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T.S. LEAF OF MARRAM GRASS.

"*Ammophila Arundiacæ.*" X 35.

Photomicrographs

— OF —

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7—Spirogyra, Sp. In conjugation			rium vulgaris	0	6
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8—Ulothrix	0	6	Rhizome	1	0
9—Fucus vesiculosus, V.S. of			28—Pteris aquilina, V.S. Sori	0	6
Conceptacle, for Antheridia			29—Selaginella Willdenovii, T.S.		
and Oogonia	1	0	Stem	0	6
10—Torula (Yeast)	1	0	30—Do. do. Fertile Spike	1	0
11—Mucor mucedo, asexual repro-			31—Pinus Sylvestris, T.S. of Root	0	6
duction, from pure culture..	1	0	32—Do. do. T.S. of Stem for		
12—Pythium, Sporangia	1	0	developing tissue, three		
13—Penicillium, pure culture	1	0	stages	1	0
14—Agaricus campestris, V.S.			33—Pinus sylvestris, T.S. of Leaf	0	6
pileus	0	6	34—Do. do. T.S. Timber	0	6
15—Peziza convexula, V.S. of			35—Do. R.L.S. do.	0	6
Apothecia	0	6	36—Do. T.L.S. do.	0	6
16—Parmelia, Sp. V.S. of do.	0	6	37—Do. L.S. Staminate		
17—Polytrichum (Moss) T.S. of			strobilus	0	6
Leaf	0	6	38—Do. T.S. Polycotyle-		
18—Lycopodium clavatum, T.S.			donous Ovule	0	6
of Stem	0	6	39—Do. L.S. Embryo Sac..	1	0
19—Capsule, of Moss, Funaria V.S.	1	0			
20—Antheridia, and Archegonia,					
of Funaria	1	6			
21—Sporogonium of Pellia, L.S.	0	6			
22—Antheridia, Marchantia poly-					
morpha	0	6			

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PREFACE.

In placing this book of **PHOTOMICROGRAPHS** in the hands of Teachers and Students, we feel that we are supplying a long-felt want. No such work has previously been published.

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ABRAHAM FLATTERS, F.R.M.S.

Teacher in Microscopical Research to the Municipal School of Technology, Manchester. Specialist in Micro-Technology to the Manchester Chamber of Commerce.

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INDEX.

Abbreviations to Illustrations :—

- T.S.—Transverse Section.
 L.S.—Longitudinal Section.
 R.L.S.—Radial Longitudinal Section.
 T.L.S.—Tangential Longitudinal Section.
 V.S.—Vertical Section.

No.	
1—	Spirogyra
2—	T.S. Fucus Vesiculosus, Male conceptacle
3—	T.S. Do. Female do.
4—	V.S. Apothecia of Parmelia parietina
5—	Penicillium glaucum (Pure culture)
6—	Puccinia graminis (Uredospores)
7—	Do. (Telutospores)
8—	Do. (Aecidiospores)
9—	V.S. Apothecia Peziza convexula
10—	V.S. Thallus, Marchantia polymorpha
11—	V.S. Sporangia, do.
12—	"Chara Sp.," Fruiting fronds
13—	Thallus of Fern, "Gymnogramma"
14—	V.S. of Thallus do.
15—	T.S. Vascular Bundle of "Pteris Aquilina"
16—	L.S. do.
17—	T.S. Stem of Equisetum telmateia
18—	Do. do. (Meristem tissue)
19—	T.S. Vegetative bud do.
20—	L.S. Do. do.
21—	L.S.—Lateral growing point
22—	T.S. Fertile head (Meristem tissue)
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24—	T.S. Stem of "Selaginella"
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26—	L.S. Ovule of "Gossypium"
27—	Young plant do.
28—	Do. do.
29—	L.S. Root of Bean, "Faba vulgaris"
30—	T.S. do. do.
31—	T.S. do. "Acorus calamus"
32—	T.S. do. Onion, "Allium cepa"
33—	L.S. do. do. (Karyokinesis)
34—	T.S. Apical-cell of Root of Fern, Aspidium
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36—	T.S. Radicals of a Grain of Barley
37—	Entire plant, Common Duckweed
38—	T.S. Root of Indian Corn
39—	T.S. Stem of Indian Corn
40—	L.S. Vascular Bundle of Indian Corn
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42—	T.S. Stem of "Gossypium," Cotton plant
43—	T.S. do. do.
44—	T.S. do. "Hippuris," Mare's tail
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46—	T.S. do. "Limnanth"
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TO make a complete study of a solid mass of tissue, Sections must be cut at different planes to each other, *viz.* :—Transverse, Radial-longitudinally, and Tangential-longitudinally. Each Section when placed under the Microscope will present to the observer a surface cut at right angles to each other.

DIAGRAM OF A DICOTYLEDONOUS STEM.

- 1—Tangential area, passing through the Bast Fibres, (see Nos. 51 to 53).
- 2—Tangential area, passing through the Xylem (wood).
- 3—Radial line, passing through the Pith.

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A, Filament in normal vegetative condition.

B, Filaments in conjugation.

2.—T.S. Male Conceptacle, "*Fucus vesiculosus*."

Limiting tissue of thallus.

Lining of conceptacle.

Mouth of conceptacle.

Protective hairs among which are distributed the antheridia.

3.—T.S. Female conceptacle, *fucus vesiculosus*.

Limiting tissue of thallus.

Protective hairs.
Oogonia in various stages of
development.
Mouth of conceptacle.

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Apothecia containing spores.

Mycelium.

Unicellular algæ.

Rhizoides or root-hairs.

5.—*Penicillium glaucum*.

— Mycelium of fungus.

— Conidiophores (fruiting bodies).

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Uredospores.
Mycelium of
fungus.

Disorganised
tissue of leaf

Disorganized
palisade layer.

Upper cuticle of
leaf.

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Attacked by teleutospores of
puccinia graminis.

8. T.S. Leaf of Berbery.

Attacked by aecidiaspores of *puccinia*
graminis.

9.—V.S. Apothecia, *Peziza convexula*.

10.—V.S. Thallus of "*Marchantia polymorpha*."

11.—V.S. Sporangia of *Marchantia polymorpha*. 12.—Fruiting Fronds, of "*Chara* sp."

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Primary ground tissue.

Endodermis.

Bast sheath.

Bast elements.
Spiral vessels.

Scalariform vessels

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Primary ground tissue

Sclerenchyma sheath

Bast elements.

Spiral vessels.

Scalariform vessels.

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18.—T.S. Stem of "*Equisetum telmateia*."

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33.—L.S. Root of Onion,
"Allium cepa "

Part of 32×200 showing
nucleus in various stages of
division (Karyokinesis).

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Sections 1-6, passing
through the same cell
at various planes in
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Sections 1-6, passing
through the same cell
at various planes in
longitudinal direction.

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Ground tissue.

Spiral vessels.

Annular vessel.

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Cambiform zone.

Developing vascular
bundles.

Primary vascular bundles

42. T.S. Stem of "Gossypium Sp." Cotton Plant.

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<i>e</i> Cortex.	<i>f</i> Cuticle.	<i>g</i> Medullary Rays.	<i>h</i> Resin Cells.

43. —T.L.S. Stem of "Gossypium Sp." Cotton Plant.

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45.—L.S. Stem, “*Hippuris vulgaris*,” Mare’s-tail

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67.—T.L.S. Stem (Timber) "*Pinus sylvestris*," Common pine.

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Stigma.

Fleshy pillar to which the anthers are attached.

The anthers containing pollen.

The petals and sepals.

Bract.

Ovary.

Ovules.

Apex of flower-stalk. (Thallamus.)

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Central axis.

Vascular system of catkin.

Anthers.

Flower-scales.

Filament.

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81.—T.S. Flower-bud of "*Papaver rhœas*," Common Corn poppy.

82.—T.S. Flower-bud, "*Cheiranthus cheiri*," Wallflower. 83.—T.S. Flower-bud, "*Iris germanica*," Purple iris.

84.—T.S. Flower-bud, "*Lilium croceum*," Orange lily.

85.—T.S. Anther of "*Lilium croceum*," Orange lily.

86.—T.S. Ovary of “*Lilium croceum*,” Orange Lily.

87.—Entire flower of Wheat, “*Triticum sativum*.”

88.—Stigma and Pollen of
"Triticum sativum," Wheat.

89.—Stigma and Pollen of
"Triticum sativum," X 180
(part of No. 88).

90. —L.S. Embryo-Sac, "*Triticum sativum*," Wheat. 91. L.S. Seed of "*Triticum sativum*," Wheat.

92.—L.S. Plumule of "*Triticum sativum*," Wheat.

93.—L.S. Radical of "*Triticum sativum*," Wheat.

94.—T.S. Seed of "*Triticum sativum*," portion enlarged. 95.—T.S. Cremocarp of "*Smyrniolum olusatrum*," Alexanders.

96.—Entire Capsule of “*Capsella bursa-pastoris*,” Shepherds-purse.

97.—Starch of “*Solanum tuberosum*,” Potato.

Starch of potato photographed with polarized light.

98.—T.S. Stem of "*Tradiscantia discolor*," *Tradiscantia*.

99.—T.S. Seed of "*Ricinus communis*," Castor Oil plant.

100.—T.S. Corm of "*Phajus grandifolius*," Orchid.

Vascular bundle

Ground tissue.

Starch and leucoplasts.

101.—L.S. Root of "*Taraxacum officinale*," Dandelion.

Sphaero-crystals of inuline deposited on cell walls, forming balls of various sizes.

102.—L.S. Stem of “*Euphorbia splendens*,” *Euphorbia*. 103.—L.S. Root, “*Scorzonera hispanica*.”

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