THE AROID COLLECTIONS AT THE MISSOURI BOTANICAL GARDEN

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The Missouri Botanical Garden, which first opened its gates to the public in 1859, is the second oldest botanical garden in the United States, the oldest having been founded by John Bartram in Philadelphia early in the 18th century. Located on more than 70 acres in the heart of St. Louis, it features a large Japanese garden, a climatically controlled geodesic dome for tropical plants and numerous other indoor and outdoor displays. The Garden, long associated with Washington University, and more recently with St. Louis University, the University of Missouri and Southern Illinois University, has been involved in the training of many botanists. Its library with more than 65,000 volumes and its herbarium of about 3 million specimens play an important role in systematic botany and horticulture.

The Garden's long involvement in tropical America with an active staff of tropical field botanists has provided the institution with rich aroid collections. The bulk of the older living accessions still in existence were acquired by George Pring and Ladislaus Cutak during trips to Central and South America. Also important were trips made by Dr. George Bunting, a staff member at the Missouri Botanical Garden during the early 1960's.

The scientific work at the Missouri Botanical Garden emphasizes floristic studies and monographic (revisionary) studies of tropical plant families in tropical America and Africa. A significant percentage of its systematists are involved in field work at any time. Currently projects are underway in Panama, Nicaragua, Colombia (Chocó), Peru, Venezuela, New Caledonia, South Africa and the Middle East. These projects add significantly to the scientific collections of aroids at the Garden. The collection of dried herbarium material at the Missouri Botanical Garden is perhaps the largest in the world. Though no exact count has been made of the entire collection, it consists of the equivalent of 20 full standard herbarium cases with about 50% of the collection having been made in the past 15 years principally in the more interesting parts of the American tropics. The genus *Anthurium* (the only one accurately counted) contains more than 5,400 specimens (not counting photos) as of May 1979. While it's not possible to directly compare this number of collections with other large collections such as those of the New York Botanical Garden, or the Smithsonian Institution, it can be compared rather well with the collection at the Field Museum and at

the Kew Herbarium. The Field Museum has by my count approximately 3300 collection of *Anthurium* and the Kew Herbarium has an estimated 3,600 specimens in all genera (Simon Mayo, personal communication). The *Anthurium* collection at Kew, which is possibly one of the most completely represented at Kew, consists of approximately 1,400 collections. On the other hand, Kew and the Field Museum as well as all of the other herbaria mentioned above, still have a larger collection of type material than the Missouri Botanical Garden. The Kew Herbarium has, for example, approximately 160 type specimens of *Anthurium* alone. The number of type specimens at the Missouri Botanical Garden is, however, increasing rapidly.

The Garden's display collection of live tropical aroids is housed in the Climatron among more than one-half acre of plantings in a natural tropical setting. The aroid collection includes large, well established species, including the rare *Philodendron subincism* Schott, recollected by George Bunting in Mexico a century after it was first described from a Karwinsky collection of unknown origin. Some of the bird's nest *Anthurium* collections (section *Pachyneurium*) stand about 2 meters tall. A huge old collection of *Monstera deliciosa* covers a rock wall featuring a 10 foot waterfall. Plans are being made to greatly improve the aroid collections in the Climatron by supplementing aroid collections from my research collections when active work with any group has been completed. A good collection of native temperate aroids, including *Arisaema* and *Peltandra*, are grown out of doors at the Garden and other introduced temperate genera such as *Calla*, *Pinellia*, and *Symplocarpus* are also displayed. Even the genus *Arisarum* from the Mediterranean region has proven capable of surviving the recent severe winters in outdoor gardens such as in the new English Woodland Garden.

Research collections are housed in a greenhouse of 3,450 square feet with a southern exposure. It is fitted with permanent shadecloth and automatic humidity control. The center of the greenhouse has tiered metal benches and the north wall is of rough poured concrete with an attached wire trellis for growing climbing genera such as *Philodendron*, *Syngonium* and *Monstera*. Since the wall is almost 25 feet high, it is hoped that even genera like *Syngonium* and *Monstera* which must grow to a considerable height before flowering will be able to grow to maturity.

The research aroids, which I have mostly collected during the past three years, consist of more than 2,000 collections in 27 genera. The collections are largely from Mexico, Central America and Panama, though with many also from northern South America. Most well represented are *Anthurium* with 1,617 collections representing ca. 170 species, *Philodendron* (333 collections), *Dieffenbachia* (92 collections), *Syngonium* (73 collections), *Spathiphyllum* (48 collections), *Stenospermation* (22 collections), and *Xanthosoma* (41). Also represented are collections of *Aglaonema*, *Alocasia*, *Amorphophallus*, *Arisaema*, *Asterostigma*, *Caladium*, *Colocasia*, *Culcasia*, *Dracontioides*, *Dracontium*, *Epi-*

Figures 1-4: A large individual of *Monstera deliciosa* trailing over waterfall in the Climatron. 2. *Philodendron subincisum* in Climatron. 3. A steep bank in the Climatron supporting *Philodendron gloriosum* (front), *Anthurium schlechtendalii* (center left) and *Anthurium formosum* (top). 4. Aroid Research House showing the juvenile leaves of a species of *Philodendron* whose adult leaves may become more than 1m long.

premnum, *Holochlamys*, *Homalomena*, *Montrichardia*, *Rhaphidophora*, *Rhodospatha*, *Schismatoglottis*, *Urospatha* and *Zantedeschia*.

Virtually all of the material is vouchered with dried herbarium collections and only a small percentage is of unknown origin.

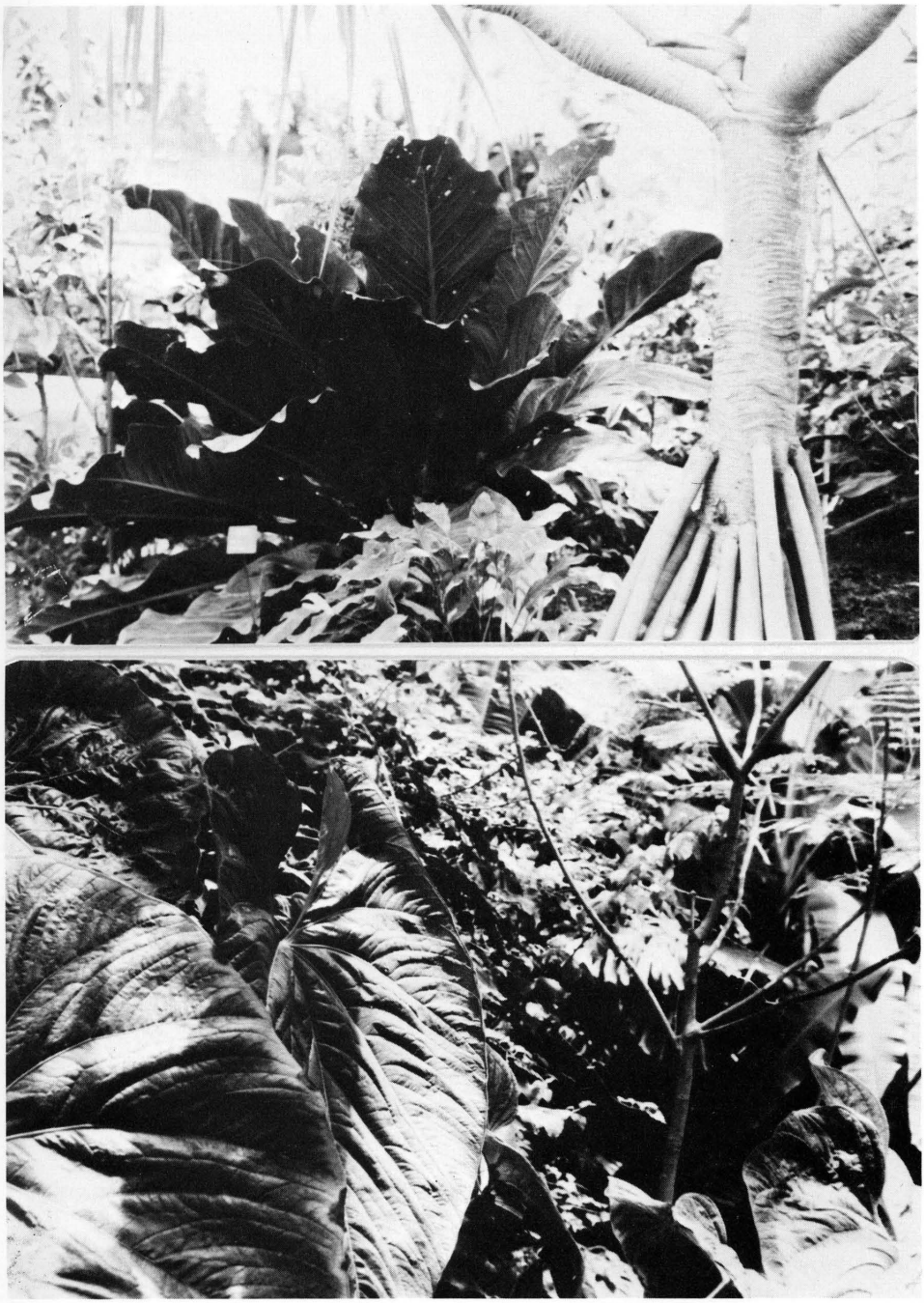
Although much research with Araceae is carried out in the aroid greenhouse, many collections are removed to my office where more detailed studies are carried out. At any one time, there are between 30 and 50 different species flowering in my office, where daily phenological observations are carried out and where descriptions are prepared.

Current research on aroids at the Missouri Botanical Garden is concentrated on a revision of *Anthurium*. Field work during the past two years has been in Central America and a revision of the genus *Anthurium* for Central America will be finished in about one year. A revision of the genus *Anthurium* for Costa Rica, done with Richard Baker, is now finished and will be published soon in *Brenesia*. That treatment contains 71 species, including 23 new species. A revision of *Syngonium* is nearing completion. That revision will include more than 30 species of which 8 species are new to science.

Future work with aroids will concentrate on further revisionary work with *Anthurium* in South America. Particular emphasis is now being placed on revisions of *Anthurium* sections *Pachyneurium* (bird's nest type) and *Calomystrium*. The latter have generally thick, cordate blades, and have persistent, thick cataphylls which remain intact, such as *Anthurium fraternum*, *A. nymphiifolium*, *etc.*

Additional research projects with aroids include a revision of the Araceae for the Flora of Ecuador, the Flora of Nicaragua, the Flora of Chiapas, the Flora Costaricensis and the Flora of Vera Cruz.

For the purposes of obtaining material for my revision of *Anthurium*, I am particularly anxious to obtain more collections from South America and would like to obtain live plants through exchange or purchase. Anyone wishing to see the research collections at the Missouri Botanical Garden should contact me in advance. Anyone with South American species of *Anthurium* wishing to exchange plants may consult the appendix for a list of the species growing in my research collection and contact me to see what is available for exchange. The species name followed by "Croat & Baker" and those followed by "Croat" are to be published soon. Those followed by "sp. nov. ined." are in various stages of completion and some may turn out to be species which are already described, so the names in the list are subject to change and should not be considered final until such time as they appear in print. Other distinct species are present in the collection, especially those originating from South America which have not yet been named and are thus not included in the list.



Figures 5 & 6: 5. *Anthurium jenmanii* growing beneath a screw pine in the Climatron. 6. *Anthurium formosum* in the Climatron.

Figures 7-8. 7. View of the outside of the Climatron where most display aroids are housed. 8. Aroid Research House: *Anthurium* species (left row), *Philodendron* and miscellaneous genera (center row), terrestrial genera and climbers (right and on wall).

Figures 9-10. 9. *Anthurium* section *Calomystrium* area (right) and propagation misting chambers (left). 10. Propagating misting chambers in Aroid Reserach House showing plants placed in Perlite for root production (a timer controls the degree of misting and opening or closing of windows controls the degree of air movement in the chamber).

Figures 11-12. 11. View of office with *Anthurium* species being observed and described. 12. *Anthurium* collections in office (cards attached to pots contain regular notes on phenology).

LIST OF *ANTHURIUM* SPECIES GROWING IN RESEARCH COLLECTIONS AT MISSOURI BOTANICAL GARDEN

Anthurium acutangulum Engler
A. acutifolium Engler
A. affine Schott
A. amethystinum Croat & Baker
A. andicola Liebm.
**A. andreanum* Linden
A. amnicola Dressler
A. angustilaminatum Engler
A. angustispadix Croat & Baker
A. arcuatum sp. nov. ined.
A. armeniense sp. nov. ined.
A. austin-smithii Croat & Baker
A. bakeri Hook. f.
A. beltanium Standley & Wins.
A. berriozabalense Matuda
A. binervia sp. nov. ined.
A. bredemeyeri Schott
A. brenesii Croat & Baker
A. brentberlinii sp. nov. ined.
A. bristanii Croat
A. brownii Masters
A. burgeri Croat & Baker
A. calvariense sp. nov. ined.
A. canasas Croat
A. caperatum Croat & Baker
A. cerrocampanense Croat
A. cerropelonense Matuda
A. cerropirrei sp. nov. ined.
A. chamulense Matuda
A. chiapasense Matuda
A. cinereopetiolatum Croat
A. circinnatum Croat
A. clarinervium Matuda
A. clavatum Croat & Baker
A. clavigerum P & E
A. cocleense Croat
A. colonense sp. nov. ined.
A. colonicum Krause
A. colorado-ritense sp. nov. ined.
A. concinnatum Schott
A. concolor Krause
A. consobrinum Schott
A. cotobrusii Croat & Baker
A. crassinervium (Jacq.) Schott
A. crassiradix sp. nov. ined.
A. crenatum (L.) Kunth
A. cubense Engler
A. curvispadix sp. nov. ined.
A. cuspidatum Masters
A. dolichostachyum Sodiro
A. dominicense Schott
A. dressleri Croat
A. dwyeri Croat
**A. effusalobum* sp. nov. ined.
A. fatoense Karuse Krause
A. flexile Schott
A. folsomii sp. nov. ined.
A. formosum Schott
A. friedrichsthalii Schott
A. fusiforme sp. nov. ined.
A. gracile (Rudge) Lindl.
A. gualeanum Engler
A. guildingii Schott
**A. hacumense* Engler
A. halmoorei sp. nov. ined.
A. hammelii sp. nov. ined.
A. harrisii (Grah.) Endl.
A. hebetatum sp. nov. ined.
A. helleboriforum Schott
A. hoffmannii Schott
A. huatlense Matuda
A. huixtlense Matuda
A. hylaeum Sodiro
A. interruptum Sodiro
A. jefense sp. nov. ined.
A. kamamotoanum sp. nov. ined.
A. kirkbridei sp. nov. ined.
A. kruseanum Matuda
A. kunthii P & E
A. lancetillense sp. nov. ined.
A. lancifolium Schott
A. lentii Croat & Baker
A. leonianum Sodiro
**A. leuconeurum* Lem.
A. leucostachyum Sodiro
A. lezamae Matuda
A. lindenianum C. Koch & Augustin
A. longipeltatum Matuda
A. lucens Standley ex Yuncker
A. luteynii Croat
A. melanolaminum sp. nov. ined.
A. microspadix Schott

*Note: From a cultivated source–exact collecting location of original collection unknown.

A. molinae sp. nov. ined.
A. montanum Hemsley
A. monteverdense Croat & Baker
A. nakamurae Matuda
A. nymphiifolium C. Koch & Bouché
A. obtusilobum Schott
A. ochranthum Schott
A. oerstedianum Schott
A. pageanum sp. nov. ined.
A. paludosum Engler
A. panduriforme Schott
A. pedato-radiatum Schott
A. pentaphyllum var. *bombacifolium* (Schott) Madison
**A. pentaphyllum* (Aubl.) G. Don var. *pentaphyllum*
A. pirrense sp. nov. ined.
A. pittieri Engl.
A. pluricostatum Croat & Baker
A. podophyllum (Cham. et Schlechtd.) Kunth
**A. polyschistum* R. E. Schultes & Idrobo
A. prolatum Croat & Baker
A. pseudoranchoanum sp. nov. ined.
A. pseudoroseospadix sp. nov. ined.
A. purpureospathum Croat
A. ramonense Engler ex Krause
A. ranchoanum Engler
A. ravenii Croat & Baker
A. roseospadix sp. nov. ined.
A. rotundistigmum Croat
A. rzedowskii sp. nov. ined.
A. sagawaense sp. nov. ined.
A. salvadorense Croat
A. salviniae Helmsley
A. santafeense Croat
A. scandens (Aubl.) Engl.
A. scandens var. *pusillum* Sheffer
A. scherzerianum Schott
A. schlechtendalii Kunth
A. schlechtendalii Kunth ssp. *jimenizii* (Matuda) Croat
A. schottianum Croat & Baker
A. seibertii Croat & Baker
A. seleri Engler
**A. selloum* C. Koch
A. siltepecanum sp. nov. ined.
A. silvigaudens Stand. & Steyer
A. spathiphyllum N. E. Brown
A. spectabile Schott
A. standleyi Croat & Baker
A. subcordatum Schott
A. subovatum Matuda
A. subsignatum Schott
A. tenerum Engler
A. terreyae Standley & L. O. Williams
A. tilaranense Standley
A. titanium Standley & Steyermark
A. tonduzii Engler
A. trinerve Miq.
A. umbrosum Liebm.
A. upalaense Croat & Baker
A. utleyi Croat & Baker
A. valeense Croat
A. validifolium Krause
A. verapazense Engler
A. vera-santos sp. nov. ined.
A. warocqueanum J. Moore
A. watermaliense Hort ex Bailey
A. wendlingeri Barroso
A. williamsii Krause