The Sectional Groupings of *Anthurium* (Araceae)

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In order to conduct a successful hybridization with *Anthurium* it is necessary to have some understanding of the inter-relationships among different species of *Anthurium*. This paper will introduce the sectional classification of the genus to you and will detail some examples of inter-sectional crosses that have proven successful. Others, where no success has yet been achieved, will also be reported.

The first system of subgeneric classification was that of H. W. Schott in his "Prodromus Systematis Aroidearum" published in 1860, in which he classified the 183 known species of *Anthurium* into 28 sections.

In the most recent revision of the genus by Engler (1905) the species are divided into 18 sections. By the time this revision was published, considerably more species had been described, and Engler was dealing with 486 species. A discussion of the differences between Schott and Engler's systems and their relative merits will be the subject of a longer paper in which the changes proposed here will be substantiated.

In this paper a somewhat modified version of the system used by Engler will be presented. Examples are given of species representing each section. In addition a key is provided for identifying the sections and the diagnostic characteristics are provided for each group.

Preliminary Key to Natural Groups of *Anthurium* *

1. Leaf blades prominently 3-lobed or palmatified to palmatisect
    2. Leaf blades divided into 3 segments
        3. Leaf segments fully free to the base
            Section *Dactylophyllium* Engler
        3. Leaf segments united at the base
            Section *Semaeophyllium* Schott
    2. Leaf blades divided into 5 or more segments
        4. Leaf segments free to the base
            Section *Dactylophyllium* Engler
        4. Leaf segments united at the base (the central one may be free)
            Section *Schizoplacium* Schott
1. Leaf blades entire, may be lobed at the base but not prominently 3 or more lobed

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* Section *Episeiostenium* Schott is omitted as it is a seemingly unnatural group and no definitive characteristics have been determined for its separation.

5. Leaf blades conspicuously dark glandular punctate at least on the lower surface
    6. Blades cordate, hastate or otherwise, with usually definite posterior lobes; most basal veins usually merging with the margin of the blade below the middle of the blade (i.e., not mostly extending to above the middle of the blade as in section *Digitinervium*), the blade thus lacking a "melastome" look
        Section *Belolonchium* Schott (*A. verapazense* Alliance) (This group includes *A. chiapasense* Standl., *A. lucens* Standl. ex Yuncker, *A. riograndicolum* Matuda and *A. longipeltatum* Matuda. Species restricted to Mexico and Middle America)
    6. Blades either acute to obtuse or subcordate at base with usually only a single collective vein extending along the margin to the apex (Section *Porphyrochitonium*) or with several basal veins prominently arcuate-ascending to the apex with many, close, parallel primary lateral veins extending between all the basal veins giving the blade the appearance of a "melastome" leaf blade (Section *Digitinervium*)
7. Leaf blades with several pairs of the basal veins sharply arcuate-ascending, extending to or almost to the apex; primary lateral veins numerous, distinct, parallel and extending in more or less straight lines between all the basal veins giving the leaf blade a "melastome" look; pistils often prominently exserted and quadrangular; ovules and seeds 1 per locule
    Section *Digitinervium* Sodiro
7. Leaf blades with usually no more than one pair of basal veins (usually merely the collective vein) extending along the margin to the apex; primary lateral veins usually not numerous and closely parallel; pistils exserted or not, not usually quadrangular; ovules and seeds usually 2 or more per locule
    8. Plants usually scandent; stems slender, mostly less than 6 mm diam.; internodes somewhat elongate; berries acute at apex; throughout the range of the genus
        Section *Tetraspermium* Schott
    8. Plants usually more or less caespitose, at least lacking slender stems; stems usually more than 1 cm diam.; berries often more or less truncate and indented at the apex (not true of *A. hookeri* from N.E. South America and Lesser Antilles); principally from Costa Rica to Ecuador, especially western South America
        9. Plants large, with "bird's-nest" habit; leaf blades with scalariform venation (i.e., with the tertiary veins extending in almost straight lines between the primary lateral veins); Trinidad, Surinam and Lesser Antilles as far north as St. Kitts)
            A hookeri Kunth (Alliance unknown, not *Pachyneurium*)
        9. Plants usually with medium-sized leaves and usually not with distinct "bird's-nest" habit; leaf blades lacking scalariform venation, the tertiary veins irregularly anastomosing or at least not running in almost straight lines between the primary lateral veins
            Section *Porphyrochitonium* Schott
5. Leaf blades epunctate or at least not conspicuously dark glandular punctate

10. Vernation of leaf blade involute (i.e., with both margins rolled inward toward the midrib); plants frequently with "bird's-nest" habit; blades often thick, frequently more or less oblanceolate or obovate to elliptic
10. Vernation of leaf blades supervolute (i.e., with one margin rolled inward toward the midrib and the alternate margin rolled around the midrib and the rolled up opposite margin giving the cut-away view a cochleate appearance); plants usually lacking a "bird's-nest" habit; leaves various
    11. Stems scandent, wiry (usually less than 3 mm thick), with numerous short, adventitious roots scattered along their length; internodes elongate, flowering branches bearing 1-6 leaves; 1-ribbed cataphylls lacking; Mexico to Panama
        Section *Polyphyllium* Engler
    11. Stems short or scandent but not slender and wiry; internodes short or long but usually more than 8 mm long, the adventitious roots restricted to the nodes; flowering branches bearing a single leaf (branches are short and do not appear to be branches); 1-ribbed cataphylls present and usually conspicuous
        12. Roots white, bearing velamen; blades thin, narrowly oblanceolate, the primary lateral veins numerous and scarcely more prominent than the interprimary veins; stems rarely more than 1 cm diam. with persistent, reddish-brown, intact cataphylls; spadix with no more than 3 flowers visible per spiral from any angle; chromosome number 2N = 10 or 20
            Section *Leptanthurium* Schott
12. Roots usually greenish, lacking velamen; blades various, usually with the primary lateral veins conspicuously more prominent than the interprimary veins (except for section *Urospadix);* stems various; cataphylls usually dilacerating (except section *Calomystrium* and some in section *Belolonchium* with cordate blades); number of flowers per spiral various but usually more than 3
    13. Blades usually lanceolate or oblong-lanceolate or oblong, less frequently oblong-elliptic, acute to obtuse or rarely truncate at the base, the primary lateral veins frequently numerous and scarcely more prominent than the interprimary veins; stems usually short; internodes short; principally species from eastern South America, especially southeastern Brazil
        Section *Urospadix* Engler
    13. Blades various, oblong to cordate, usually with the primary lateral veins conspicuously more prominent than the interprimary veins
14. Stems conspicuously elongate, usually less than 20 mm diam.; plants erect to scandent; blades chiefly much longer than broad, mostly oblong or nearly so, generally acute, obtuse to rounded at the base, rarely cordate
    15. Pistils prominently exserted long before anthesis and many times longer than stamens when they appear
        Section *Oxycarpium* Schott
    15. Pistils not prominently exserted before anthesis, about as long or no more than a few times longer than the stamens
        Section *Xialophyllium* Schott
14. Stems short or somewhat elongate but not conspicuously elongate or viney, usually more than 2 cm diam. (slender but repent in section *Chamaerepium* Schott); blades various but only rarely +/— oblong, cor-

date or variously lobed at the base with prominent posterior lobes

16. Stems repent; internodes short with persistent, intact cataphylls; leaves narrowly ovate; spadix short, cylindrical
Section *Chamaerepium* Schott

16. Stems erect or repent only at the base; internodes short or somewhat elongate; cataphylls persistent or not, usually not remaining intact except for section *Calomystrium;* spadices various, usually long-tapered

17. Leaves velvety, usually metallic green in color, the epidermal cells papillate or otherwise elevated; petioles frequently conspicuously ribbed; B-chromosomes present
Section *Cardiolonchium* Schott

17 Leaves not velvety, usually not metallic green, the epidermal cells flat, not papillate or raised; petioles various; B-chromosomes lacking

18. Ovary locules 2-ovulate; leaves subrounded, deeply cordate; spadix long-stipitate; Cuba and Jamaica
Section *Gymnopodium* Engler

18. Ovary locules 1-ovulate; leaf shape various but usually not subrounded; spadices stipitate or not; throughout the range of the genus

19. Blades moderately thin, often conspicuously veiny or even bullate; primary lateral veins numerous and mostly closely parallel
Section *Polyneurium* Engler

19. Blades coriaceous or nearly so, smooth or veiny but usually not conspicuously bullate, the primary lateral veins neither numerous nor closely parallel

20. Stems usually bearing conspicuous, thick, intact, reddish-brown cataphylls; leaf blades usually thick, the minor veins usually not prominently raised; upper blade surface usually with raphide cells visible
Section *Calomystrium* Schott emend Engler

20. Stems usually with the cataphylls deciduous or weathering into a mass of fibers, sometimes persisting intact; leaf blades usually thick, the minor veins conspicuous or not; upper blade surface usually lacking visible raphide cells
Section *Belolonchium* Schott

SECTIONS OF ANTHURIUM

I. *TETRASPERMIUM* Schott (Fig. 1-3)

This small section consists of plants which are usually somewhat scandent with slender stems and generally long internodes (Fig. 2 & 3). The cataphylls are usually thin and decompose but persist at least at the terminal nodes (Fig. 1 & 3). Leaf blades are generally more or less elliptic and acute at the base usually with numerous primary lateral veins. One or both surfaces of the blade are conspicuously glandular-punctate (with dark dots). The spadix is usually small (generally short) and the berries have 4 or more seeds. The best example of the section is the very common *Anthurium scandens* (Aubl.) Engler which ranges throughout the American tropics. The section *Tetraspermium* is uniquely based on 2N = 24, except for *A. tonduzii* Engler with 2N = 30. Polyploid is a prominent feature of *A. scandens* of 2N = 24, 48, 84 and for *A. trinerve* Miq. of 2N = 24 found in Central America and 2N = 30 found in Surinam.

Fig. 1. *Anthurium* trinerve Miq. *Croat 36357*

Fig. 2 *Anthurium* sp. nov. *Croat 55751*

The section *Tetraspermium* appears to be a very natural section but is one of the smallest with probably fewer than eight species. Sheffer and Kamemoto (1976) attempted numerous interspecific hybridizations using *A. scandens* and *A. trinerve* as pollen parents, but none has resulted in hybrids. Due to the unique chromosome number, the inability of *A. scandens* and *A. trinerve* to form hybrids with other *Anthurium* species would be anticipated. *Anthurium scandens* and *A. trinerve* cannot easily be used as maternal parents, since they are apparently self-pollinating or apomictic (i.e., capable of producing seed without any form of fertilization or sexual union).

Fig. 3 *Anthurium* sp. *Selby Gardens 77-2100*

II. *GYMNOPODIUM* Engler (See Exotica 3, p. 132)

This section is based on a single rare species from western Cuba, *Anthurium gymnopus* Griseb., and is characterized by its somewhat scandent habit, elongate internodes, deciduous cataphylls and subcoriaceous, suborbicular leaf blades. It is also characterized by its long inflorescence with a long-stipitate spadix. The most important character is that the berries have up to 4 seeds. This species was the only cordate species known to Engler with more than 2 seeds per berry and perhaps too much emphasis was placed on this distinction. Possibly, once living material of this species is available for study it will prove to be more appropriately included in another section.

Anthurium gymnopus was counted by Gaiser (1927) with 2N = 30, however, *A. gymnopus* has apparently not been involved in hybridization studies.

III. *PORPHYROCHITONIUM* Schott (Fig. 4 & 5)

This section was represented in both Schott's and Engler's treatments by a single species, *A. scherzerianum* Schott which is well known in cultivation. That species is characterized by its large bright red spathe. Apparently it was on this basis alone that both Schott and Engler placed it in its own section. It otherwise shares identical vegetative characters with many species Engler placed (perhaps

erroneously) in his section *Urospadix*. In addition all of these species have generally slender stems with short internodes, generally elongate, non-cordate leaf blades which are glandular-punctate at least on one surface. They bear one or more prominent collective veins along the margin (Fig. 4). In addition the berries usually have 3 or more seeds and are frequently depressed at the apex (Fig. 5).

As defined here the section *Porphyrochitonium* is a large, presumably natural group (though relatively few had been described by the time of Engler's revision in 1905) and the group with probably the most species new to science. The section ranges principally from Costa Rica to Ecuador with the greatest concentration of species in northwestern Colombia. Relatively few species are widespread in cultivation, one of the best known being *A. bakeri* Hook. f. (atypical in having only 2 seeds per berry). Most are relatively small plants.

Chromosomally the section is based on 2N = 30. Aneuploids have been reported in *A. bakeri* Hook. f., *A. bicollectivum* Croat (ined.), *A. lancifolium* Schott and *A. scherzerianum* Schott.

At least two different intracrossable groups have been identified. One group includes *A. bakeri* Hook. f., *A. bicollectivum* Croat (ined.), *A. crassiradix* Croat

Fig. 4 *A. sagawae* Croat *Kamemoto 393*

Fig. 5 *A. pageanum* Croat *Page 82*

(ined.), *A. lancifolium* Schott, *A. pageanum* Croat (ined.), *A. paludosum* Engler, *A. sagawae* Croat (ined.), *A. scherzerianum* Schott, *A. terryae* Standl. & Wms., *A. utleyi* Croat & Baker and *A. wendlingerii* Barroso. Although not all species have been successfully crossed with every other species in the group, gene flow throughout this group has been demonstrated to be possible. The other group includes *A. amnicola* Dressler and *A. antioquiense* Engler which are not only intercrossable but crossable with *A. andraeanum* Linden of section *Calomystrium*. Throughout the section, aneuploidy can be expected to have a deleterious effect on fertility.

IV. *PACHYNEURIUM* Schott (Fig. 6-8)

This large section, comprised principally of the "birds-nest" *Anthuriums*, is seemingly a very natural one. Most have a decidedly rosulate habit with short, densely rooted stems and generally large blades which are more or less oblanceolate or obovate (broader above the middle) (Fig. 6). Unlike section *Porphyrochitonium* which may have blades of similar shape, section *Pachyneurium* generally has blades with most of the primary lateral veins extending free to the margin. The species in the section typically have short petioles. The most definitive characteristic of section *Pachyneurium* is the presence of involute leaf vernation (the manner in which the blade is rolled or folded before opening). In all other sections of *Anthurium* (indeed all other Araceae except the Asian genus *Lagenandra),* the leaf vernation type (or more appropriately ptyxis) is supervolute, i.e., one margin is rolled inward with the other rolled around it so that a section in end view would look coiled like that of a conch shell. In the section *Pachyneurium* both margins are rolled inward toward the midrib. In an end view one would see two tightly rolled portions of leaf. Even in face view the involute vernation is easily observed for the brief time that a leaf is emerging (Fig. 7). This character is important because a few members of the section have long

Fig. 6 *A. jenmanii* Engler
Botanical Garden, Port-au-Prince, Trinidad

petioles and other have cordate blades (Fig. 8). These species (especially the latter) do not look much like typical "bird's-nest" anthuriums.

Owing to their ability to accumulate debris and because of their numerous roots, many species of the section are adapted for growing in areas of low rainfall or where there is a pronounced dry season. Members of this section rarely occur in the wettest type of forest such as in the Choco Department of Colombia.

Chromosomally the section *Pachyneurium* is relatively uniform with most species counted having 2N = 30. A few species however have 2N = 60 and B chromosomes have been reported in two other species, *A. crenatum* and *A. solitarium*. *Anthurium jenmanii* is unique with 2N = 48; a chromosome number otherwise found only in section *Tetraspermium*.

Typical members of the section include *A. affine* Schott, *A. crassinervium* (Jacq.) Schott, *A. cubense* Engler, *A. salviniae* Hemsley and *A. schlechtendalii* Kunth. Atypical members include *A. ranchoanum* Engler, *A. schottianum* Croat & Baker and *A. standleyi* Croat & Baker.

In general where interpsecific pollinations have been attempted, the species of section *Pachyneurium* are intercrossable. Several intersectional crosses have been made. Successful intersectional crosses of *A. grandifolium* with *A. subsignatum* Schott (section *Semaeophyllium)* and the velvety leaved species (section *Cardiolonchium)* have been reported. Fruit set has been obtained in some intersectional crosses involving section *Belolonchium (A. umbrosum* Liebm. x *A. standleyi* Croat & Baker; *A. chiapasense* Standl. x *A. fosteri* sp. nov. and *A. lancetillense* Croat (ined.) x *A. luteynii* Croat. Additionally *A. hookeri* Kunth (unidentified section) is crossable with both *A. crenatum* and *A. luteynii.*

Fig. 7 *A. ranchoanum* Engler *Croat 48519A*

Fig. 8 *A. Standleyi;* Croat & Baker *Burle Marx 227*

Fig. 9 *A. flexile* Schott *Croat 42654*

Fig. 10 *A. clidemioides* Standley Photo Gil Daniels

Fig. 11 *A. gracile* (Rudge) Lindley Selby Gardens 79-187

Fig. 12 *A. pittieri* Engler *Croat 35981*

V. *POLYPHYLLIUM* Engler (Fig. 9 & 10)

This small but very natural section has only 2 species. It is characterized by having very slender, wiry stems with adventitious roots along the internodes (restricted to the nodes in other sections). In addition *Polyphyllium* is the only section of Anthurium which lacks cataphylls, having instead sheathing petioles for protection of new growth.

The section was revised by Croat & Baker (1978) and includes *A. flexile* Schott and *A. clidemioides* Standley. Only one taxon *(A. flexile* ssp. *muelleri* (Macbr.) Croat & Baker) has been counted with 2N = 60 chromosomes. The crossability of *A. flexile* to other *Anthurium* species is at present unknown.

VI. *LEPTANTHURIUM* Schott (Fig. 11)

This small section containing perhaps only *A. gracile* (Rudge) Lindl. is nevertheless unique and apparently quite natural. *Anthurium gracile* differs in being perhaps the only species with white roots (owing to a layer of velamen). Sheffer and Kamemoto (1976) were unable to cross *A. gracile* with any of the other 56 species used in their compatibility studies. The species was found to be unique chromosomally with a polyploid series of chromosomes (2N = 20, 40, 60). *Anthurium gracile* is considered to be one of the most primitive chromosomally of all the species of *Anthurium.* Numerous pollinations have been made using the pollen of *A. gracile* but without success. As in section *Tetraspermium,* the lack of hybrids is not surprising considering the unique chromosome number. *Anthurium gracile* cannot conveniently be used as a maternal parent, since it apparently is self-pollinating or apomictic.

VII. *OXYCARPIUM* Schott (Fig. 12)

This section, represented principally by *A. pittieri Engler* is perhaps not distinct. The section was recognized by both Schott and Engler. Schott included three species, one of which is now known to be a member of section *Pachyneurium.* The remaining species, *A. decurrens* Poeppig, was retained by Engler who added also *A. pittieri* Engler and *A. guayaquilense* Engler. The section was poorly defined, apparently being recognized by the mere presence of early-emergent pistils, a characteristic which seems to cut across sectional lines.

Chromosome counts in the section *(A. pittieri* Engler and *A. pittieri* var. *fogdenii* Croat ined.) are 2N = 30. Hybrids of *A. pittieri* have not been documented.

VIII. *XIALOPHYLLIUM* Schott (Fig. 13-17)

This section as delimited by Engler (1905) seems certain to be an unnatural one with at least two different types of plants involved. Both groups have stems erect or scandent with long internodes and have leaf blades which are typically longer than broad and only rarely conspicuously lobed at the base. Many of these species have thin, veiny, usually matte often somewhat bullate blades and commonly have greenish inflorescences. Most species with known fruits exhibit greenish or yellowish-green fruits. The plants in this group commonly occur at higher elevations though some members may occur near sea level in northwest South America. Examples of species in this group include *A. davidsoniae* Standley (Fig. 13), *A. microspadix* Schott (Fig. 14), *A. myosuroides* (H.B.K.) Endl. and *A. pallens* Schott (Fig. 15).

The remainder of the species placed in section *Xialophyllium* tend to have more coriaceous, usually semiglossy to glossy blades which are smooth or at

Fig. 13 *A. davidsoniae* Standley *Croat 48592*

least not markedly veiny or bullate. Examples include *A. bredemeyeri* Schott (Fig. 16 & 17) *A. caucanum* Engler (not as of Exotica III), *A. mindense* Sodiro, *A. popayanense* Engler,, *A. purdieanum* Schott and *A. stipitatum* Benth.

Both groups of section *Xialophyllium* are poorly known horticulturally and the group, albeit an unnatural one, is a relatively large one and deserving of considerably more study.

Most chromosome counts in the section are 2N = 30 though *A. microspadix* Schott has a count of 2N = 60 (Sheffer & Croat, 1983) and *A. pulchellum* Engler has a report of 2N = 63 (Mookerjea, 1955) which probably represents the presence of aneuploidy in the section.

Few attempted interspecific hybridizations have been reported, however fruit set has been obtained in a pollination of *A. testaceum* Croat & Baker x *A. radicans* C. Koch (Section *Chamaerepium).*

Fig. 14 *A. microspadix* Schott *Croat 40906A*

Fig. 15 *A. pallens* Schott *Croat 48556*

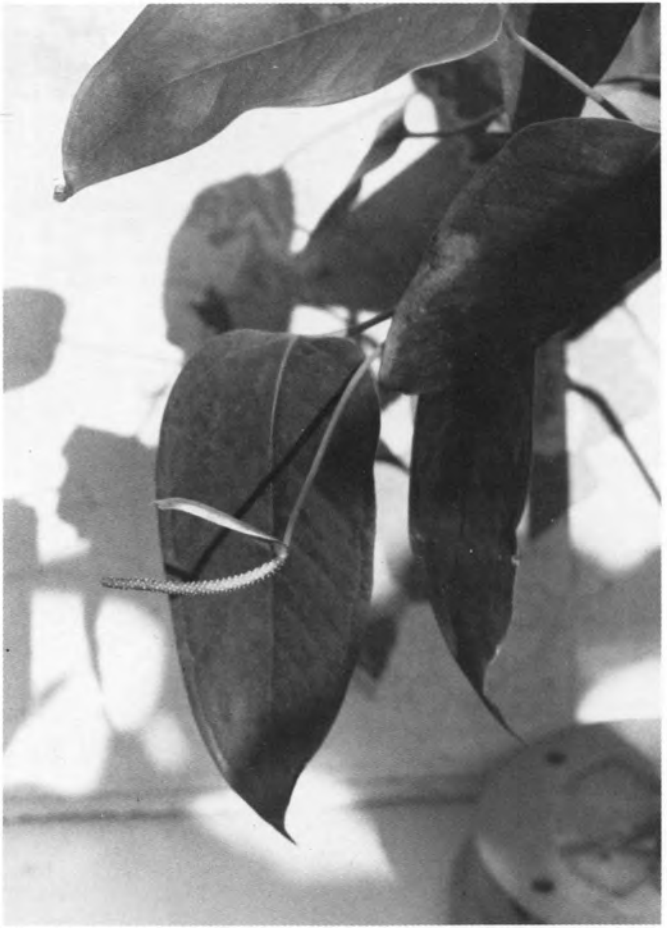


Fig. 16 *A. bredemeyeri* Schott *Liesner 11725*

Fig. 17 *A. bredemeyeri* Schott *Croat 38479*

IX. *POLYNEURIUM* Engler (Fig. 18)

This group, which seems somewhat unnatural, is characterized chiefly by having relatively thin blades which usually have numerous, closely parallel primary lateral veins. The internodes may be short or elongate. The most well known examples include *A. argyrostachyum* Sodiro, *A. corrugatum* Sodiro, *A. cuspidatum* and *A. panduriforme* Schott. Blade shape in the section is highly variable, ranging from cordate to more or less oblong which may be acute to subcordate at the base. A few of the species in this group are well known ornamentals but most members of this relatively large group are poorly known.

The section is poorly known chromosomally with *A. caperatum* Croat & Baker having 2N = 30 and three counts for *A. wallisii* Masters of 2N = 30, 2N = 30 + 2B and 2N = 60. While there is no way to confirm the identities of the plants used in these counts it is assumed that at least the Sheffer and Kamemoto counts (1976) represented a member of section *Cardiolonchium*. There is growing at Kew Gardens a plant bearing the name *A. wallisii* which looks much like *A. rubrinervium* (Link.) G. Don (a bona fide member of section *Cardiolonchium)* and this plant in no way matches the type specimen which is a typical member of section *Polyneurium*.

Information on crossability in section *Polyneurium* is lacking, however fruit set was obtained in an attempted cross between *A. caperatum* x *A. ravenii* Croat & Baker (sect. *Calomystrium).*

X. *UROSPADIX* Engler (Fig. 19-21)

This is the largest group defined by Engler and as defined it is certainly the most unnatural assemblage in the genus. All of the glandular-punctate species (mostly described after Schott's time) are correctly placed in section *Porphyrochitonium*. Once this natural assemblage is removed, most of the remainder consists of a seemingly natural group of species concentrated in eastern and southeastern Brazil. It is this group which contains such examples as *A. bellum* Schott, *A. binotii* Linden (Fig. 19), *A. comtum* Schott (Fig. 20), *A. crassipes* Engler, *A. galeotii* (Hort.) C. Koch, *A. lucidum* Kunth (Fig. 21), *A. miguelianum* C. Koch & Augustin, *A. olfersianum* Kunth and *A. vittariifolium* Engler, that should be properly considered section *Urospadix*. As defined, section *Urospadix* exhibits relatively uniform characteristics. Generally species in this section have short stems with short internodes and epunctate leaf blades which are typically much longer than broad (being typically lanceolate). Only rarely are they cordate or subcordate at the base. Perhaps the most important characteristic is the typically close, numerous primary lateral veins which are scarcely more prominent than the interprimary veins.

Because of its concentration in eastern Brazil on the ancient, eroded Guyana shield and Atlantic Coastal slopes ranging from Baia to Rio Grande do Sul, the section *Urospadix* is possibly one of the oldest sections in the genus.

The section is apparently based on 2N = 30, however a number of B chromosomes or fragments have been reported. The chromosome number for *A. harrisii* (Grah.) Endl. is especially confusing with both fragments and B chromosomes being reported. *Anthurium bellum* Schott has counts of 2N = 28 and 56 (Bhattacharya, 1977 and Mookerjea, 1955 respectively). *Anthurium lucidium* Kunth with a chromosome number of ca. 124 is the highest known chromosome number in *Anthurium*.

Little information about crossability in this section is currently available.

Fig. 18 *A. argyrostachyum* Sodiro *Croat 55741*

Fig. 19 *A. binotii* Linden Kew Gardens 000-73-13100

Fig. 20 *A. comtum* Schott Kew Gardens 687-61-68708

Fig. 21 *A. lucidum* Kunth Kew Gardens 000-73-13213

Fig. 22 *Anthurium* sp. Colombia: Risaralda: Mistrato
Cultivated by Jaime Posada, Medellin

Fig. 23 *A. ovatifolium* Engler
Croat 50577

XI. *EPISEIOSTENUM* Schott

Of all the sections presented by Engler this is the least likely to be a valid one. Already half of the species assigned to this small group by Engler have unequivocally been placed in other sections including the section *Pachyneurium*. It will not be discussed further in this paper.

XII. *DIGITINERVIUM* Sodiro (Fig. 22 & 23)

This relatively small, seemingly very natural group, is characterized by thick blades with glandular punctations, steeply ascending basal veins (usually two or more pairs extending sharply toward the apex and often reaching well above the middle of the blade) (Fig. 22). It also has transversely oriented and closely parallel tertiary veins extending between the basal veins.

The section *Digitinervium* is restricted to the Andes of northwestern South America and the mountains of Costa Rica and Panama. The most well known example of this section is probably *A. ovatifolium* Engler (Fig. 23) *(A. "caucanum maximum"* of Exotica III, P. 130). *Anthurium lentii* Croat & Baker, the only Central American representative of this section, is another example. Other examples include *A. crassifolium* N.E. Brown, *A. lingua* Sodiro and *A. weberbaueri* Engler.

Only *A. lentii* has been counted with apparently 2N = 30, since Sheffer & Kamemoto (1976) found a aneuploid series of 2N = 28, 29, 30 and 31. Little about crossability is known about this section, however fruit set has been obtained in a cross of *A. nymphiifolium* C. Koch & Bouche (section *Calomystrium)* x *A. lentii*.

XIII. *CARDIOLONCHIUM* Schott (Fig. 24-28)

This apparently natural group is relatively well known horticulturally. It is a medium-sized section characterized by plants with short stems and short internodes and with peduncles and petioles which are often striate or ribbed (Fig. 24 & 25). The leaf blades are generally conspicuously velvety on the upper surface while the tertiary veins on the lower surface are inconspicuous (Fig. 26 & 27). The condition on the lower surface results from the epidermal cells which are raised, sometimes even more or less conical. The velvety species which have been investigated are also distinct chromosomally, all having additional B-chromosomes (small chromosomal fragments) in addition to their regular count of 2N = 30 (Sheffer & Kamemoto, 1976).

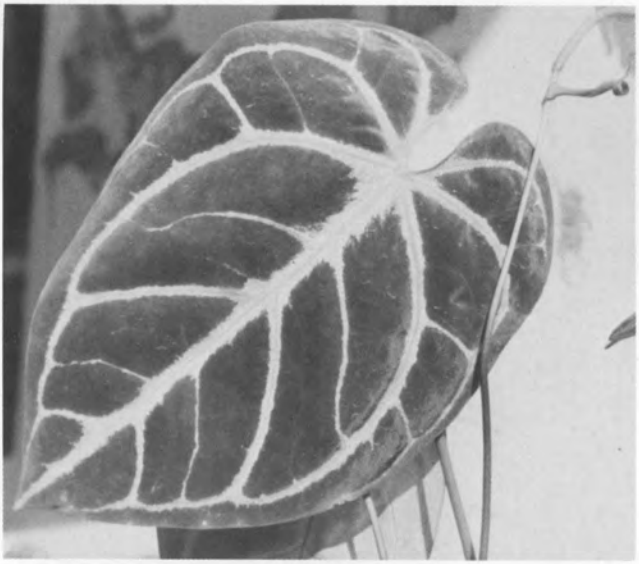
Some of the well known examples in this section are *A. clarinervium* Matuda, *A. crystallinum* Linden & Andre, *A. leuconeurum* Lem., *A. magnificum* Linden, *A. regale* Linden and *A. warocqueanum* J. Moore.

Anthurium cerrocampanense Croat (ined.) and *A. alienatum* Schott (Fig. 28) are aberrant members of section *Cardiolonchium* lacking velvety leaf blades but having winged petioles and B-chromosomes.

In general where intrasectional interspecific pollinations have been attempted, the species of this section are intercrossable, and numerous reports have been made of intersectional crosses involving section *Cardiolonchium* with sections *Belolonchium, Calomystrium* and *Semaeophyllium*. In interspecific pollinations between sections *Cardiolonchium* and *Belolonchium,* fruits of viable seed have been obtained for example between *A. yetlense* Matuda *(Belolonchium)* and *A. clarinervium* or *A. forgetii*. Good fruit set and germination have also been reported between *A. hoffmannii (Calomystrium)* and *A. dressleri*. Hybrids between *A. cerrocampanense. A. crystallinum* and *A. regale* Linden and *A. subsignatum* Schott *(Semaeophyllium)* have been made.

Fig. 24 *A. dressleri* Croat
Croat 370008

Fig. 25 *A. alienatum* Schott
Cultivated by Charlie McDaniel



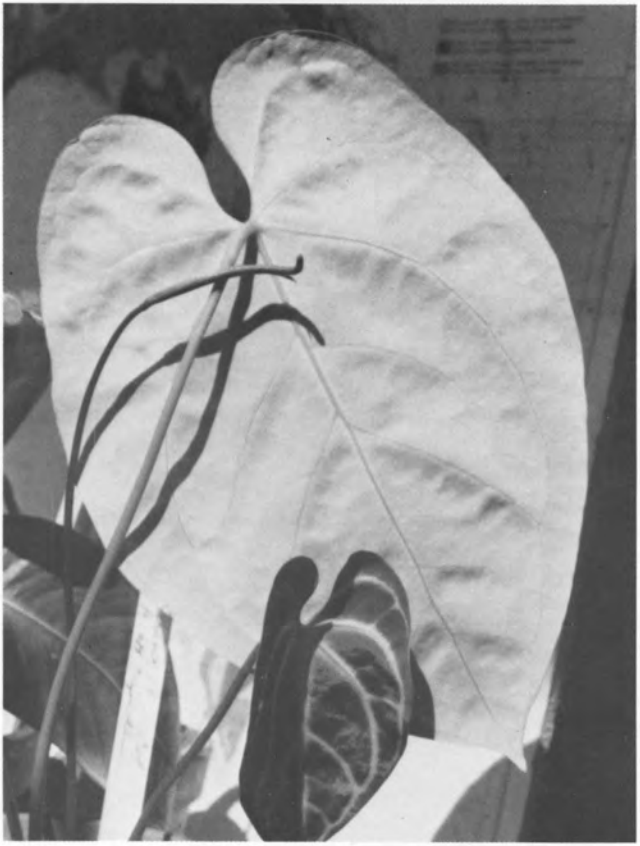


Fig. 26, 27 *A.* cf. *crystallinum*
Linden & Andre *Cirino 18*

Fig. 28 *A. alienatum* Schott Cultivated by Charlie McDaniel

Fig. 29 *A. radicans* C. Koch Selby Garden 53-75-3

XIV. *CHAMAEREPIUM* Schott (Fig. 29)

This section consists of only *A. radicans* C. Koch, a species from southeastern Brazil. It is presumably most closely related to section *Urospadix*. Although no single character distinguishes it from any other section, the combination of characters it exhibits, especially its repent habit and short, more or less ellipsoid spadix, make it unique.

Chromosome counts on *A. radicans* indicate that there may be more than one ploidy level involved since Pfitzer (1975) reports a haploid count of N = 15, whereas Gaiser (1927) reports a diploid count of 2N = 50. Little is known about crossability in this species.

XV. *CALOMYSTRIUM* Schott emend Engler (Fig. 30-34)

The section *Calomystrium* is one of the most natural and recognizable groupings within *Anthurium:* however, some of the differences are more easily observed than put into words. Members of the section have generally distinct leaf types, variously cordate (Fig. 30) and generally thick, often variously speckled with light spots on the lower surface but only rarely with dark glandular punctations. More frequently than in any other section, the leaf blades have distinctly visible, short, linear clusters of raphide cells which are paler than the surface but rarely more than a few millimeters long. Probably the most easily observed characteristic of the section is the presence of persistent cataphylls (Fig. 31) which are usually dry reddish-brown to brown and remain intact. In other sections cataplylls are usually either deciduous or weather into fibers.

Fig. 30 *A. colonense* Croat *Croat 49238*

Fig. 31 *A. fusiforme* Croat *Croat 33332*

Fig. 32 *A. kamemotoanum* Croat Folsom 3831A

Inflorescences of section *Calomystrium* are also distinctive but they are more difficult to describe (Fig. 32-34). In general spadices appear somewhat glossy, the tepals and the spathes are thick and often variously pastel colored, ranging from white to pale green and from pale pink to deep red. Perhaps more than any other group, a higher percentage of the species produce sweet, pleasant aromas.

The group has some very well known examples not the least of which is *A. andraeanum* Linden, the most well known species in the genus. Others include *A. formosum* Schott, *A. hoffmannii* Schott (not as of Exotica III), *A. nymphiifolium* C. Koch & Bouche and *A. obtusilobum* Schott.

Section *Calomystrium* is a very large one with what would appear to be a large number of new species concentrated especially in Panama, Colombia and Ecuador.

Chromosomally, the section is simply 2N = 30. No polyploids have been identified, and B chromosomes have only been found in *A. andraeanum* Linden

Intrasectional hybridizations have been attempted with a number of these species, and they tend to be intercrossable. Specifically, hybrids have been obtained from crosses among *A, andraeanum* Linden, *A. folsomianum* Croat (ined.), *A. formosum* Schott, *A. kamemotoanum* Croat (ined.), *A. nymphiifolium* C. Koch & Bouche, *A. ravenii* Croat & Baker, *A. roseospadix* Croat (ined.) and *A. veitchii* Masters.

More intersectional pollinations have been successful with section *Cardiolonchium* than any other section. Both *A. andraeanum* Linden and *A. armeniense* Croat (ined.) (sect. *Calomystrium)* have been successfully hybridized with *A. antioquiense* Engler and *A. amnicola* Dressler of section *Porphyrochitonium*. Fruit set has been obtained between section *Calomystrium* and sections *Belolonchium, Cardiolonchium, Digitinervium, Polyneurium* and *Semaeophyllium*.

Fig. 33 *A. nymphiifolium* C. Koch & Bouche
Croat 38341

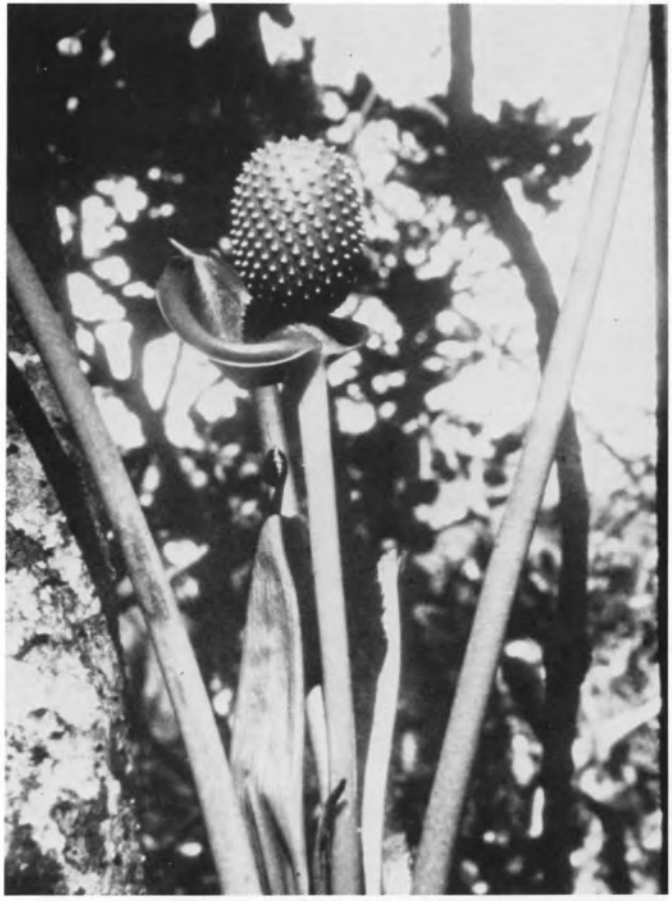


Fig. 34 *A. globosum* Croat
Folsom 7215

Fig. 35 *A. gualeanum* Engler *Croat 50601*

Fig. 36 *A. variegatum* Sodiro Selby Gardens 152-76-18

XVI. *BELOLONCHIUM* Schott emend Engler (Fig. 35-39)

This section is the most poorly known of all sections included in Engler's revision of *Anthurium* and would appear to be a "dumping ground" for all cordate species not clearly assigned to other groups with cordate leaves such as sections *Cardiolonchium* and *Calomystrium*.

There are at least two groups of seemingly related cordate species currently placed here and the section may ultimately have to be divided into several distinct sections. In one group the leaves are relatively coriaceous and dry brown. Examples of this group are *A. bogotense* Schott, *A. brownii* Masters, *A. concinnatum* Schott, *A. gualeanum* Engler (Fig. 35), *A. incurvatum* Engler, *A. rigidifolium* Engler and *A. variegatum* Sodiro (Fig. 36). Quite a number of the species in this group occur at relatively high elevations and bear more or less hooded spathes (Fig. 37-39). Still another group has thinner leaf blades which dry green. These include *A. dolichostachyum* Sodiro, *A. lancetillense* Croat, *A. ovandense* Matuda and *a. umbrosum* Liebm.

Most species in the section *Belolonchium* have 2N = 30 chromosomes though one species (*A. patulum* Sodiro) was reported as having 28 + 1f chromosome (Sharma & Bhattacharya, 1976) in the diploid condition. Still another species believed to be in this section (*A. supianum* Engler) is reported to have ca 90 chromosomes (Sheffer & Kamemoto, 1976).

Two species reported for this section by Sheffer & Croat (1983) were erroneously placed in this section. *Anthurium cerrocampanense* Croat with 2N = 30 + 2B chromosomes is best placed in section *Cardiolonchium* while *A. signatum* C. Koch & Mathieu with 2N = 34 is best placed in section *Semaeophyllium*.

Little documented data is available about hybridization within the section. Based on fruit set only, intrasectional pollinations and intersectional pollinations between *Belolonchium* and *Cardiolonchium* or *Calomystrium* are in general successful.

Fig. 37 *A. antonioanum* Croat *Croat 49840*

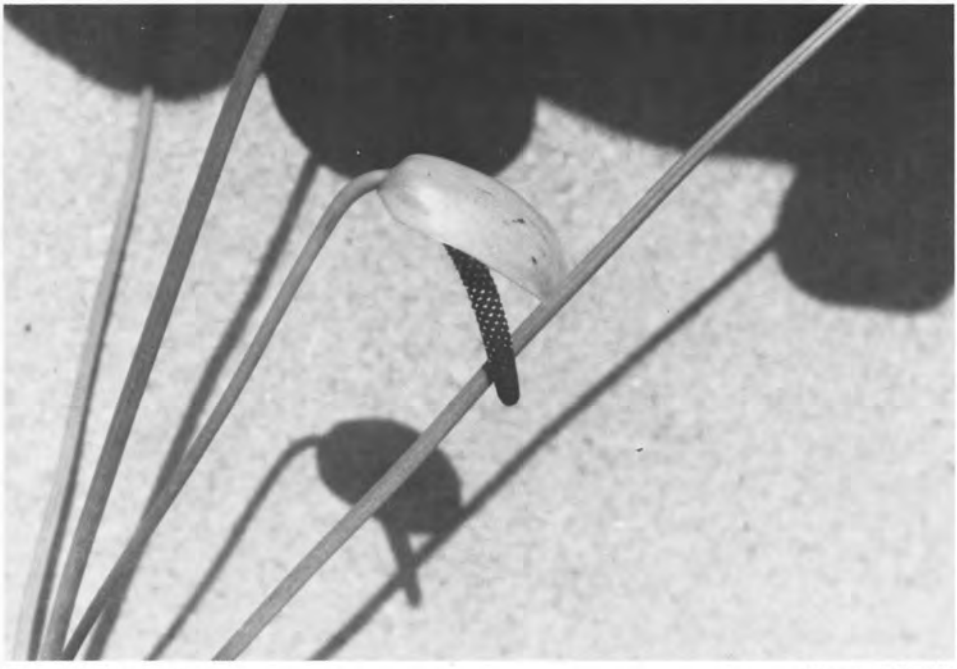


Fig. 38 *Anthurium* sp. *Croat 50569*

Fig. 39 *A. variegatum* Sodiro Selby Gardens 152-76-18

Fig. 40 *A. falcatum* Sodiro Cultivated by Roberto Burle Marx *Croat 55735*

XVII. *SEMAEOPHYLLIUM* Schott (Fig. 40-42)

This section as treated by Schott contained only the deeply 3-lobed species and would have appeared to be a relatively natural group. Engler's realignment, based on the shape of the inflorescence, is, in my opinion, an unnatural one. The section has species with generally short stems with short internodes. The blades are deeply 3-lobed but entire, not divided into leaflets. Examples include *A. falcatum* Sodiro (Fig. 40), *A. furcatum* Sodiro, *A. garagaranum* Standley, *A. grexavium* Madison, *A. insigne* Masters, *A. rimbachii* Sodiro, *A. signatum* C. Koch & Bouche, *A. truncicolum* Engler (Fig. 41), *A. tilaranense* Standley, *A. tridigitatum* Engler and *A. subsignatum* Schott (Fig. 42).

Chromosome counts for the section are few with both 2N = 30 and 60 being reported. Aneuploids have been counted in *A. signatum* C. Koch & Matthieu with 2N = 34 and 30 + 1f.

Little is known about crossability, however *A. subsignatum* Schott has been hybridized with *A. cerrocampanense* Croat (ined.), *A. crystallinum* Linden & Andre and *A. regale* Linden of section *Cardiolonchium.*

Fig. 41 *A. truncicolum* Engler
Cultivated by Roberto Burle Marx

Fig. 42 *A. subsignatum* Schott
Kew Gardens 458-53-45803

Fig. 43 *A. longissimum Pittier* *Croat 54492*

XVIII. *SCHIZOPLACIUM* Schott (Fig. 43-45)

Schott included all palmately lobed (but not dissected to the base) species in his section *Schizoplacium* and all species which had leaves palmately lobed to the base into his section *Dactylophyllium*. Engler placed all species with palmately divided leaves into section *Schizoplacium* but created two divisions within the section to accommodate these. Each of these divisions is called a "series." Schott's treatment is considered more natural and will be used here.

Section *Schizoplacium*, as treated by Schott is probably a very natural one containing only three species (considering current synonomy). Even considering plants described since Schott's time there are only seven species in the section. These include *A. angustisectum* Engler, *A. expansum* Gleason, *A. longissimum* Pittier (Fig. 43), *A. palmatum* (L.) G. Don, *A. pedatum* Kunth, *A. pedatoradiatum* Schott and *A. podophyllum* (Cham. & Schlecht.) Kunth (Fig. 44 & 45).

Only three chromosome counts have been reported for this unusual section and the counts of 2N = 30 , 2N = 39 and N = 15 indicate that more work needs to be done with this group to understand its cytological relationship with other sections. Both *A. pedatoradiatum* Schott and *A. podophyllum* Kunth were placed in section *Dactylophyllium* (following Engler's system of classification) by Sheffer & Croat (1983) but as previously stated they are best placed in section *Schizoplacium*. No crossability data is available.

Fig. 44 *A. podophyllum* (Cham. & Schlect.) Kunth
Cultivated by Bill Virden

Fig. 45 *A. podophyllum* (Cham. & Schlect.) Kunth
Croat 48376

Fig. 46 *A. arisaemoides* Madison
Selby Gardens 152-76-22

XIX. *DACTYLOPHYLLIUM* Schott (Fig. 46-48)

The section *Dactylophyllium* consists of all species which are palmately lobed to the base (i.e., with free segments). The number of segments may be 3, 5 7, 9 or more but always the number is an odd one. The age of the blade is often reflected by the number of leaflets present. Some species never have more than three segments. These include *A. thrinax* Madison, *A. arisaemoides* Madison (Fig. 46), *A. cutucuense* Madison, *S. trisectum* Sodiro and *A. triphyllium* Brongn. ex Schott (Fig. 47).

Examples of species with five or more leaf segments include *A. brevipedunculatum* Madison, *A. buchtienii* Krause, *A. clavigerum* Poepp., *a. croatii* Madison (Fig. 48, *A. eminens* Schott, *A. kunthii* Poepp., *A. pentaphyllum* (Aubl.) G. Don, *A. polydactylum* Madison and *A. polyschistum* Schultes & Idrobo.

Chromosome counts in this section have been primarily 2N = 30 though a number of counts of 2N = 60 indicate a certain amount of polyploidy as well. Aberrant counts of 2N–60 + 4 fragments and 2N–60 + 1B chromosome indicate a need for more cytological work with the group. Certainly the group appears superficially to have no relationship to section *Cardiolonchium* (another group where B chromosomes have been reported). Very little is known about crossability with the section, however attempted crosses have thus far been unsuccessful.

Fig. 47 *A. triphyllum* Brongn. ex Schott *Croat 50781*

Fig. 48 *A. croatii* Madison *Croat 51283A*

Literature Cited

Bhattacharya, G. N. 1977. A cytological study of the tribe Anthurieae (Araceae), Bull. Bot. Soc. Bengal, 51-56.

Croat, T. B. and Baker, R. 1978. Studies in Araceae II: *Anthurium* Section *Polyphillium*, Selbyana 2:230-238.

Engler, A. 1905. Araceae-Pothoideae, Das. Pfl. IV. 23B, Heft 21, pp. 1-330.

Gaiser, L. O. 1927. Chromosome Numbers and Species Characters in *Anthurium*, Proc. Trans.R. Soc. Can. 21:137.

Mookerjea, A. 1955. Cytology of different species of Aroids with a view to trace the basis of their evolution, Caryologia 7:221-291.

Pfitzer, P. 1957. Chromosomenzahlen von Araceen, Chromosoma 8:436-446.

Schott, H. W. 1860. Prodromus Systematis Aroidearum. Vienna. 1860.

Sharma, A. K. and Bhattacharya, G. N. 1966. A cytotaxonomic study on some taxa of Araceae, Genet. Iber. 1-262.

Sheffer, R. D. 1974. Chromosome number and compatibility in the genus *Anthurium* (Araceae) with a taxonomic revision of Section *Tetraspermium*, Doctoral dissertation, University of Hawaii.

— and Kamemoto, H. 1976. Cross compatability in the Genus *Anthurium*, J. Amer. Soc. Hort. Sci. 101(6): 709-713.

— , Theobold, W. L. and Kamemoto, H. 1980. Taxonomy of *Anthurium scandens* (Araceae), Aroideana 3:86-93.

— and Croat, T. B. 1983. Chromosome numbers in the Genus *Anthurium* (Araceae) II.

We regret to announce the loss of member

BILL VIRDEN

An aroid enthusiast, Bill owned and operated Hi Wan Nursery in Poway, California. He was instrumental in attempts to organize the Southern California Chapter of the I.A.S. His interests in the past few years have been focused on fund-raising activities for the Southern California Humane Society.