The liverworts, collected from Panhala have been listed below. It also includes the taxonomy, morphology, anatomy and palynology of them.

DIVISION - BRYOPHYTA

Leafy or thalloid green plant body, small in nature, lacks the true roots, stem or leaves. In liverworts thallus grows prostrate on the ground and is attached to the substratum by delicate, unbranched, unicellular hair-like organs called rhizoids. In mosses the plant body is erect, bears leaf-like expansions and attached to the substratum by branched, multicellular rhizoids. Vascular tissue absent. Sexual reproduction oogamous. The sex organs are jacketed and multicellular. The sperms are biflagellate, both are of whiplash type. Fertilisation takes place in presence of water. Sporophyte is rootless and consists of a foot, a seta and a capsule. Meiospores are homosporous.

CLASS-HEPATICAE

Gametophyte dorsiventrally differentiated, may be thallose or commonly leafy (foliose). In foliose leaves without midrib, thallus attached to the substratum by means of simple, unicellular rhizoids. Internal structure simple, dorsal layer with air chambers and assimilatory filaments. Reproductive organs develop from a single initial cell,

sporophyte without meristematic tissue, sporophyte with foot, seta and capsule. Sporogenous tissue endothecial in origin, with spores and elaters (except *Riccia*), Columella absent.

ORDER - MARCHANTIALES

The plant body or the gametophyte usually prostrate, thalloid, thallus green, flat, thick and fleshy, dorsiventral, dichotomously branched. Thallus with prominent midrib. Rhizoids of two types, smooth and tuberculated. Scales often present. Thallus differentiated into dorsal assimilatory portion and ventral colourless, compact storage tissue. Dorsal surface differentiated into air chambers or air pores. Sex organs either scattered along with midrib or grouped in receptacle. Sporangium may be simple or with foot, seta and capsule. Capsule wall unistratose, elaters often present.

FAMILY - RICCIACEAE

The gametophyte is a flat, dorsiventral, dichotomously branched, ribbon shaped, fleshy. Dorsal photosynthetic region contains air channels. Epidermis lacks definite pores. Sex organs occur on median furrow on the upper surface in longitudinal rows, extending the entire thallus from apex to backwords. Archegonia immersed singly in the cavities on the dorsal

surface. Sporophyte without foot or seta and remains embedded in the tissue of the thallus. Elaters are absent.

KEY TO THE GENUS

Thallus with small scales, plants dichotomous, sex organ embedded, no receptacle. --- *Riccia* (Mich.) L.

a) GENUS - *RICCIA* (Mich.) L.
Riccia Micheli, Nov. Plant Gen : 106, 1729,
Riccia Linnaeus, Spec. Plant : 1138, 1753.

Monoecious or dioecious. Gametophyte is prostrate, dorsiventral. Thallus dichotomously branched, rosette like appearance, terrestrial or rarely aquatic. Each thallus is linear or wedge shaped and has midrib. Ventral surface bears marginal scales and rhizoids. Scales are one cell thick, hyaline. Rhizoids are of two types, smooth and tuberculate.

The assimilatory zone consists of green tissue. Photo-synthetic layer with narrow and deep enclosed air spaces. Sex organs arise on dorsal surface and at maturity get embedded in the thallus, involucres absent. Antheridial chambers opens by a narrow pore (ostiole) on the upper surface. Archegonia purple at the tip, neck occasionally projecting. Sporophyte sessile, without foot or

seta. immersed in the thallus, calyptra persistent. Spores large, tetrahedral, brown to black. Elaters absent.

KEY TO THE SPECIES

1. Plants are aquatic, floating. --- *Riccia fluitans* L.

   Plants on moist or dry soil, not aquatic. --- 2

2. Thalli green, overlapping with broad lobes, spores dark brown irregularly reticulated and dentate. --- *Riccia crystallina* L.

3. Thalli large compact blue green forming complete rosettes spores opaque, granular, dark brown with thick exine and thin entine.

   --- *Riccia frostii* Aust.

1. *Riccia fluitans* L. emend K. Muller

   Riccia fluitans Linn. Spec. plant : 1139, 1753

   Plate I and II.

   Plate Figs. 1 - 7.

Thalli are green in patches. Aquatic plants, floating on stagnant water, thallus several times dichotomously branched. Segments linear, long, apical portion with dorsal groove. Cross section shows large air chambers, polyhedral with unistratose wall. Upper epidermis is continuous. Ventral side with inconspicuous scales and rhizoids in terestrial form while rhizoids are absent in aqueous form. Capsule

forming a spherical protuberance on the ventral side. Spores brownish yellow, translucent.

Habit : Stagnant water and on the bank of well.

locality : Well in the nursery.

2. *Riccia crystallina* L.

Riccia crystallina L. Sp. Pl. : 1138, 1753

Riccia catalinee Undrew. Bot. Gaz., 19 : 275, 1894

Riccia brandegei Undrew. Bot. Gaz., 19 - 275, 1894

Riccia crystallina Warnst., Krypt. Ft. Mark Brandenburg, 80 : 1902

Riccia robusta Kash., Jour. Bom. Nat. Hist. Soc., 24 : 348, 1916

Plate III and IV

Plate Figs. 8 - 14

Thallus yellowish-green or reddish in colour. Plants overlapping with broad lobes, dichotomously branched. Dorsal surface flat, margins often turned upwords with a fairly broad, median groove. Cross section shows upper assimilatory or photosynthetic zone and lower storage region. Assimilatory zone consists of green cells in vertical columns, with wide and large air chambers. Storage region consists of colourless parenchymatous cells. Archegonium is flask shaped organ consists of swollen portion known as venter and a long slender neck. No visible stalk. 6 to 7 neck canal cells are surrounded by 9 neck cells. Rhizoids

mostly simple, few tuberculate, spores dark brown, black at maturity. Reticulations irregular and dentate.

Habit : On moist soil

Locality : Gopaltirth bag

3. *Riccia frostii* Aust., Bull. Torrey bot. Club. 6 : 17, 1875;
Riccia watsonii Aust., Bull. Torrey bot. Club. 6 : 17, 1875;
Riccia frostii var. *major* Undrew., Bot. Gaz. 19 : 273, 1894;
Riccia beclaeriana St., Spec. Hepat. 1 : 49, 1898;
Riccia microspora St., Spec. Hepat. 1 : 43, 1898;
Riccia sanguinea Kash., Jour. Bom. Nat. Histo. Sec. 24 : 349.
Plate No. V and VI
Plate Figs. 15 - 22

Plants in large compact blue green, prostrate, dorsiventral, dichotomously branched forming complete rosettes. Dorsal surface flat or slightly convex, having narrow groove towards apex. Lobes linear, oblong, closely attached to the substratum. Cross section shows upper assimilatory zone and lower storage region. The upper dorsal region composed of vertical rows of chlorophyll containing cells separated by narrow air spaces. Archegonia numerous, archegonial neck does not protude out. Sporophyte globular, merged. The mature spores lie free in a cavity or sac, without elaters. Spores opaque, granular, dark brown with

thick exine and thin entine. Rhizoids mostly simple and rarely tuberculate.

Habit : On moist ground associated with grass.

Locality : Along the roads behind the nursery.

SYSTEMATIC POSITION :

Division : Bryophyta

Class : Hepaticae

Order : Marchantiales

Family : Ricciaceae

Genus : *Riccia*

Species : i) *fluitans* L. emend K. Muller

ii) crystallina L.

iii) *forstii* Aust.

FAMILY - TARGIONIACEAE

Plants dioecious or monoecious, dorsiventrally prostrate, thin. Air chamber in a row, with or without filament, scales in two rows, rhizoids smooth and tuberculate. Antheridia on mid dorsal or on ventral innovation, may be on main thallus, in cushion, lateral or terminal, involucres terminal. Archegonia few. Capsule ovate. Spores rounded, reticulate or muricate. Elaters long, fusiform, bi-or trispiral.

KEY TO THE GENUS

Archegonia on receptacles, receptacle sub-apical, plants robust, surface with ventral innovation near the apex. --- *Targionia* (Mich.) L.

b) GENUS- *TARGIONIA*

Targionia (Mich.), L. Sp. PL. : 1136

Plants thallose prostrate, terrestrial, prostrate, Monoecious or dioecious. Thallus simple, with innovations ventrally present near the apex, with distinct areoles on the dorsal surface. Air pores simple, projecting, air chambers distinct. Ventral scales in two rows, purple coloured. Antheridia on dorsal surface, disc like ends arising from midrib or in mid-dorsal cushions on the main shoots; ostioles papiliform. Involucre two, bi-valved on the under side behind the apex. Archegonia few in single sporangium. Capsule breaking through the calyptra. Apex of capsule become detached in fragments at maturity. Capsule wall single layered, with spiral or annular bands. Spores reticulate. Elaters, bi-or trisprial.

KEY TO THE SPECIES

Terrestrial plants, green, prostrate with rough dorsal surface. Black sporophyte on the under side behind the apex. Branched elaters with bi- and unbranched with tri-sprial thickening.

--- *Targionia hypophylla* (Mich.) L.

4. *Targionia hypophylla* L. Sp. Pl. P. 1136 (1753).

Plate No. VII - X

Plate Figs. 23 - 38

Plants thallose, terrestrial, prostrate and green in colour, long and broad thallus with less frequent ventral shoots and rarely dichotomously branched. Dorsal surface green. Margin entire, with rough surface. Thallus apex is distinctly notched. Air pores simple conspicuous, slightly elevated, with 3 concentric rings of 8-10 cells each. Scales triangular, delicate, appendaged with slightly curved with long subulate apex. Smooth and tuberculate rhizoids are present. Differentiation of thallus with distinct air chambers, filled with green filaments on upper side and parenchymatous storage tissue on lower side. Involucres terminal, ventral, sessile, purple with 5-6 archegonia. Each archegonium consists swollen, venter and long slender, tubular neck. Neck consists of about 8 neck canal cells with longitudinal rows of 9 to 10 neck cells. Mouth of the neck is closed by cover cells. Spores reticulate. Elaters branched and unbranched with bi- and tri-spiral thickening respectively.

Habit : Terrestrial, prostrate forming patches on moist ground

Locality : Teen Darwaja, Gopaltirth bag, Sajja kothi, Ambarkhana

SYSTEMATIC POSITION

Division : Bryophyta

Class : Hepaticae

Order : Marchantiales

Family : Targioniaceae

Genus : *Targionia*

Species : *hypophylla* L.

KEY TO THE GENUS

Plants, delicate. small, yellowish green, dichotomously divided, densely overlapping; grows in dark and moist places showing yellowish phosphorescence. --- *Cyathodium* Kunze

c) GENUS - *CYATHODIUM*

Cyathodium Kunze. in Lehm. Pug. VI, P. 17 (1854).

Plants monoecious or dioecious, thin, small, tufted on rocks or on ground. Thallus thin, delicate, dichotomously divided Rhizoids smooth, some thick walled without pegs. Black, coloured mustard like sporophyte is present at the notch of ventral surface. Capsule dehiscing by 8 equally large valves after separation of lid. Spores spherical, more or less muricate. Elaters long, tri-spiral few in number.

KEY TO THE SPECIES

Plants delicate, papery, yellowish green, shining, overlapping in tufts. --- *Cyathodium tuberosum* Kash.

5. *Cyathodium tuberosum* Kashyap

Cyathodium tuberosum Kashyap, New Phyt.,Vol.XIII P.210 (1914)

Cyathodium penicillatum St., Sp. Hep. Vol. VI, P. 4 (1916).

Plate XI - XIII

Plate Figs. 39 - 48

Plants deliate, small, yellowish green, dichotomously divided, densely overlapping, fan shaped. At the notch of the ventral surface presence of a black mustard like sporophytes. Air chambers in one layer, partitions with or without air pores. Operculum made up of 8 cells. Antheridia enclosed in antheridial chambers, open by an ostiole. Rhizoids smooth, with wavy margin but not tuberculate. Sporophyte encloses spores and elaters which are limited in numbers. Spores yellowish, spherical, more or less muricate. Elaters long, tri-spiral with one broader and other pointed end.

Habit : In moist shady places and dark caves

Locality: Nursery wall, Cave near MSEB station, Gopaltirth bag, Wagh Darwaja.

SYSTEMATIC POSITION :

Division : Bryophyta
Class : Hepaticae
Order : Marchantiales
Family : Targioniaceae
Genus : *Cyathodium*
Species : *tuberosum* Kash.

FAMILY - REBOULIACEAE

Plants are thallose, dorsiventral, prostrate and mostly dichotomously branched. Air pores simple. Antheridia in sessile receptacles. Archegonia on raised receptacles. Sporophyte differentiated into foot, seta and capsule. Capsule wall without thickenings. Elaters present and well developed.

KEY TO THE GENUS

Receptacle dorsal, pores simple, scale in two rows with appendage. Female receptacle, dorsal, male receptacle horse-shoe shaped.

--- *Plagiochasma* L. et. L.

d) GENUS - *PLAGIOCHASMA* L. et. L.

Plagiochasma L. et. L. in Lehm. Pug. Pl. IV P. 13 (1832).

Plants monoecious or dioecious. Thalli large, prostrate in thick large patches, greenish or bluish in colour. Air chambers

narrow, air pores with thick radial walls. Scales in two rows with appendages. Male receptacle horse-shoe shaped, sessile surrounded by scales. Simple air pores. Female receptacles sessile when young and stalked at maturity. Receptacle concave on the dorsal side, with barrel shaped pores, 2-6 lobed. Involucres large, bivalved, each containing similar archegonium. Calyptra thin. Capsule short with large foot, opens by lid. Capsule wall thin, one layered. Spore large, brownish yellow, tetrahedral. Elaters short bi- or tri-spiral, rarely furcate.

KEY TO THE SPECIES

1. Plant monoecious,

= Thallus articulate, male and female receptacles at the articulations.

--- *Plagiochasma articulatum* Kash.

= Thallus appendiculate, female receptacle always dorsal.

--- *Plagiochasma appendiculatum* L. et. L.

2. Plant dioecious,

= Thallus linear and continuous, --- *Plagiochasma intermedium* L. et. G.

6. *Plagiochasma articulatum* Kashyap.

Plagiochasma articulatum Kash. New phyt. Vol. XIII. P.320 (1914).

Plate No. XIV - XVII

Plate Figs. 49 - 65

Plants monoecious, thallus green, long, broad; lobes oblong-obovate, flat with undulate margins, with notched apex. Thallus often articulated. Receptacles at the articulations. Male receptacle is 'horse-shoe' shaped followed by globular, sessile or shortly stalked female receptacle. Sporophyte with 3-4 lobes having a stalk. Cross section of thallus differentiated into assimilatory zone and storage region. Air chambers empty in several layers. Pores simple, inconspicuous. Ventral surface purple, scales purple, narrow, appendaged, appendages bend over growing point like a beak. Rhizoids simple and tuberculated. Male receptacle containing number of antheridia enclosed in a antheridial chamber. Female receptacle is shortly stalked, globular, surrounded by scales, encloses archegonia. Sporophyte is differentiated into foot, seta and capsule. Spores yellowish, reticulate, with prominent, tri-radiate mark. Elaters branched without spiral thickening.

Habit : On the rocky area and on the exposed walls

Locality : Temple, Andharbav, Ambarkhana

7. *Plagiochasma appendiculatum* L. et. L.

Plagiochasma appendiculatum L. et. L. Pug. IV, P. 14 (1832)

Plate No. XVIII - XXII

Plate Figs. 66 - 81

Plants monoecious, thalli green, broad forming thick patches. Lobes oblong, obcordate, dichotomously branched. Dorsal surface smooth, slightly concave. Margins undulate, with inconspicuous areolae. Male receptacle horse-shoe shaped followed by globular, sessile or stalked female receptacle. Sporophyte terminal, stalked with 3 lobes. Cross section of thallus differentiated into assimilatory zone and storage region. Air chambers empty in several layers. Air pores large, bounded by 3 concentric rings of 8-9 cells each. Ventral surface purple, scales purple, lunate, appendaged, appendages large, 1-2, hyaline, entire rounded with acute apex, made up of several layers of thickened cell walls. Rhizoids simple and tuberculate. Male receptacle shows assimilatory tissue partitioned into antheridial chambers, some of which contain androgonial mass. Spores yellowish, reticulate. Elaters simple, bi-spiral.

Habit : On the rocky area, into the crevices of walls.

Locality : Andharbav.

8. *Plagiochasma intermedium* Ldbg. et. G.

Plagiochasma intermedium Ldbg. et. G.; G.L. et. N. Syn. Hep. P. 513 (1844).

Plate No. XXIII - XXVI

Plate Figs. 82 - 94

Thalli are dioecious, forming thick patches. Thallus, linear, broad, slightly dichotomously branched. Each lobe is strap-shaped, dorsal

surface green. Margins purple, entire to dentate. Male receptacle at the apex of the main thallus, often with an adventitious shoot in front. Female receptacle subsessile, and on the middle of the dorsal surface. Cross section of thallus shows assimilatory zone partitioned by air chambers and a storage zone. Epidermal cells polygonal with large air pore; pores are bounded by 2 to 3 concentric rings of 8 to 9 cells each; radial walls slightly thickened. Ventral surface purple, scale, multicellular, 1 cell thick, violet, acute at the apex. Rhizoids simple and tuberculate type. Male receptacle shows assimilatory tissue partitioned into antheridial chambers, some of which contain androgonial mass. Female receptacle globular, subsessile, enclosing archegonia. Spores brownish, reticulate, with broad, entire, reticulated wings. Elaters branched, without spiral bands.

Habit : On the moist walls and crevices of the rocky area.

Locality : Andharbav, Ambarkhana

SYSTEMATIC POSITION :

Division : Bryophyta
Class : Hepaticae
Order : Marchantiales
Family : Rebouliaceae
Genus : *Plagiochasma*
Species : i) *articulatum* Kash.
ii) *appendiculatum* L. et. L.
iii) *intermedium* L. et. G.

KEY TO THE GENUS

Plants terrestrial, with lateral wings, sex organs on main shoots, female receptacle terminal, with a characteristic perianth. --- *Asterella.*

e) GENUS : *Asterella*

Thallus terrestrial, prostrate, small or medium, green, plants dioecious. Male receptacle sessile, naked, cushion-like, female receptacle terminal, on the main shoot, stalked, perianth usually ovate or oblong with an abconic apex, dividing longitudinally by many teeth. Spores tetrahedral, reticulate - lamellate on the convex side, more or less yellow. Elaters short, simple or furcate, mono-or bi-spiral.

KEY TO THE SPECIES

Plants dioecious, narrow, linear, ribbon shaped, beaked or angular sporophyte. Male receptacle with long cushion.--- *Asterella angusta* Kash.

9. Asterella angusta Beauv. MSG,. Bot. IV. P. 236 (1987).
Fimbriaria angusta st.
Fimbriaria angusta st., Sp. Hep. Vol. I, P.104 (1899).
Plate No. XXVII - XXXII
Plate Figs. 95 - 110

Dioecious, thallus long, narrow, linear. Dorsal surface flat with wavy and purple margins and notched apex. Male receptacle with long, purple cushion. Female receptacle disciform, stalked. Sporophyte angular or beaked. Cross section of thallus is differentiated into assimilatory zone and storage region. Air chambers usually in one layer with few filaments and empty. Air pores small, bounded by 3 concentric rings of 6 cells each. Male receptacle contains number of androgonial masses enclosed in antheridial chambers. Sporophyte encloses no. of spores which are dark brown with imperfect reticulations. Elaters, simple and branched, thick and short, yellowish mono-spiral or partly bi-spiral.

Habit : Generally on moist places. Sometimes on dry rocks.

Locality : Nursery wall

SYSTEMATIC POSITION :

Division : Bryophyta

Class : Hepaticae

Order : Marchantiales

Family : Rebouliaceae

Genus : *Asterella*

Species : *angusta* Beauv.

ORDER - METZERIALES

Plant body is either thalloid or foliose. Foliose forms differentiated into stem and leaves. Scales usually absent. Rhizoids always smooth.

Thalloid members show little or no anatomical differentiation. Leafy forms are distinctly dorsiventral, leaves without midrib. Sex organs usually arranged in groups but never raised on stalked receptacles, occasionally immersed in cavities. Sporophyte with foot, seta and capsule. Capsule wall two or more cells in thickness. Elaters are present. Capsule dehisces usually by four valves.

FAMILY - FOSSOMBRONIACEAE

Plants thallose, foliose or forms intermediate between them. In the foliose forms leaves in two rows, parallel to the stem or obliquely inserted and succubous, simple. Archegonial group surrounded by a perianth. Capsule generally with a long seta, globose, dehiscing irregularly or by four valves to the base. Capsule wall usually of two layers of cells. Elaters adherent to the base of the capsule or partly free, bi- to tetra-spiral.

KEY TO THE GENUS

Plants without air-chambers and pores, usually without scales on the ventral surface, capsule more or less globose, thallus without nostoc colonies, rhizoids purple. --- *Fossombronia* Raddi.

f) GENUS - *FOSSOMBRONIA* Raddi

Fossombronia Raddi., in Atti, Soc., Ital. Mod. 18 (1818).

Gametophyte delicate, pale-greenish in colour. Plants may be creeping or solitary patches. Stem creeping, simple or dichotomously branched and strongly arched below, with long, smooth rhizoids. Leaves simple, green, in two rows, succubous, broader than length, narrow at the base, succubous, obliquely inserted, irregularly lobed margin. Plants mono or dioecious. Capsule shortly pedicilate, globose, dark brown to blackish at maturity. Spores large, rounded, tetrahedral. Elaters short, branched or unbranched, bi- or tri-spiral.

KEY TO THE SPECIES

Thallus leafy, pale green, with mustard like brownish black coloured capsule with long, colourless seta. Distal face of spore with lamellae without reticulations. --- *Fossombronia himalayensis* Kash.

10. *Fossombronia himalayensis*, Kash.

Fossombronia himalayensis Kashyap. New phyt. Vol. XIV, P. 4 (1915).

Fossombronia levieri st., Sp. Hep. Vol. VI, P. 74 (1917).

Plate XXXIII - XXXIV

Plate Figs. 111 - 119

Plants green, when young and becomes pale green at maturity growing on moist soil or rocks. Plants differentiated into stem like and leaf like structures. Leaves simple, oblong, wavy, obliquely inserted on the stem, irregularly sinuate. Sporophyte differentiated into foot, seta and capsule which is mustard like and black in colour. Seta is transparent and long. Capsule becomes dark brown at maturity, dehisces irregularly. Only smooth wall rhizoids present. Capsule contains spores and elaters. Spore tetrads are found. Spores dark brown with furcate lamillae forming few reticulations. Elaters simple, bi- or tri-spiral.

Habit : On moist rocks, walls or among grasses.

Locality : Nursery wall, Teen Darwaja.

SYSTEMATIC POSITION :

Division : Bryophyta

Class : Hepaticae

Order : Metzeriales

Family : Fossombroniaceae

Genus : *Fossombronia*

Species : *himalayensis* Kash

PLATE- I

PLATE FIGS. 1 - 3

Riccia fluitans L.

1. Aquatic habit
2. Terrestrial habit
3. Ventral view of thallus showing sporophyte

PLATE- II

PLATE FIGS. 4 - 7

Riccia fluitans L.

4. T.S. of thallus x 70.
5. T.S. of thallus passing through young sporophyte x 22.
6. T.S. of thallus passing through mature sporophyte x 26.
7. A Spore x 28.

PLATE- III

PLATE FIGS. 8 and 9

Riccia crystallina L.

8. Habit

9. Habit : Enlarged view

PLATE- IV

PLATE FIGS. 10 - 14

Riccia crystallina L.

10. T.S. of thallus x 30.
11. Archegonium x 50.
12. Smooth rhizoid x 42.
13. Tuberculated rhizoid x 57.
14. A Spore x 34.

PLATE- V

PLATE FIGS. 15 and 16

Riccia frostii Aust.

15. Habit

16. Habit : Enlarged view

PLATE- VI

PLATE FIGS. 17 - 22

Riccia frostii Aust.

17. T.S. of thallus x 6.4.
18. Archegonium x 80.
19. Smooth rhizoid x 91.
20. Tuberculated rhozoid x 80.
21. T.S. of thallus through sporophyte x 7.3.
22. A Spore x 34.

PLATE- VII

PLATE FIGS. 23 and 24

Targionia hypophylla L.

23. Habit.

24. Habit : Enlarged view

PLATE- VIII

PLATE FIGS. 25 and 26

Targionia hypophylla L.

25. Male branch

26. Ventral view of thallus showing sporophyte

PLATE- IX

PLATE FIGS. 27 and 32

Targionia hypophylla L.

27. T.S. of thallus x 7.3.

28. T.S. of thallus through showing epidermal air pore x 29.

29. Air pore (surface view) x 69.

30. Scale x 29.

31. Smooth rhizoid x 92.

32. Tuberculated rhizoid x 50.

PLATE- X

PLATE FIGS. 33 - 38

Targionia hypophylla L.

33. T.S. of thallus through female receptacle x 3.6.
34. Archegonium x 29.
35. Spores x 68.
36. A Spore x 28.
37. An Elater (Simple) x 80.
38. An Elater (Branched) x 68.

PLATE- XI

PLATE FIGS. 39 - 41

Cyathodium tuberosum Kash.

39. Habit

40. Habit : enlarged view

41. Thallus showing sporophytes

PLATE- XII

PLATE FIGS. 42 - 45

Cyathodium tuberosum Kash.

42. T.S. of thallus x 29.

43. Operculum cells x 57.

44. T.S. of passing through male receptacle x 21.

45. Smooth rhizoid x 69.

PLATE- XIII

PLATE FIGS. 46 - 48

Cyathodium tuberosum Kash.

46. T.S. of thallus through sporophyte x 11.

47. A Spore x 23.

48. An Elater x 63.

PLATE- XIV

PLATE FIGS. 49 and 50

Plagiochasma articulatum Kash.

49. Natural Habit and Habitat

50. Habit : Enlarged view

PLATE- XV

PLATE FIGS. 51 and 52

Plagiochasma articulatum Kash.

51. Monoecious plant showing male and female receptacles and sporophyte.

52. Monoecious plant showing male and female receptacles and sporophytes.

PLATE- XVI

PLATE FIGS. 53 - 57

Plagiochasma articulatum Kash.

53. T.S. of thallus x 7.

54. T.S. of thallus (enlarged view) x 35.

55. Air pore (surface view) x 7.

56. Scale with single appendage x 3.

57. Scale with two appendages x 6.

PLATE- XVII

PLATE FIGS. 58 - 65

Plagiochasma articulatum Kash.

58. Smooth rhizoid x 91.

59. Tuberculated rhizoid x 91.

60. T.S. of thallus passing through male receptacle x 5.

61. T.S. of thallus passing through female receptacle x 3.

62. T.S. of thallus passing through young sporophyte x 5.

63. Spores x 34.

64. A Spore x 29.

65. An Elater x 36.

PLATE- XVIII

PLATE FIGS. 66 and 67

Plagiochasma appendiculatum L. et. L.

66. Natural Habit and Habitat.

67. Habit : Enlarged View

PLATE- XIX

PLATE FIGS. 68 and 69

Plagiochasma appendiculatum L. et. L.

68. Monoecious thalli showing male and female receptacles.

69. Monoecious thallus showing male and female receptacle.

PLATE- XX

PLATE FIGS. 70 and 71

Plagiochasma appendiculatum L. et. L.

70. Thalli showing sporophytes.

71. Thallus showing sporophyte.

PLATE- XXI

PLATE FIGS. 72 - 77

Plagiochasma appendiculatum L. et. L.

72. T.S. of thallus x 7.

73. Air pore (Surface View) x 42.

74. Scale showing two appendages x 5.

75. Scale appendage x 21.

76. Smooth rhizoid x 42.

77. Tuberculated rhizoid x 68.

PLATE- XXII

PLATE FIGS. 78 - 81

Plagiochasma appendiculatum L. et. L.

78. T.S. of thallus passing through male receptacle x 5.

79. Spore and Elaters x 4.

80. Spores x 28.

81. An Elater x 43.

PLATE- XXIII

PLATE FIGS. 82 and 83

Plagiochasma intermedium L. et. G.

82. Natural Habit and Habitat.

83. Natural Habit and Habitat (Enlarged View)

PLATE- XXIV

PLATE FIGS. 84 and 85

Plagiochasma intermedium L. et. G.

84. Male and female thalli mixed.

85. Thallus showing male female receptacles and sporophytes.

PLATE- XXV

PLATE FIGS. 86 - 90

Plagiochasma intermedium L. et. G.

86. T.S. of thallus x 6.

87. T.S. of thallus showing air pore x 28.

88. Air pore (Surface View) x 57.

89. Scale with appendages x 5.

90. Rhizoids (smooth and tuberculated) x 91.

PLATE- XXVI

PLATE FIGS. 91 - 94

Plagiochasma intermedium L. et. G.

91. T.S. of thallus through male receptacle x 4.

92. T.S. of thallus through female receptacle x 3.

93. A Spore x 34.

94. An Elater x 46.

PLATE- XXVII

PLATE FIGS. 95 and 96

Asterella angusta Beauv.

95. Natural Habit and Habitat

96. Habit Enlarged View

PLATE- XXVIII

PLATE FIGS. 97 and 98

Asterella angusta Beauv.

97. Male plants

98. Male plants (Enlarged View)

PLATE- XXIX

PLATE FIGS. 99 and 100

Asterella angusta Beauv.

99. Female plants

100. Female plants (Enlarged View)

PLATE- XXX

PLATE FIGS. 101 and 102

Asterella angusta Beauv.

101. Sporophytes (Young)

102. Sporophytes (Mature)

PLATE- XXXI

PLATE FIGS. 103 - 106

Asterella angusta Beauv.

103. T.S. of thallus x 7.

104. T.S. of thallus (Enlarged View) x 29.

105. Air pore (Surface View) x 40.

106. T.S. of thallus through male receptacle x 55.

PLATE- XXXII

PLATE FIGS. 107 - 110

Asterella angusta Beauv.

107. T.S. through sporophyte x 55.

108. A Spore x 34.

109. An Elater (Simple) x 36.

110. An Elater (Branched) x 59.

PLATE- XXXIII

PLATE FIGS. 111 - 113

Fossombronia himalayensis Kash.

111. Natural Habit and Habitat.

112. Habit : Enlarged View.

113. Plant showing sporophyte.

PLATE- XXXIV

PLATE FIGS. 114 - 119

Fossombronia himalayensis Kash.

114. Smooth rhizoid x 57.

115. Spores and elaters x 14.

116. Tetraspores x 28.

117. Spore x 23.

118. An Elater (Trispiral) x 63.

119. An Elater (Bispiral) x 23.

PLATE I

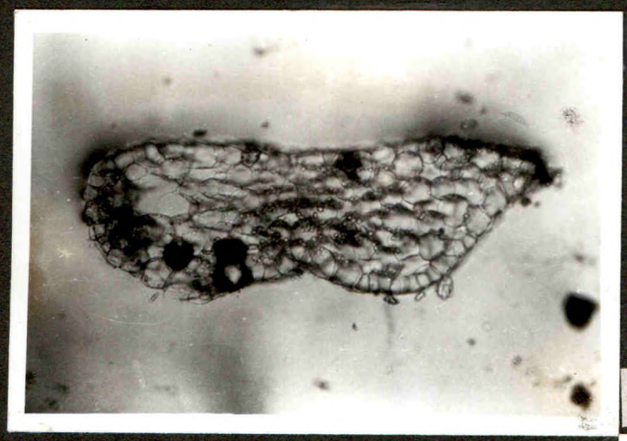
1

2

Riccia fluitans L.

3

PLATE II



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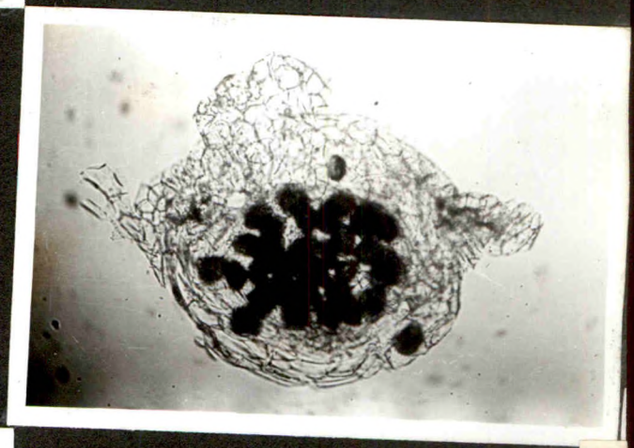

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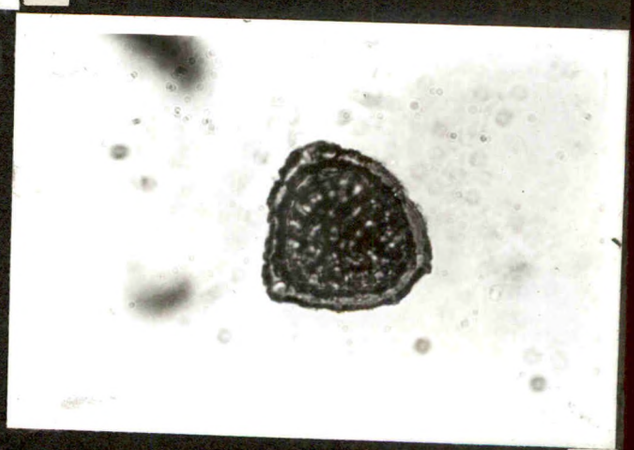

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PLATE III

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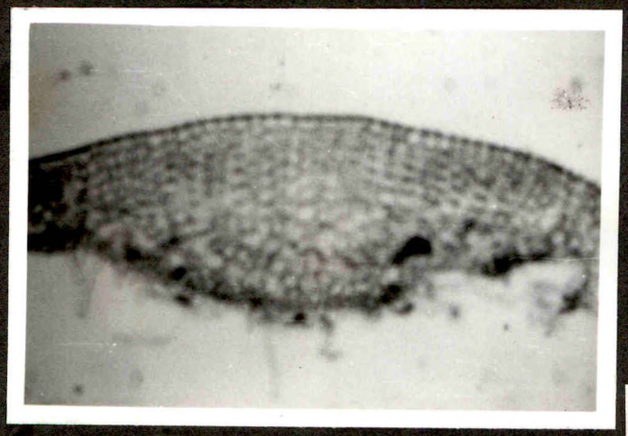
Riccia crystallina L.

PLATE IV



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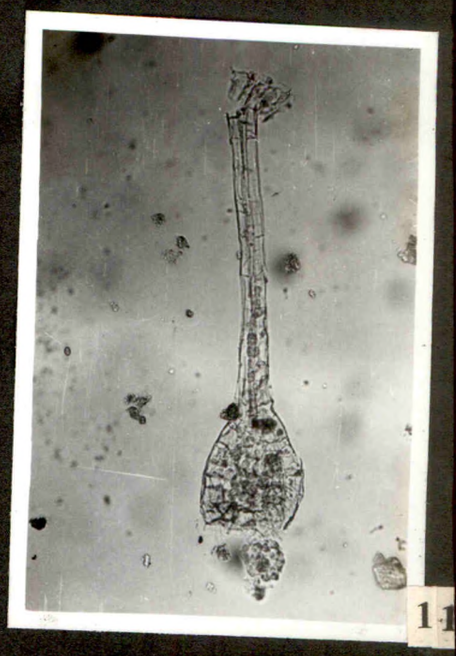

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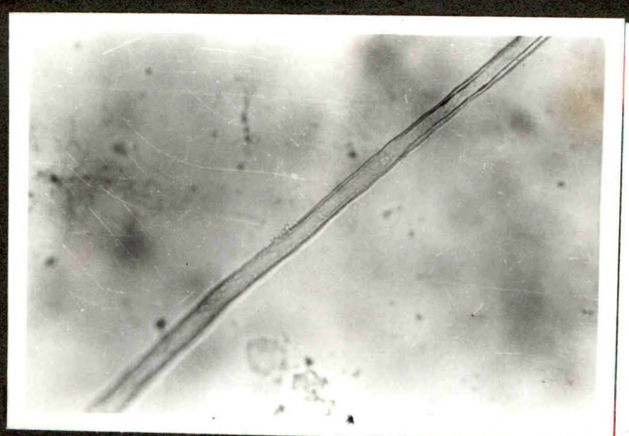

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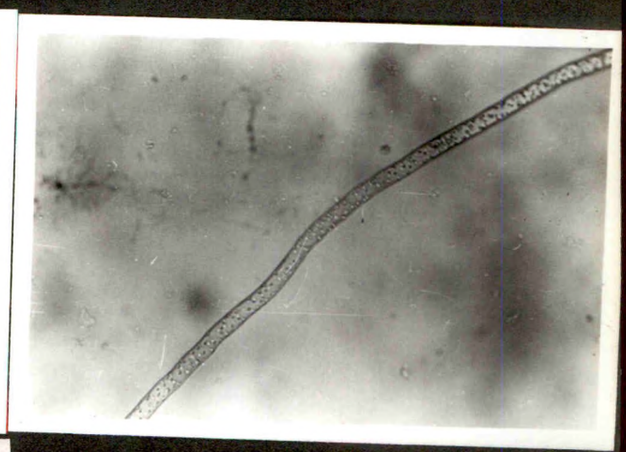

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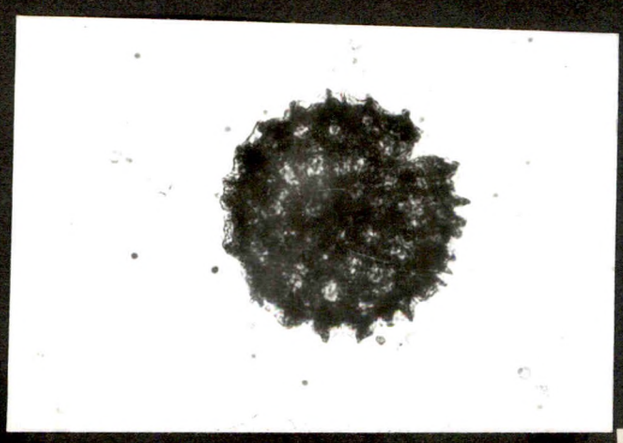

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PLATE V

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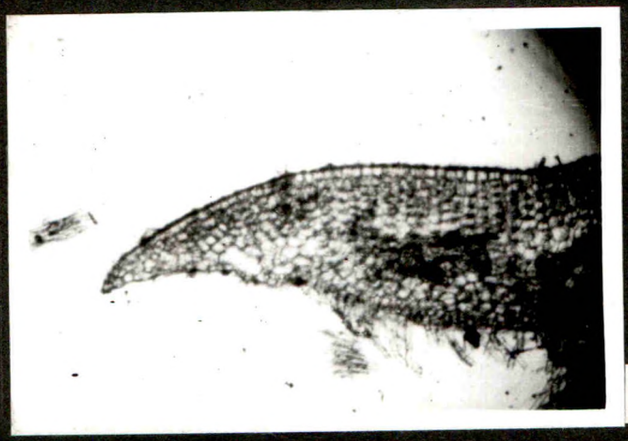
***Riccia frostii* Aust.**

PLATE VI



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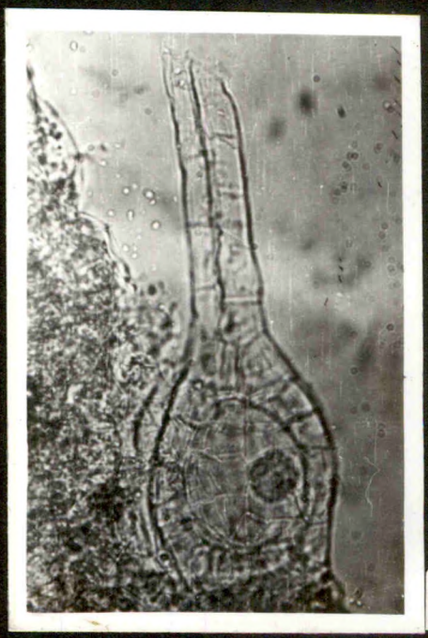

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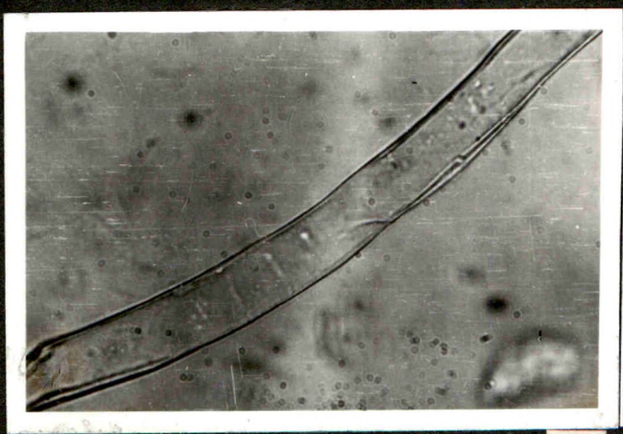

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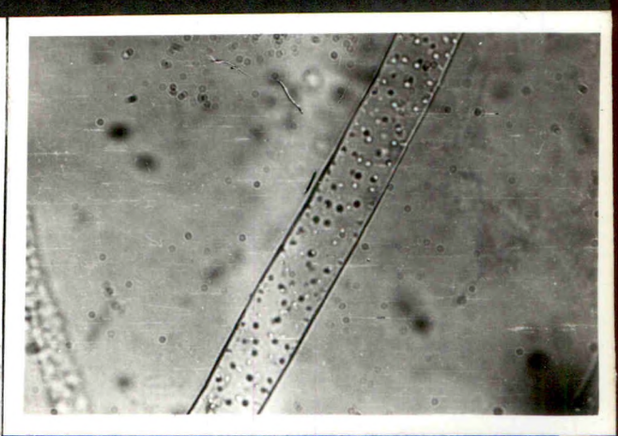

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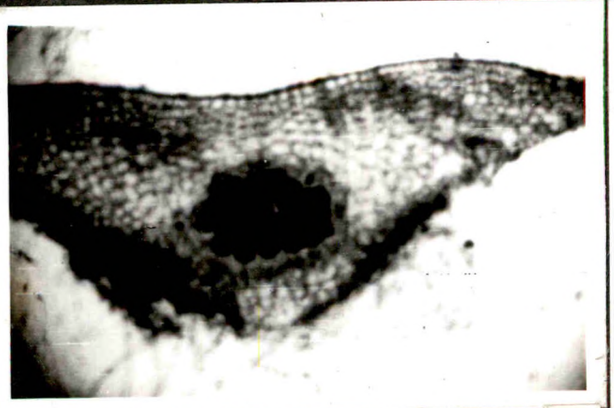

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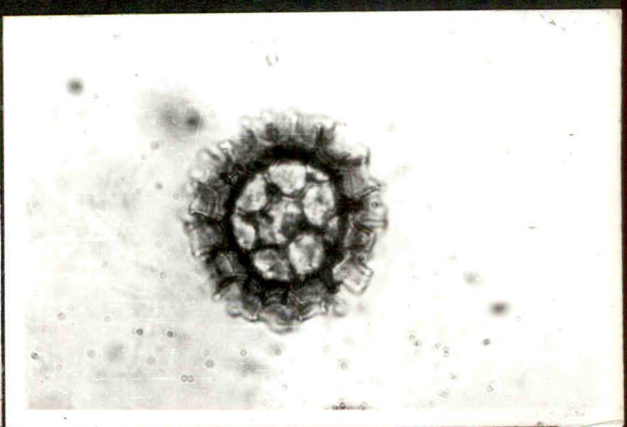

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PLATE VII

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***Targionia hypophylla* L.**

PLATE VIII

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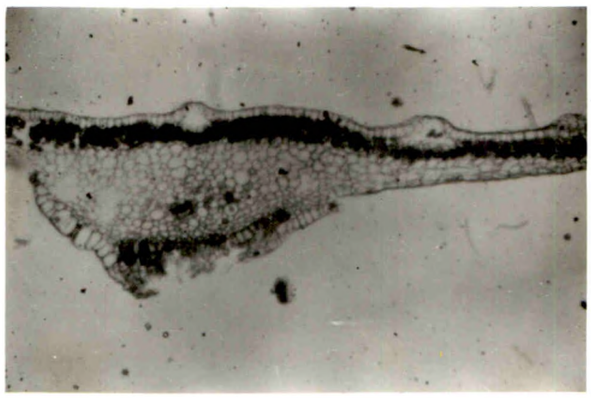
PLATE IX



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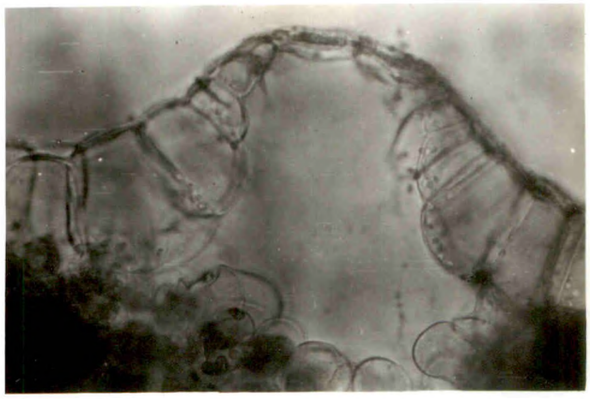

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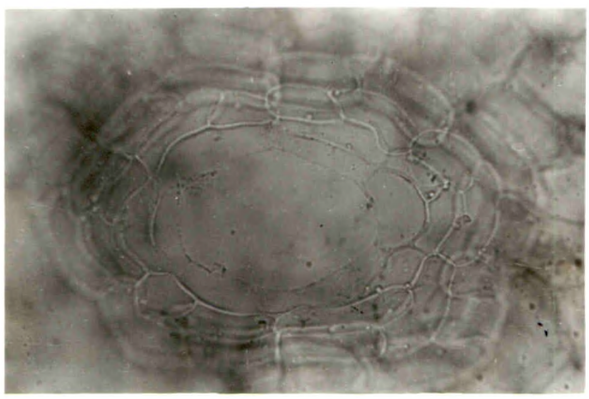

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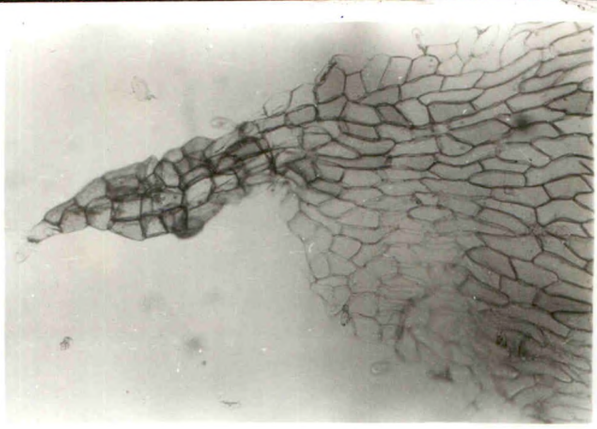

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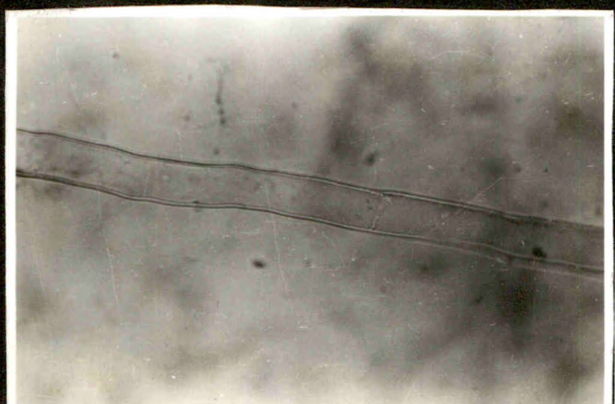

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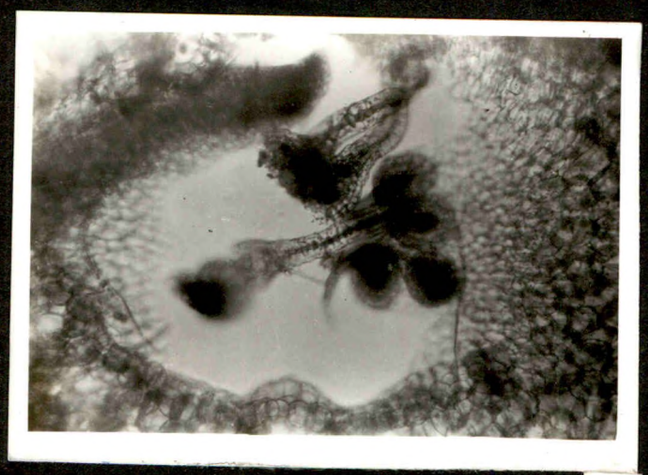
PLATE X



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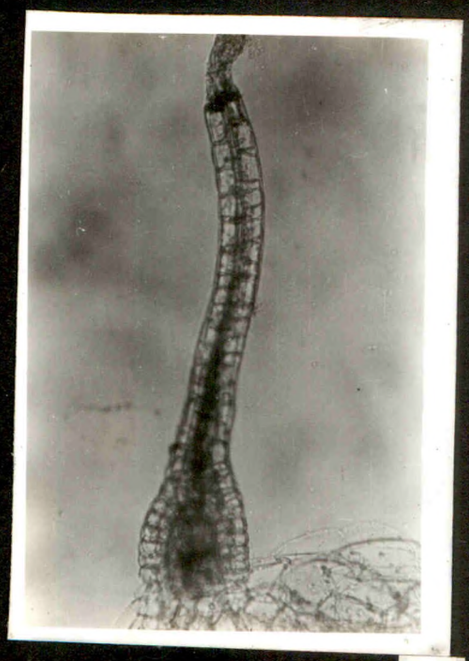

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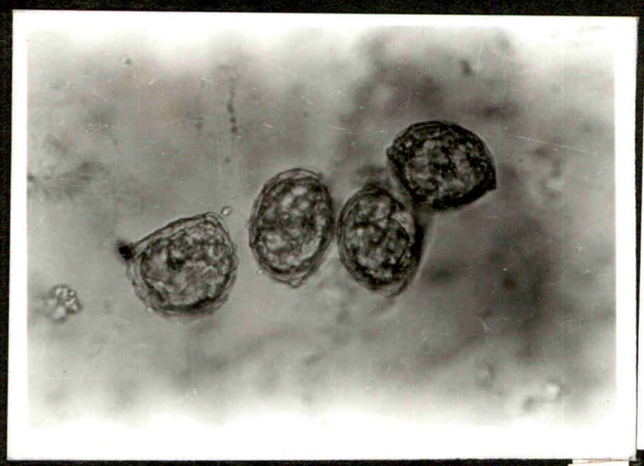

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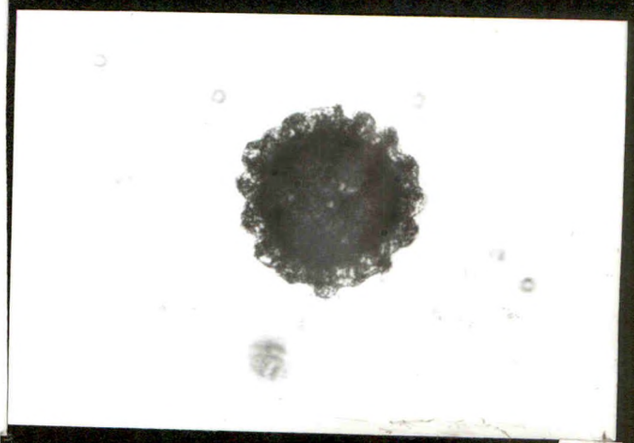

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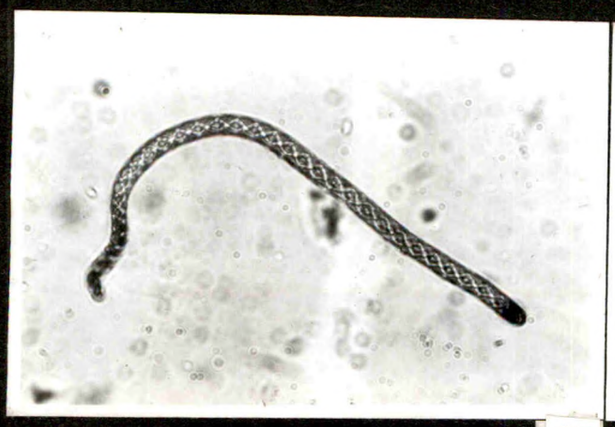

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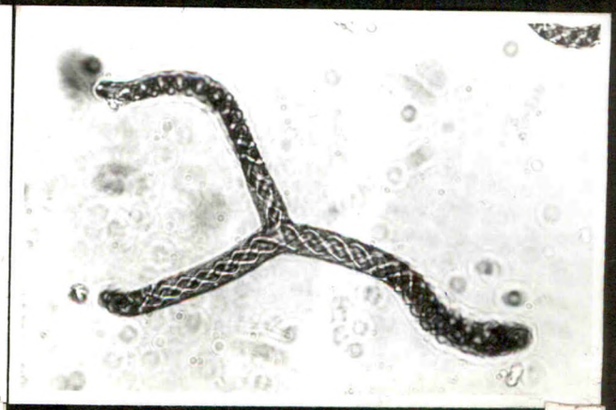

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PLATE XI

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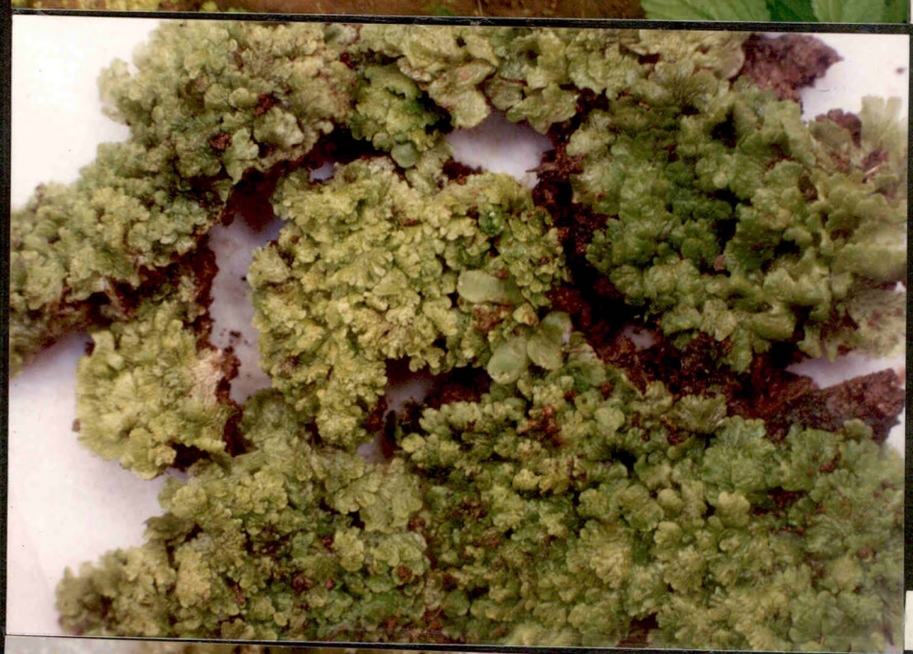

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Cyathodium tuberosum Kash.

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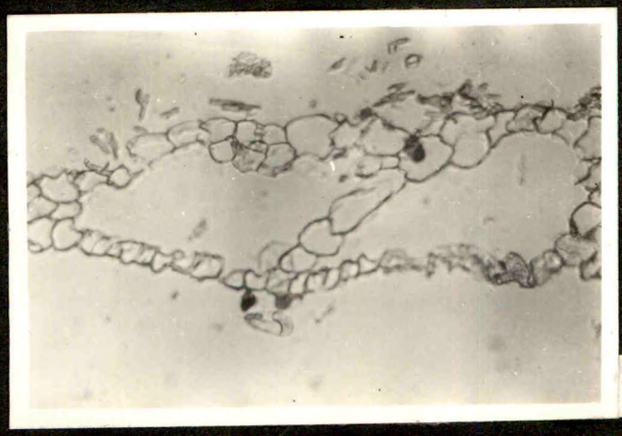
PLATE XII



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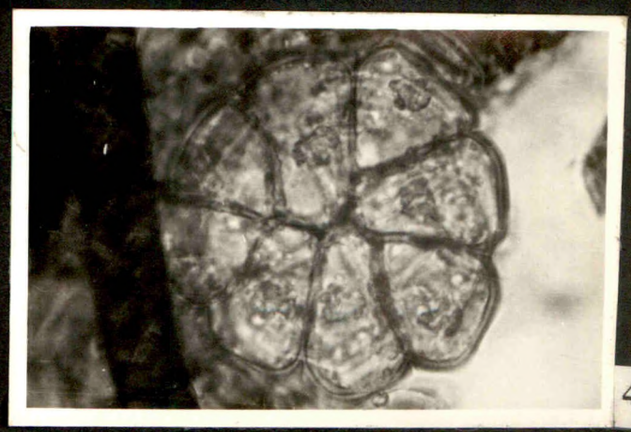

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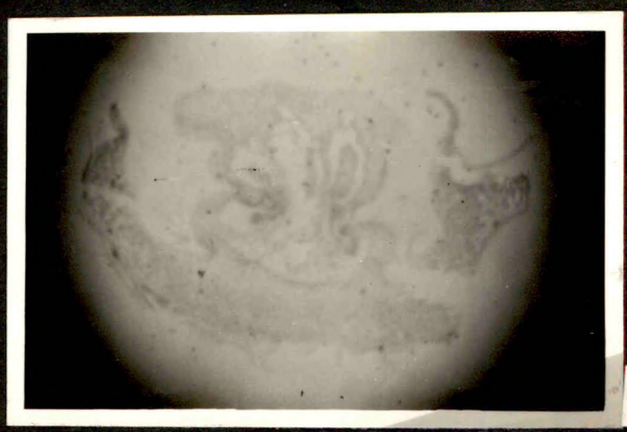

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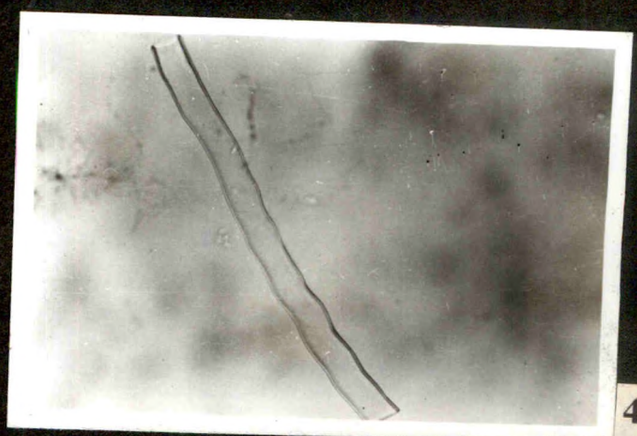

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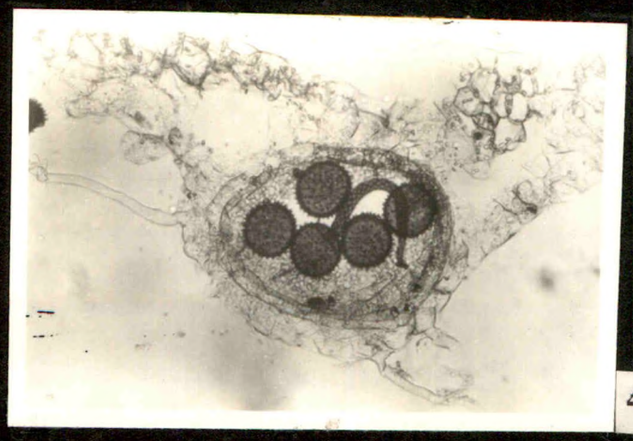
PLATE XIII



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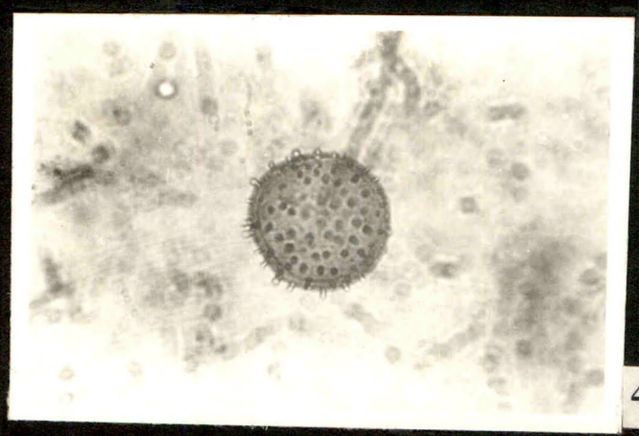

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PLATE XIV

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***Plagiochasma articulatum* Kash.**

PLATE XV

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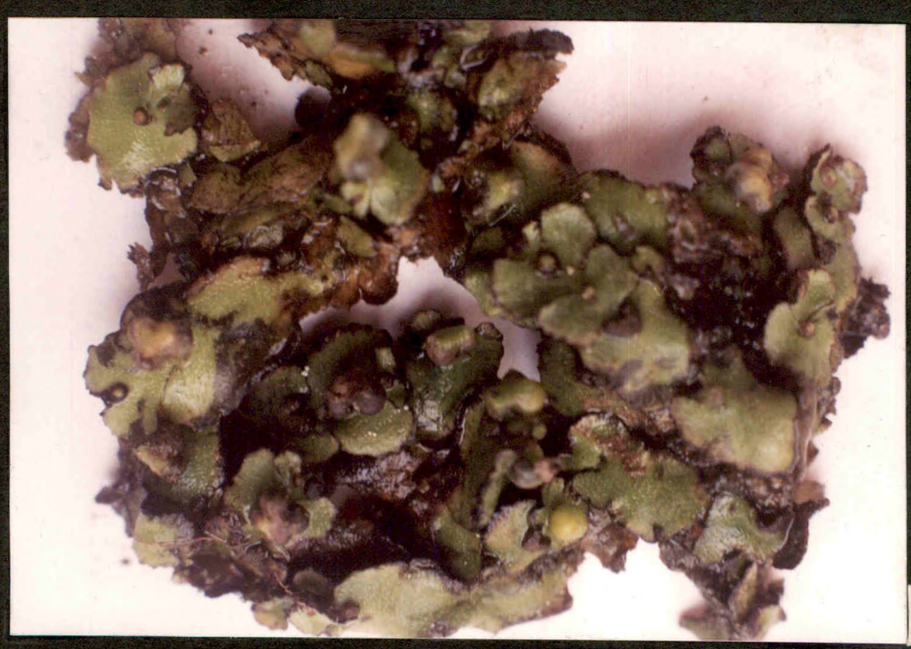

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PLATE XVI

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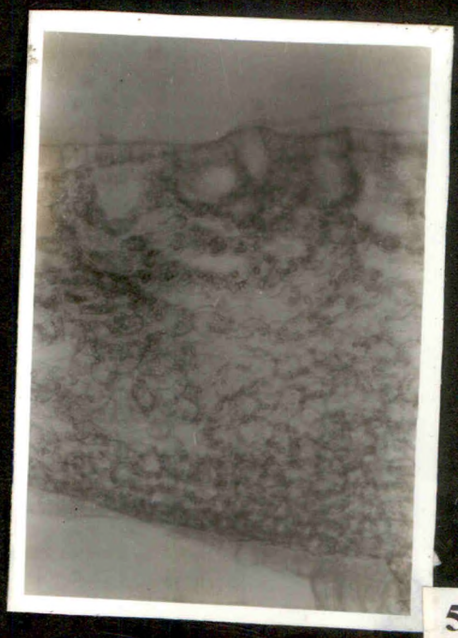

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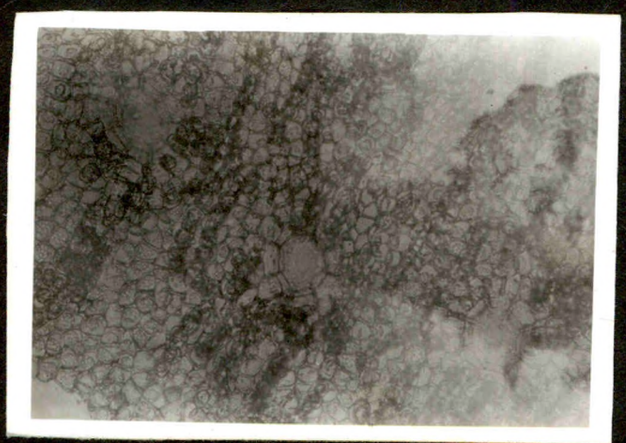

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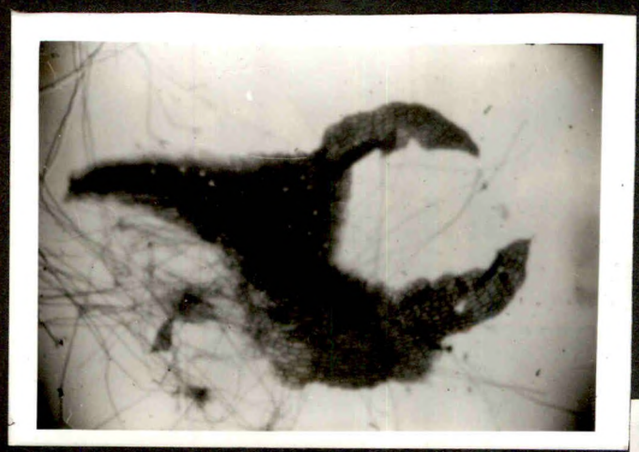

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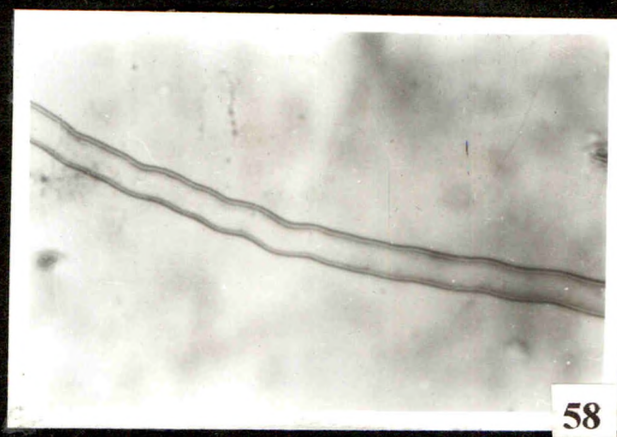
PLATE XVII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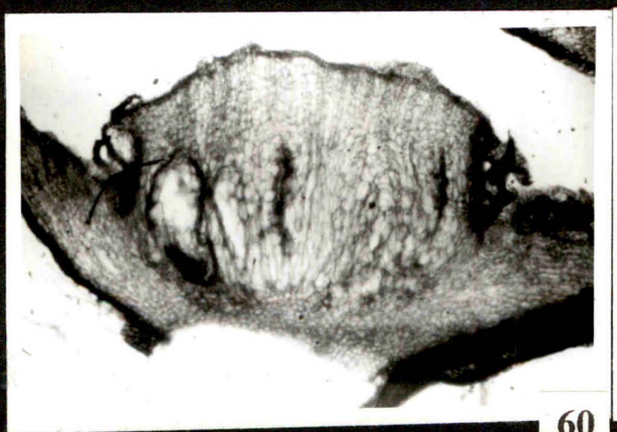
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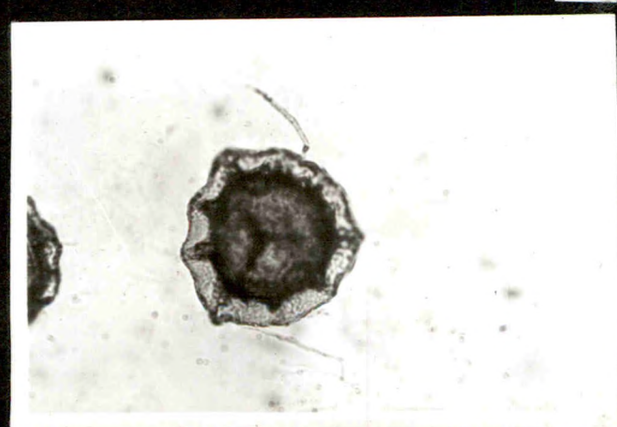
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PLATE XVIII

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***Plagiochasma appendiculatum* L. et. L.**

PLATE XIX

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PLATE XX

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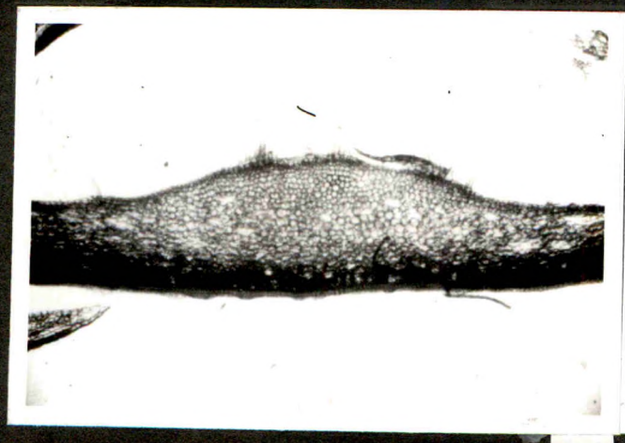
PLATE XXI



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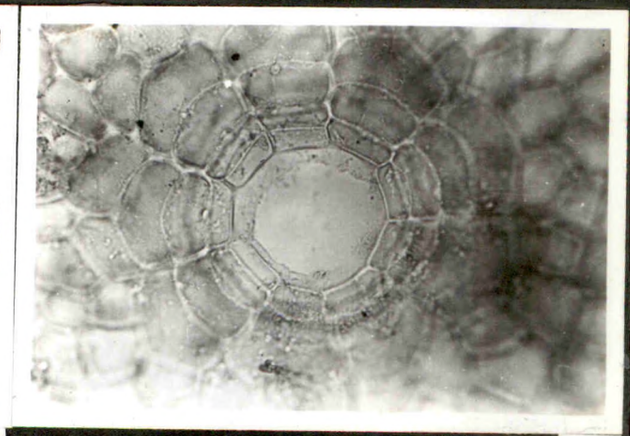

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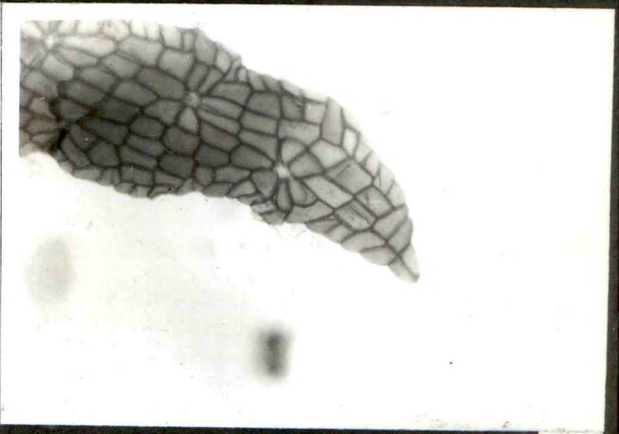

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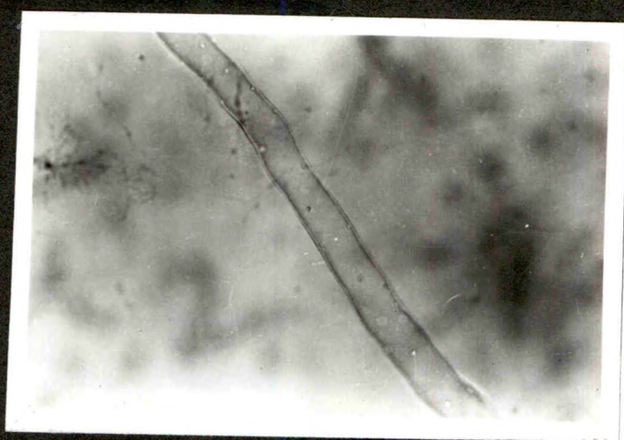

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PLATE XXII

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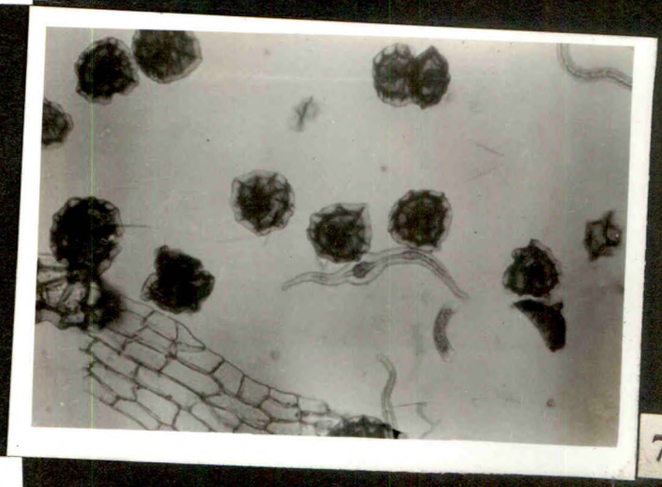

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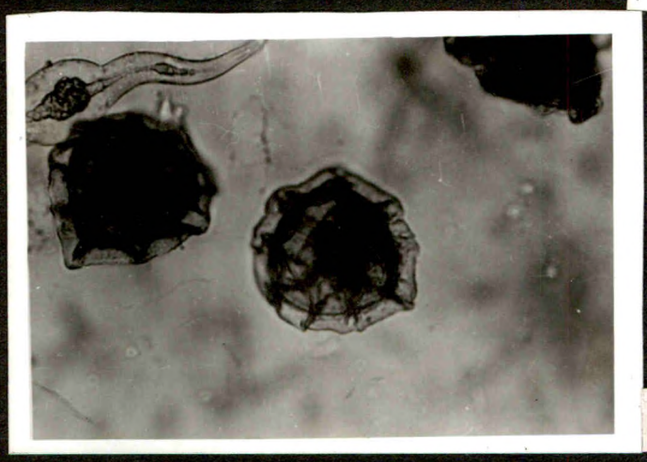

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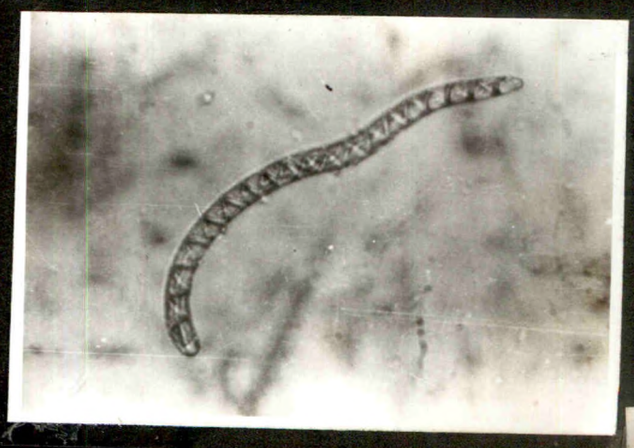

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PLATE XXIII

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Plagiochasma intermedium L. et. G.

PLATE XXIV

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PLATE XXV

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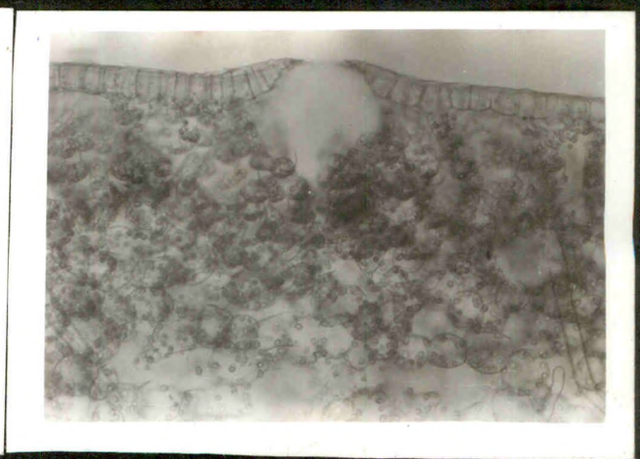

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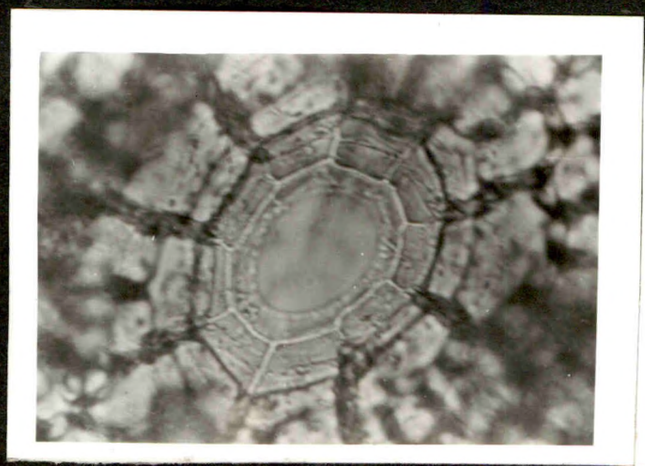

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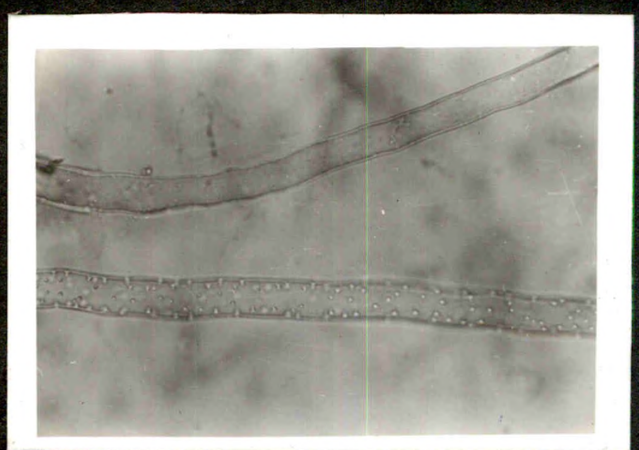

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PLATE XXVI

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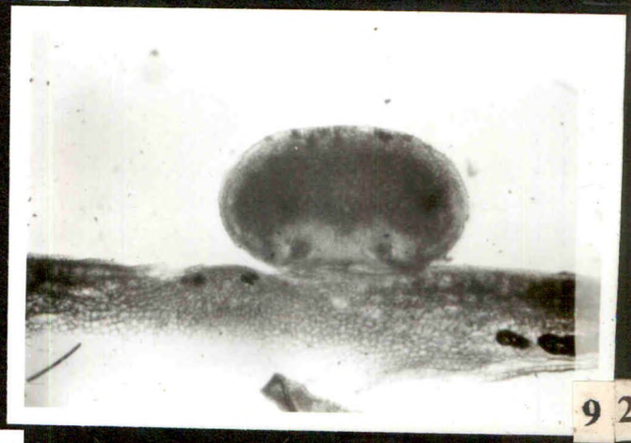

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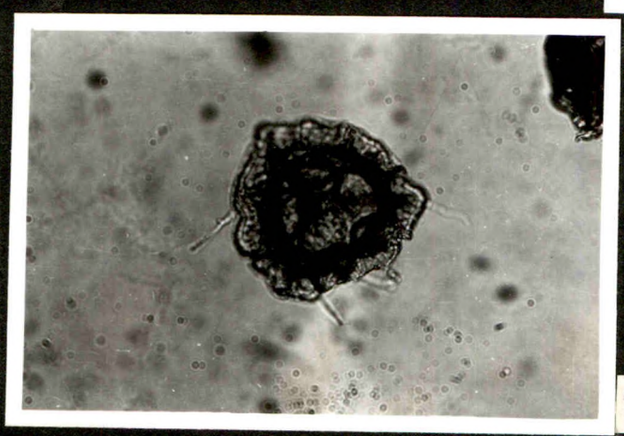

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PLATE XXVII

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***Asterella angusta* Beauv.**

PLATE XXVIII

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PLATE XXIX

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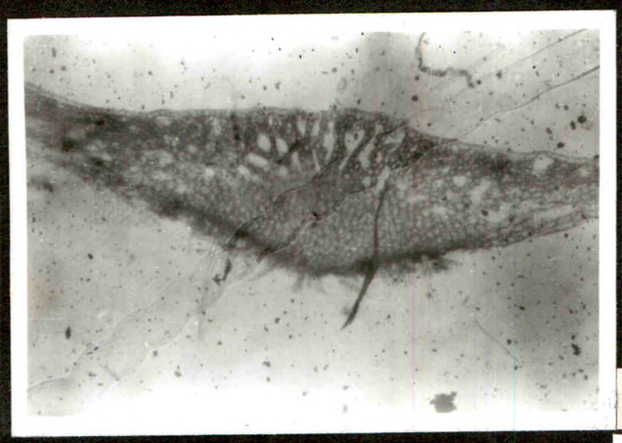
PLATE XXX

101

102

PLATE XXXI



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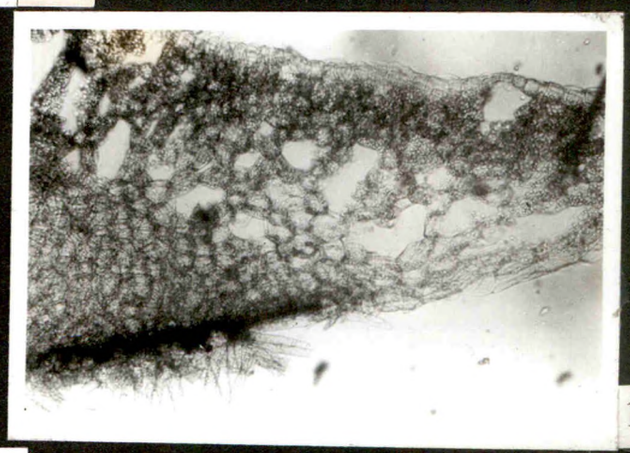

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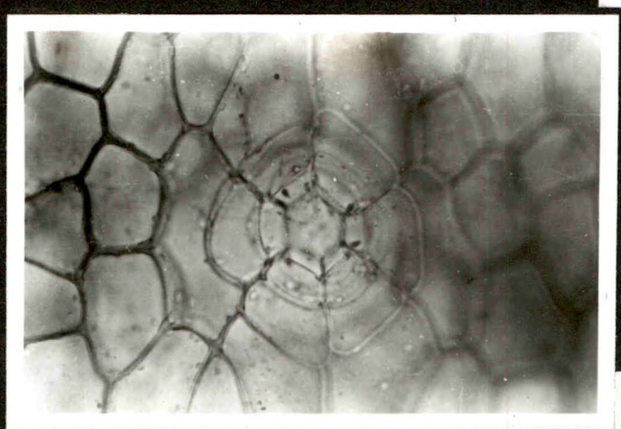

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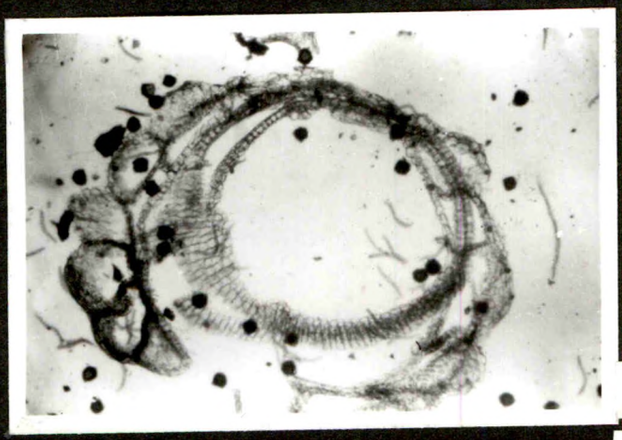
PLATE XXXII



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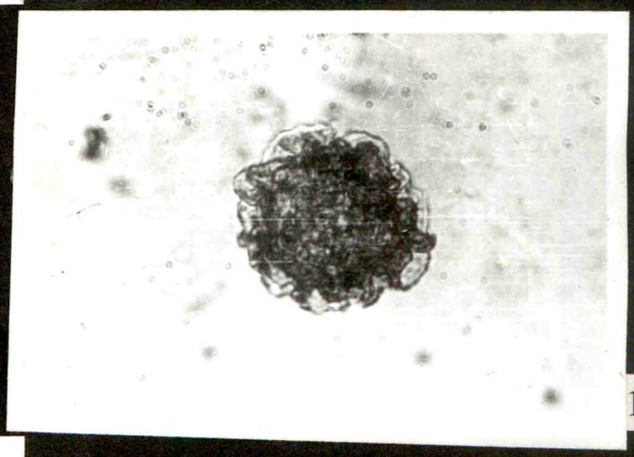

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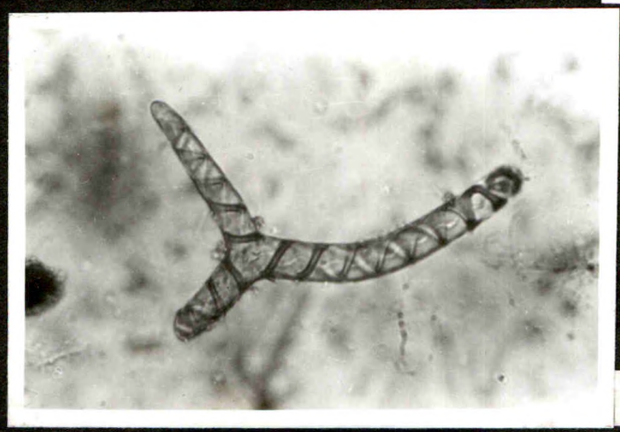

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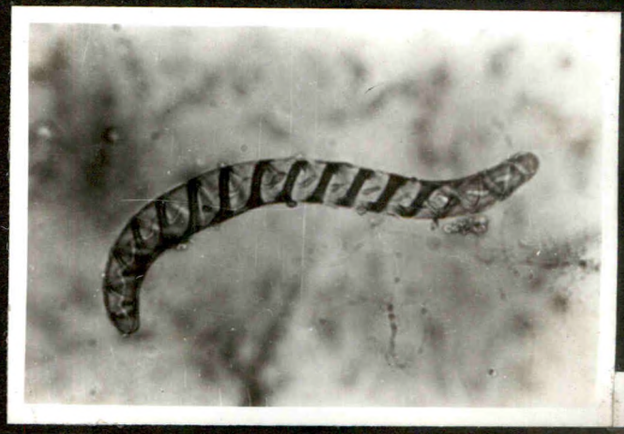

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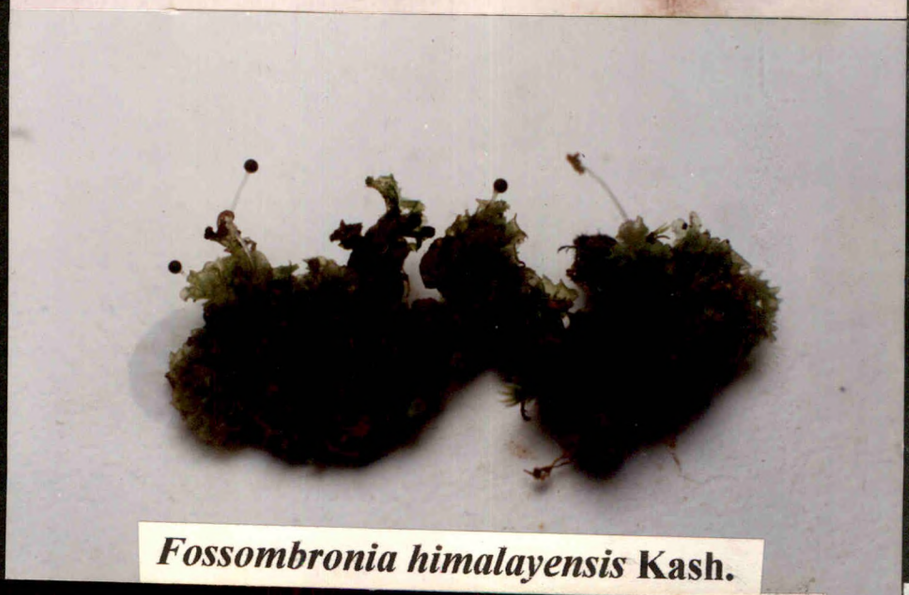
PLATE XXXIII

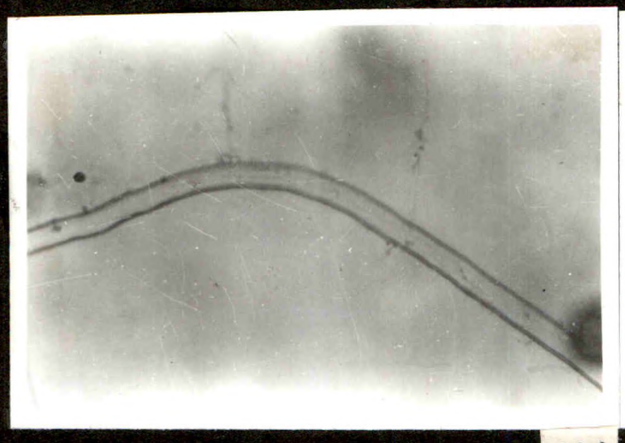
111

112



***Fossombronia himalayensis* Kash.**

PLATE XXXIV



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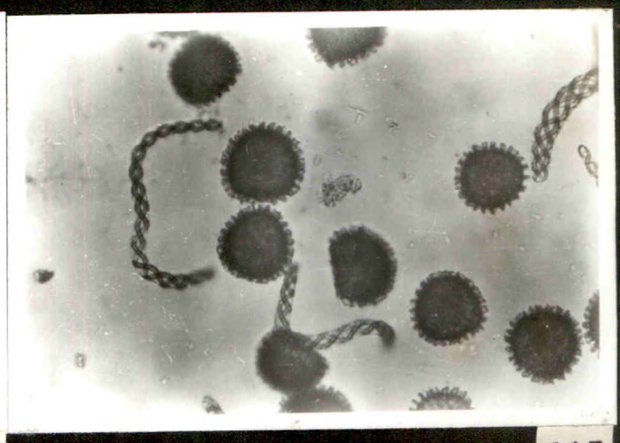

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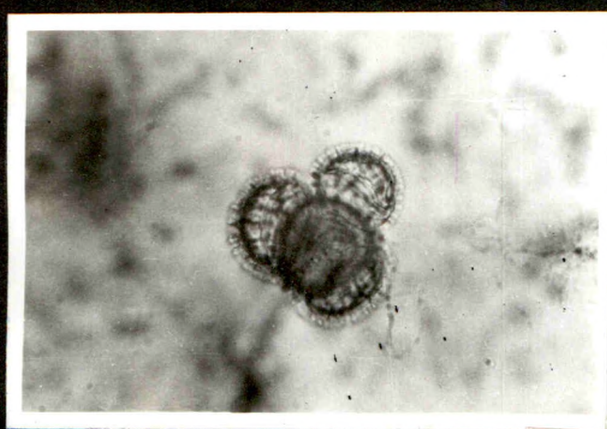

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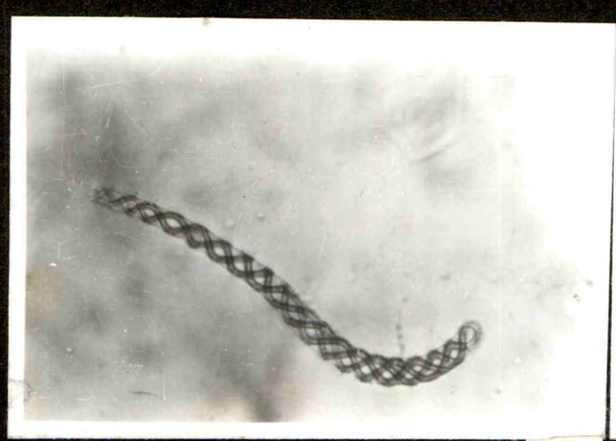

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