME / NAAM	Amount Bedrag
2627	Leslie, Bruce D.	R 29.00	1481	Snyman, A.J.	R 10.00
1166	Lightley, C.G.	5.00	1815	Snyman, P.H.R.	14.00
2228	Loots, C.J.H.	35.00	2401	Sopp, Willie	14.00
0159	Loubser, J.D.	44.00	2503	Stanton, J.H.	35.00
2310	Louw, E.	27.00	2584	Steenkamp, Jakie	5.00
1676	Louw, J.P.	10.00	0911	Steenkamp, Mnr & Mev K.	10.00
2525	Maher, Alan	35.00	2484	Stoltz, Danie H.	10.00
2069	Manga, Vasan	54.00	1004	Stranex, Philip	25.00
2203	Maritz, H.P.	44.00	2341	Strobos, J.M.L.	39.00
2564	Mattheys, Harold H.	35.00	2210	Struyf, Wim & Martie	95.00
2533	Meyer, W.	5.00	0139	Swanepoel, Johan	14.00
2534	Miessner, August	35.00	0651	Swart, M.L.	49.00
2607	Mini, M.	35.00	0265	Tarr, A.A.	14.00
2585	Mitchell, James & Thea	35.00	1708	Terblanche, J.	14.00
1210	Moodie, S.T.	44.00	2602	Terblanche, Pierre	35.00
2486	Mostert, J.I.	35.00	0304	Topham, André L.	35.00
2086	Mostert, P.J.	24.00	2237	Udemans, Willie L.	79.00
1218	Müller, D.	35.00	1760	Uys, A.G.	10.00
1722	Muller, T.I.	49.00	1969	Van de Pest, P.	40.00
2550	Muller, W.J. & C.J.	50.00	2597	Van den Berg, D.J.H.	15.00
2476	Myburgh, L.M.	26.00	1144	Van den Heede, A.M.P.	100.00
1423	Nel, J.J.G.	5.00	2590	Van der Westhuizen, P.D.	130.00
2452	Nelson, S.C.	44.00	1283	Van der Merwe, C.H.	15.00
1194	Niemand, H. & D.	54.00	0490	Van der Merwe, W.D.	14.00
1968	Oberholzer, Niël & Thea	35.00	0038	Van der Walt, Ita	35.00
1588	Ochse, A.L.	24.00	2471	Van Eeden, B.W.	35.00
0094	Olivier, L.H.	35.00	1185	Van Heerden, H.G.	34.00
2215	Parker, K.	19.00	2240	Van Rensburg, P.F.J.	4.00
2287	Pienaar, W.J.	35.00	1258	Van Rooy, Leon	14.00
2609	Pieters, A.J.	20.00	2470	Van Rooyen, A.L.	35.00
0078	Pinker, Colin E.	35.00	1924	Van Rooyen, H.C.	4.00
0734	Platford, R.J.	10.00	2332	Van Vuuren, Henco	5.00
2185	Powell, J.B.	64.00	1819	Van Vuuren, Jan A.	500.00
2409	Pretorius, J.J.	94.00	2610	Van Wyk, N.R.	35.00
2307	Pretorius, Peet	75.00	1891	Van Wyk, R.J.	44.00
1581	Prinsloo, J.J.	15.00	2604	Van Zyl, Daan	35.00
0631	Prozesky, J.G.	35.00	1756	Van Zyl, Elkie	55.00
1917	Quinn, Peter & Linda	35.00	2601	Van Zyl, P.C.	49.00
1197	Reinach, Norman	14.00	1703	Veldhoen, G.	15.00
2623	Reyneke, D.J.	79.00	2060	Veldkamp, J.A.	35.00
1222	Riordan, S.	10.00	0681	Venter, F.F.C.	94.00
2005	Roos, P.B.	20.00	2320	Venter, Marlene	15.00
0973	Rossouw, N.B.	30.00	2466	Venter, M.M.	15.00
1442	Roux, J.J.	15.00	1033	Vice, A.R.	35.00
0415	Rudman, R.R.	34.00	1607	Viljoen, Jaap	10.00
1446	Schmid, R.	15.00	1949	Viljoen, Norman	49.00
2410	Schnetler, André M.	35.00	2013	Visser, G.E.	10.00
2202	Schutte, M.	20.00	1770	Visser, W.P.	4.00
2407	Scribante, L.F.	35.00	0500	Vissers, Hans	15.00
2579	Senekal, Anton	10.00	2600	Vorster, A.D.	40.00
1959	Smalberger, H.C.	94.00	2594	Watts, S.C.	18.00
2399	Smit, C.A.	24.00	0047	Wentzel, s.W.	79.00
2378	Smook, Gustav J.	50.00	0448	Wessels, F.H.	44.00
2537	Snyders, S.	35.00	1318	Wessels, J.W.	35.00
2120	Snyman, Anton D.	15.00	0008	Wohlberg, H. Edgar	24.00
				TOTAL / TOTAAL	**R8497.00**