



PANORAMA DE LA INVESTIGACIÓN SOBRE LOS *ISOETES* DE COLOMBIA (ISOETACEAE - LYCOPODIOPSIDA)

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Temáticas

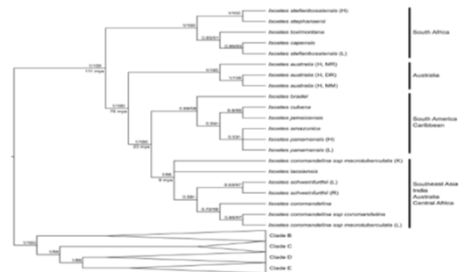
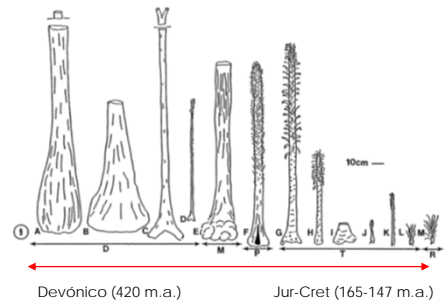
- Marco general
- Desarrollo histórico
- Estado actual
- Perspectivas futuras

Marco general

Orígenes

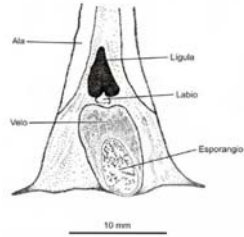


Christoffel, A. 2015 (www.tentree.com)

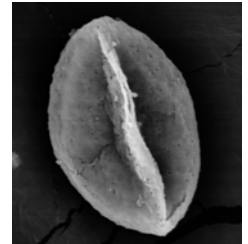
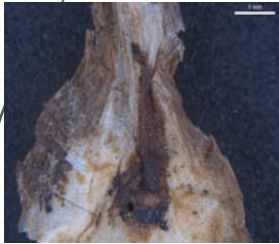


Pigg 1992 / Larsen & Rydin 2016

Características

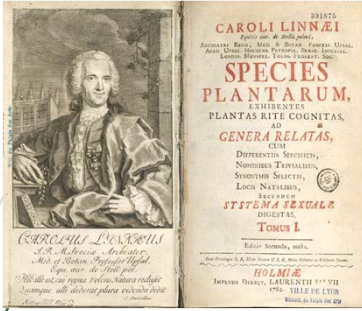


Macluf 2012



Desarrollo
histórico

Inicios



ISOETES.
ISOETES, *fr. faw.* 417, t. 419. *Nov. gen.* 1109.
Martica foliis imbricatis tenuicylindricis articulatis. Fl.
fact. 595.
Calamaria folio longiore & graciliore. Diff. mae. 541.
f. 80. f. 2.
Subolaria lacustris f. Calamitram herba aquatica alpina.
Rep. angl. p. 210. f. 210.
Habitat in Europa frigida juxta lacuum.

Linnaeus 1753 (*Species Plantarum* 2: 1100)



Hooker, William. 1861 (The British ferns) (www.biodiversitylibrary.org)

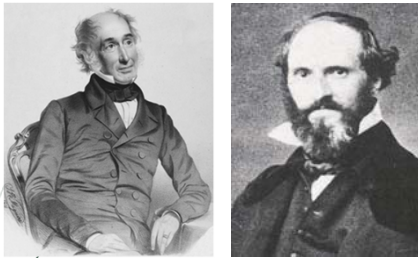
Calamaria Boehmer, Georg Rudolf. *Def. Gen. Pl.*, ed. 3: 500. 1760

Cephaloceraton Gennari, Patrizio. *Comment. Soc. Crittogam. Ital.* 1: 111. 1862

Isoetella Gennari, Patrizio. *Comment. Soc. Crittogam. Ital.* 1: 114. 1862

Stylites Amstutz, Erika. *Ann. Missouri Bot. Gard.* 44(1): 121. 1957.

Inicios



Isoetes andina Spruce.
Tarapaco de Naba. Andres Buntensen.
Oct. 1858.

acuminate-leaved var. from Peru. *Isoetes Andina*, Spruce's MS., from the Quitinian Andes (without number) is probably distinct in the broad, firm, rigid leaves, coriaceous and glossy when dry, scarcely tapering at all, but suddenly acute, and with a very broad rhizome. Another remarkable and I presume

Hooker, William. 1861 (The British ferns) / Richard Spruce
 UK: *I. lacustris* L. / *I. duriei* Bory
 EC: *I. andina* Spruce ex Hook. (t. 55)

Zwei deutsche Isoetes-Arten nebst Winken zur Aufschung derselben.

Von
Prof. Dr. A. Braun.

8. *I. Karstenii.*

In einem ungefähr 8000' hoch gelegenen See auf dem Paramo im Gebirge von Merida (Venezuela) ganz unter Wasser im

9. *I. triquetra.*

Eine dritte von Lechler in Peru entdeckte Art, von der ich der Güte des Hrn. Zeller ein Exemplar verdanke, das zwar un-

bei *Isoetes Lechleri* und *Isoetes lacustris*. Spruce's *I. Andina* von den Anden Quito's, welche zu sehen ich noch nicht Gelegenheit hatte, mag nach dem, was Hooker (British ferns l. c.) darüber angibt, eine ähnliche oder vielleicht dieselbe Art sein.

Isoetes triquetra n. sp.
In parvis humidis
Sachapata (am Lago de
Abasco) de Los Andes de los Andes
(Lechler) c. Zeller
n. 3337.



Braun, A.C.H. 1862. (Zwei deutsche Isoetes-Arten...) / G. Zeller
 PE: *I. triquetra* A. Braun (= *I. andina*) / *I. karstenii* A. Braun

Inicios

Comisión Corográfica (1851-1857)
República de la Nueva Granada
J.E. Planchon – Jean J. Linden

Herbario NAM - Université de Namur
Louis-Joseph Schlim 92: *Isoetes* sp.
¡Primer ejemplar Colombiano!

Prodromus Florae Novo-Granatensis
J.J. Triana & J.E. Planchon (1862-1867)
A/Braun: *I. karstenii*



CONGRES INTERNATIONAL D'HORTICULTURE A BRUXELLES,
24, 25, 26 Avril 1864

BUREAU CENTRAL



- | | | |
|-------------------|------------------|-----------------|
| 1. Simeon Karstén | 7. Leroy | 13. Dr. Cannart |
| 2. Brevinon | 8. Rostk | 14. Frit |
| 3. Foud | 9. Fischer | 15. Bismberg |
| 4. Flatsch | 10. Wismad | 16. Kergellan |
| 5. Kirchbach | 11. Lindau | 17. Du Motier |
| 6. Von Seebald | 12. Van den Urck | |

Congreso Internacional de Horticultura de Bruselas (1864)

Crítico: 1922 / 1986

Annals
of the
Missouri Botanical Garden

Vol. 9 APRIL, 1922 No. 2

MONOGRAPH OF THE ISOETACEAE
NORMA E. FRIEDRICH
Associate Professor of Botany, University of North Dakota

KEY TO SECTIONS

- A. Surface of megaspores chiefly tuberculate or spin.
 - a. Megaspores tuberculate 1. Tuberculatae
 - b. Megaspores spin 2. Echinatae
- B. Surface of megaspores irregularly crested or reticulate.
 - a. Megaspores irregularly crested 3. Cristatae
 - b. Megaspores reticulate, at least on basal face 4. Reticulatae

Fuchs, H.P. 1981: Sectio Laeves
Hickey, R.J. 1986: 5 a 12 tipos de ornamentación

American Fern Journal 7(1):1-10 (1986)

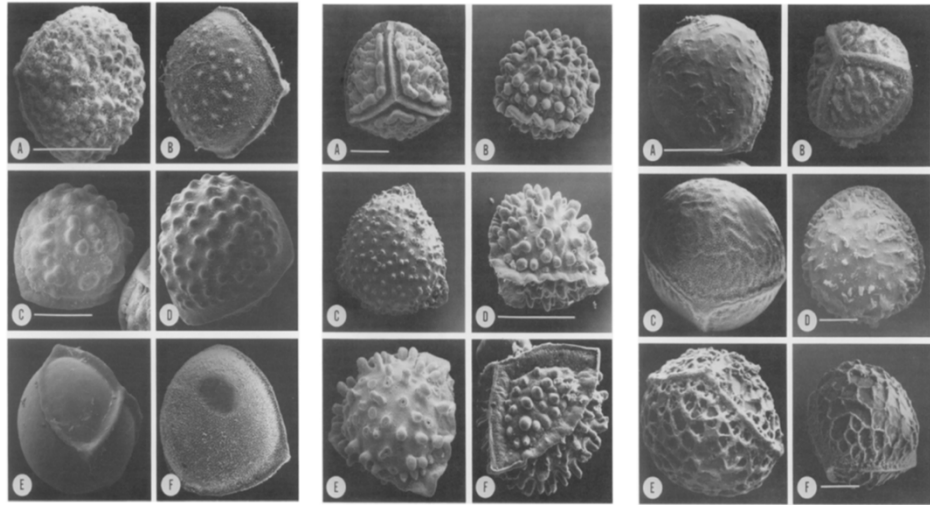
**Isoëtes Megaspore Surface Morphology:
Nomenclature, Variation, and
Systematic Importance**

R. JAMES HICKEY
Botany Department, Miami University, Oxford, OH 45056

R. J. HICKEY: ISOËTES MEGASPORES

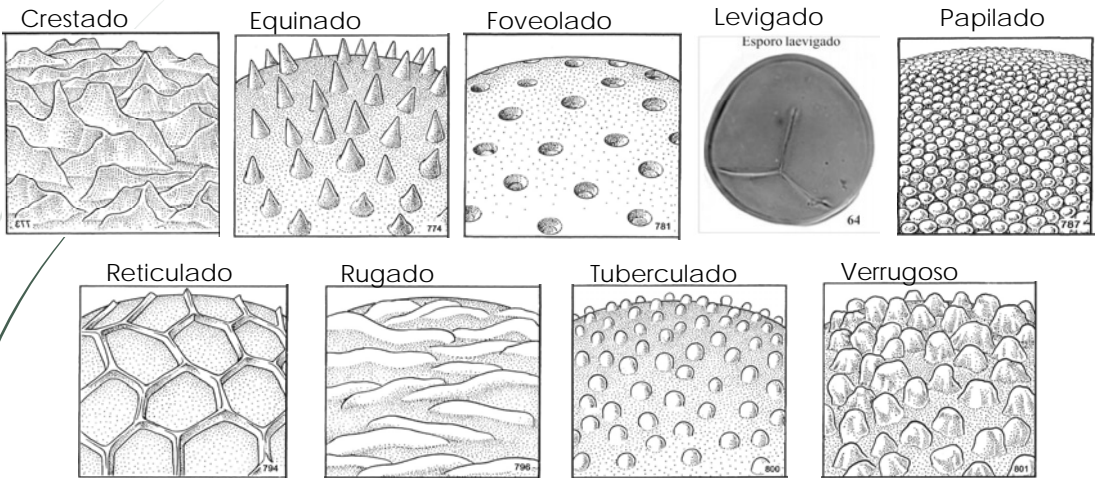
TABLE 2. Types of Megaspore Surface Morphology in Isoëtes: Descriptions, Previous Classification, and Specific Examples.

- Tuberculate:** Spores with moderately broad, radially symmetrical projections, as high as wide, with straight, inclined sides and an acute apex. Examples—*I. bradei*, *I. laetzelburgii*, *I. melanopoda* (Figs. 1a, b, 4a).
- Pustulate:** Spores with broad, radially symmetrical projections, as wide as high or wider, with convex sides and an obtuse, rounded apex. Previously classified as tuberculate. Examples—*I. cubana*, *I. triangula* (Figs. 1c, d).
- Levigate:** Spores without apparent ornamentation, smooth. Previously classified as tuberculate or levigate. Examples—*I. lechleri*, *I. mexicana*, *I. gunnii* (Fig. 1e, f).
- Succute:** Spores with radially to bilaterally symmetrical, bulbous projections which appear deflated and collapsed. Previously classified as tuberculate. Example—*I. gigantea* (Fig. 2a).
- Clevate:** Spores with radially symmetrical projections which are approximately as high as wide, with an obtuse, expanded apex. Previously classified as tuberculate. Examples—*I. ovata*, a sub-clavate condition is seen in *I. clavata* (Fig. 2b).
- Verrucate:** Spores with radially symmetrical projections, as high as or slightly higher than wide, with straight parallel sides and an obtuse apex. Previously classified as tuberculate. Example—*I. gardneriana* (Fig. 2c).
- Boculate:** Spores with narrow, radially symmetrical projections 1½ or more times as high as wide, with straight, parallel sides and an obtuse, rounded apex. Previously classified as tuberculate. Examples—*I. panamensis*, *I. boculate* (Figs. 2d-f).
- Echinote:** Spores with narrow, radially symmetrical (or nearly so) projections, at least 1½ times as high as wide, with straight, inclined sides and an attenuate, pointed apex. Previously classified as echinate. Examples—*I. echinopora*, some specimens of *I. storkii* and *I. undina* (Figs. 3d, e).
- Rugulate:** Spores with broad, distinct muri, as wide as or wider than tall, with a broadly rounded crest; the muri not forming distinct areoles. Previously classified as cristate. Examples—*I. sowerbii*, *I. herzogii* (Figs. 3a-c, 3b, c).
- Cristate:** Spores with thin, distinct muri, taller than broad, usually with an apically serrate crest; not forming distinct areoles. Previously classified as cristate. Examples—*I. storkii*, *I. ulei*, *I. undina* (Figs. 3d, 5f).
- Reticulate:** Spores with thin, distinct muri, taller than broad, usually with an apically serrate crest; forming distinct areoles. Previously classified as reticulate. Examples—*I. engelmannii*, *I. martii*, *I. novo-gruzdensis* (Figs. 3a, f).
- Retate:** Spores with broad, distinct muri, as wide as or wider than tall, with a broadly rounded crest; forming distinct areoles. Previously classified as reticulate. Examples—*I. durieui*, *I. stevensii* (See Fig. Va in Berthet & Lecocq, 1977, and Fig. 7 in Croft, 1986).



Hickey, R. James 1986: *Isoetes* Megaspore Surface Morphology: Nomenclature, Variation, and Systematic Importance (*Am.Fern J.* 76)

Desarrollo



Lellinger, David B. (2002): A modern multilingual glossary for taxonomic pteridology (*Pteridologia* 3 - AFS)

Desarrollo

Phytotaxa 277 (2): 183–185
<http://www.mapress.com/pt/>
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Article

PHYTOIAXA
 2016 176, 183–185

<http://dx.doi.org/10.11646/phytotaxa.277.2.1>

The genus *Isoetes* (Isoetaceae): a provisional checklist of the accepted and unresolved taxa

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⁴ Department of Botany, National Museum of Natural History, Smithsonian Institution, Washington, DC 20560-106, USA
 * Author for correspondence: angelo.troia@unipa.it

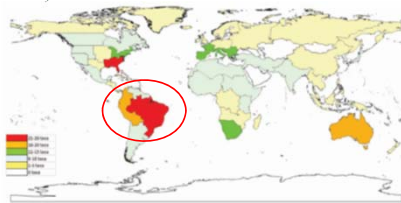


FIGURE 1. Distribution of *Isoetes* species richness using the Level 2 regions of Brinkmann (2001).

Int. J. Plant Sci. 177(2):157–174, 2016.
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 1058-5893/2016/17702-0005\$15.00 DOI: 10.1086/684179

DISENTANGLING THE PHYLOGENY OF *ISOETES* (ISOETALES), USING NUCLEAR AND PLASTID DATA

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Table 3
 Age-Calibrated Nodes

Node	Fossil ^a	Fossil age (Ma)	Uniform prior distribution (Ma)
Embryophyta (most height)	F1	467–483	467–483
		^a <i>Crypsopsis</i>	
Tracheophyta	F2	408–413	408–483
		<i>Rangia-mullia longifolia</i>	
Euphyllophyta	F3	393–402	393–483
		<i>Pentax saxe</i>	
Leopodiophyta	F5	383–388	383–483
		<i>Leclercqia simplica</i>	
Isoetesida	F6	333–383	333–483
		<i>Cyclotrypa</i> , <i>Parafloypodium</i>	
Spermatophyta	F4	313–331	313–483
		<i>Cordaites</i>	
Salvinellaceae	F7	307–323	307–483
		<i>Salvinella guthriei</i>	
<i>Salvinella</i> sensu lato clade	F8	293–323	293–483
		<i>Salvinella americana</i>	
<i>Salvinella</i> pygmaea clade	F9	83–87	83–483
		<i>Frieseanopteris stewartii</i>	

^a For references and justifications, see the text.

Gómez, Luis Diego (1980). Vegetative reproduction in a Central American *Isoetes* (*Brenesia* 18).
 Hickey, R. James (1990): Studies of Neotropical *Isoetes* L. I. *Euphyllum*, a new subgenus (*Ann. MBG* 77),
 PPG I (2016): A community-derived classification for extant lycophytes and ferns (*J. Syst. Evol.* 54).

Estado
 actual

Propuestas

- ▶ S. XIX (3): W. Hooker (1861): *I. andina*
 A. Braun (1862): *I. triquetra* (s) / *I. karstenii*
- ▶ S. XX-1 (4): T.C. Palmer (1929): *I. lechleri* var. *colombiana* (s)
 W.R. Maxon-C.V. Morton (1939-1945): *I. killipii* / *I. panamensis*
 H.K. Svenson (1944): *I. pacifica* (s)
- ▶ **S. XX-2 (18)**: H.P. Fuchs (1960-1982): 16 propuestas
L.E. Mora-W. Hagemann (1977): *I. dichotoma* (s)
 R.J. Hickey- H.P. Fuchs (1986): *I. baculata*
- ▶ S. XXI (3): R. Small & R.J. Hickey (2001): 3 propuestas

Propuestas

Especies aceptadas

<i>Isoetes andina</i>	Spruce ex Hook.
<i>Isoetes baculata</i>	Hickey & H.P. Fuchs
<i>Isoetes fuliginosa</i>	R.L. Small & Hickey
<i>Isoetes hemivelata</i>	R.L. Small & Hickey
<i>Isoetes karstenii</i>	A. Braun
<i>Isoetes killipii</i>	C.V. Morton
<i>Isoetes novo-granadensis</i>	H.P. Fuchs
<i>Isoetes palmeri</i>	H.P. Fuchs
<i>Isoetes panamensis</i>	Maxon & C.V. Morton
<i>Isoetes precocia</i>	R.L. Small & Hickey

Nombres no resueltos

<i>Isoetes bischlerae</i>	H.P. Fuchs
<i>Isoetes boyacensis</i>	H.P. Fuchs

Sinónimos

<i>Isoetes cleefii</i>	H.P. Fuchs
<i>Isoetes colombiana</i>	(T.C. Palmer) H.P. Fuchs
<i>Isoetes dichotoma</i>	L.E. Mora & W. Hagemann
<i>Isoetes lechleri</i> var. <i>colombiana</i>	T.C. Palmer
<i>Isoetes pacifica</i>	Svenson
<i>Isoetes triquetra</i>	A. Braun

Nombres inválidos

<i>Isoetes arumiana</i>	H.P. Fuchs
<i>Isoetes chilensis</i>	H.P. Fuchs
<i>Isoetes hagemannii</i>	H.P. Fuchs
<i>Isoetes leisteii</i>	H.P. Fuchs
<i>Isoetes narinensis</i>	H.P. Fuchs
<i>Isoetes quilindanensis</i>	H.P. Fuchs
<i>Isoetes steyermarkii</i>	H.P. Fuchs

Nombres inéditos

<i>Isoetes acutifolia</i>	H.P. Fuchs
<i>Isoetes serrulata</i>	H.P. Fuchs

No crecen en Colombia

<i>Isoetes andicola</i>	(Amstutz) L.D. Gómez
<i>Isoetes glacialis</i>	Aspl.
<i>Isoetes laevis</i>	U. Weber
<i>Isoetes lechleri</i>	Mett.
<i>Isoetes organensis</i>	U. Weber
<i>Isoetes ramboi</i>	Herter
<i>Isoetes rimbachii</i>	H.P. Fuchs
<i>Isoetes socia</i>	A. Braun

ESPECIES

Aceptadas:	10
No resueltos:	2
Sinónimos:	6
Inválidos:	7
Inéditos:	2

Total Colombia:	27
No presentes:	8

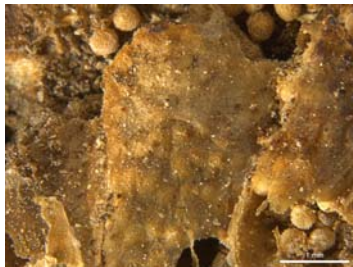
Colecciones

Departamento	No. Registros	Década	No. Registros	Especie	No. Ejemplares
Cundinamarca	153	1850	1	<i>Isoetes andina</i>	67
Boyacá	91	1920	11	<i>Isoetes karstenii</i>	57
Meta	53	1940	20	<i>Isoetes killipii</i>	48
Nariño	34	1950	37	<i>Isoetes palmeri</i>	45
Cauca	31	1960	37	<i>Isoetes novo-granadensis</i>	22
Antioquia	25	1970	220	<i>Isoetes boyacensis</i>	16
Santander	18	1980	111	<i>Isoetes bischlerae</i>	13
Risaralda	10	1990	17	<i>Isoetes hemivelata</i>	6
Valle del Cauca	10	2000	5	<i>Isoetes precocia</i>	6
Magdalena	8	2100	3	<i>Isoetes baculata</i>	1
Arauca	7			<i>Isoetes fuliginosa</i>	1
Putumayo	5			<i>Isoetes</i> sp.	36
Chocó	4			<i>Isoetes panamensis</i>	0
Tolima	4				
Huila-Cauca	2				
Caldas	1				
Cesar	1				
Huila	1				
La Guajira	1				
Norte de Santander	1				
Quindío	1				
Vaupés	1				

Recolector	No. Colección Col
Cleef, A.M.	84
Santa, J.	19
Hagemann, W.	17
Keeley, J.E.	17
Cuatrecasas, J.	12
Díaz-Piedrahita, S.	8
Otros	127

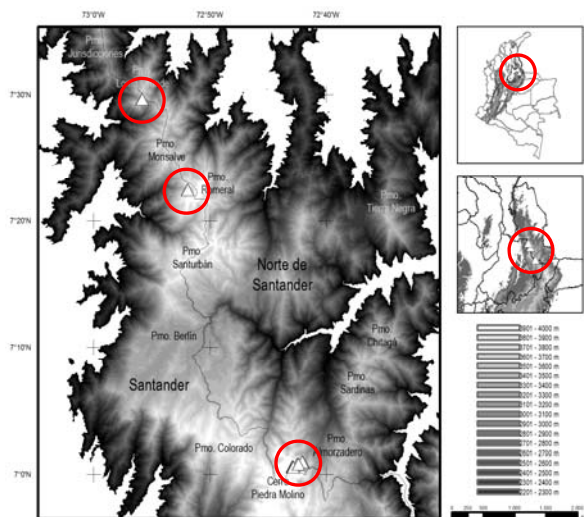
Colecciones

País	No. Registros	País	Institución	No. Registros
Colombia	291	Colombia	U. Nacional - COL	237
Estados Unidos	83	Colombia	U. de Antioquia - HUA	48
Países Bajos	79	Colombia	U. Industrial de Santander	2
Reino Unido	34	Colombia	CDMB - J. Botánico Eloy Valenzuela	1
Francia	8	Colombia	IAvH - Herbario FMB	1
España	5	Colombia	Pontificia Universidad Javeriana	1
Brasil	4	Colombia	U. La Salle - Museo de La Salle	1
Suecia	2	Países Bajos	Naturalis Biodiversity Center	79
Alemania	1	Estados Unidos	Smithsonian Institution - US	41
Bélgica	1	Reino Unido	The Natural History Museum	33
Dinamarca	1	Estados Unidos	Missouri Botanical Garden	27
Suiza	1			

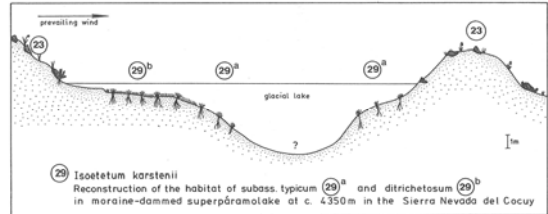


Estado actual

Vacios geográficos



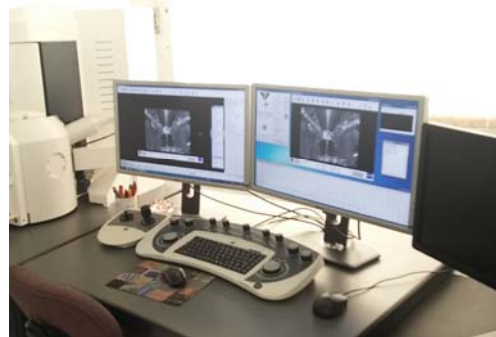
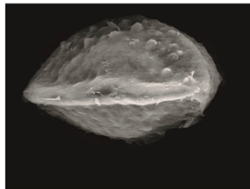
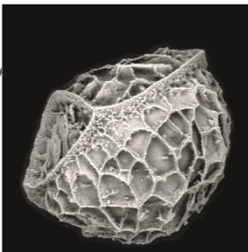
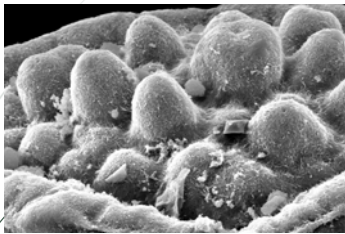
Vacios geográficos



Cleef, A.M. 1981 (The vegetation of the páramos of the Colombian C.Or.)



Caracterización



Caracterización

