Rhynia

By

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Classification

Div. – Rhyniophyta

Class: Rhyniatae

Order: Rhyniales (Psilophytales)

Family: Rhyniaceae

Genus: *Rhynia* Kidston & Lang

Locality and Horizon

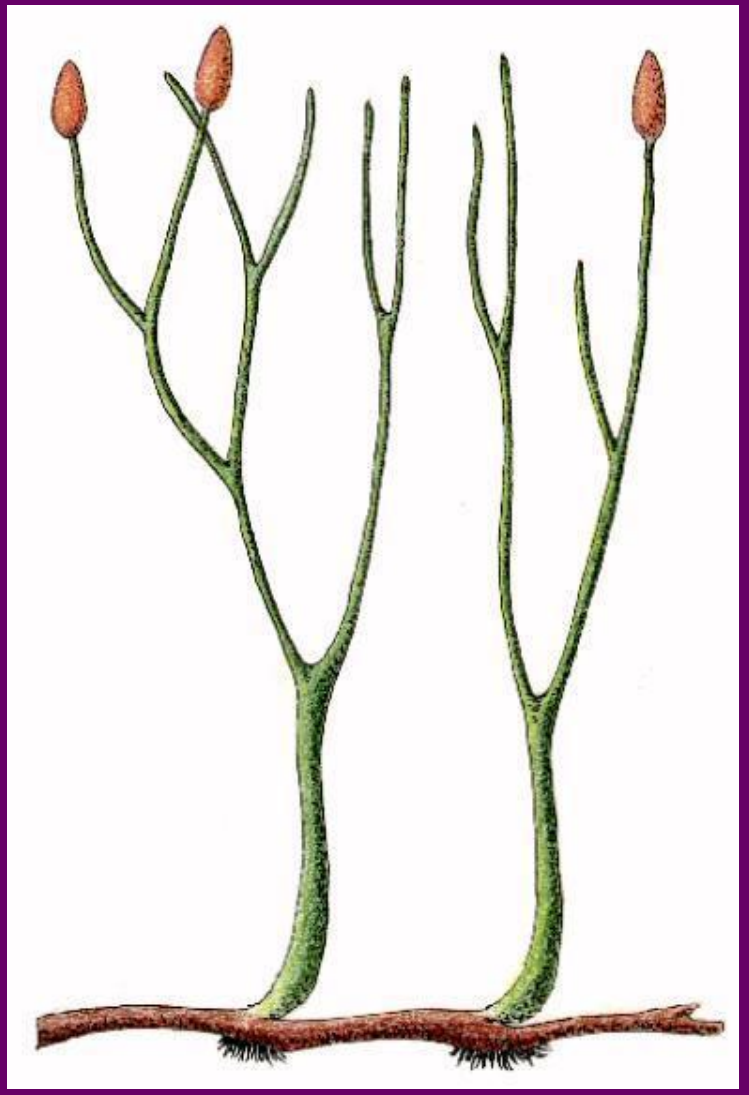
Locality: Old Red Sandstone bed of Rhynie Chert, Aberdenshire, Scotland, U.K.

Horizon: Middle Devonian (395-370 mya)

Type of fossil: Petrifaction, impregnated with silica

Habitat: Peaty habitat near volcano, Atmosphere charged with Sulfurous vapour, soil saturated with acid water

Reconstruction of *Rhynia major* (after Kidston and Lang, 1919)

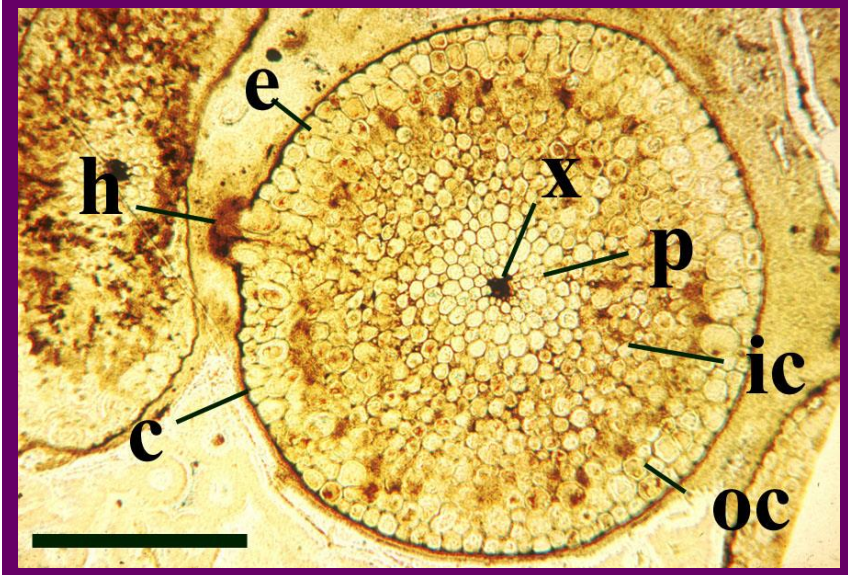


- **Height: 50 cm, Diam; 1.5-6mm**
- **Herbaceous**
- **Aerial stem dichotomous (photosynthetic)**
- **Leaves absent**
- **Roots replaced by rhizoids**
- **Sporangia terminal (12mm x 4 mm)**

Reconstruction of *Rhynia gwynnevaughanii (after* K & L)

- **Height: 20 cm, Diam.1-3mm**
- **Herbaceous**
- **Aerial stem dichotomous (photosynthetic)**
- **Leaves absent**
- **Adventitious branches (prophylls) on aerial shoot**
- **Roots replaced by rhizoids**
- **Sporangia terminal (smaller)**

T.S. Axis *Rhynia major*



Anatomy: (Rhizome/ Aerial stem):
Epidermis covered with cuticle, stomata present (absent in rhizome)
Outer cortex (Hypodermis): Parenchymatous (angular parenchyma), No intercellular space,
Inner cortex: photosynthetic, large intercellular space air spaces,
Stele: Protostele (Haplostele)
Xylem: Slender cylinder, tracheids? Annular or spriral, Protoxylem and metaxylem undifferentiated.

Rhizome: Stomata absent
Rhizoids develop from superficial cell of Rhizome
Cortex contains intercellular/ intracellular fungal hyphae of *Palaeomyces,* no photosynthetic cells

Aglaophyton major axes

Gametophyte of *Rhynia*

- Spores homosporous, thick walled with triradiate marks
- Gametophyte not definitely known
- Lyon (1957) described germinating spores from Rhynie chert. Multicellular structure at the tip of germ tube.

Controversy regarding morphological nature of *Rhynia gwynnevaughanii*

Gametophytic nature:

Merker (1958-59): Rhizomatous axis gametophytic and aerial shoot sporophytic

Prof. D.D.Pant (1962):

Axis gametophytic, sporangia not organically connected

- Stomata were regarded as neck cells of archegonia whose neck had been shed off
- Hemispherical projections were interpreted as developing sporophyte
- Haustorial cells were demonstrated at the base of hemispherical projection (developing sporophyte) to derive nutrition

Lemoigne (1968): demonstrated archegonia in rhizomatous axis and supported view of Prof. Pant

Sporophytic nature

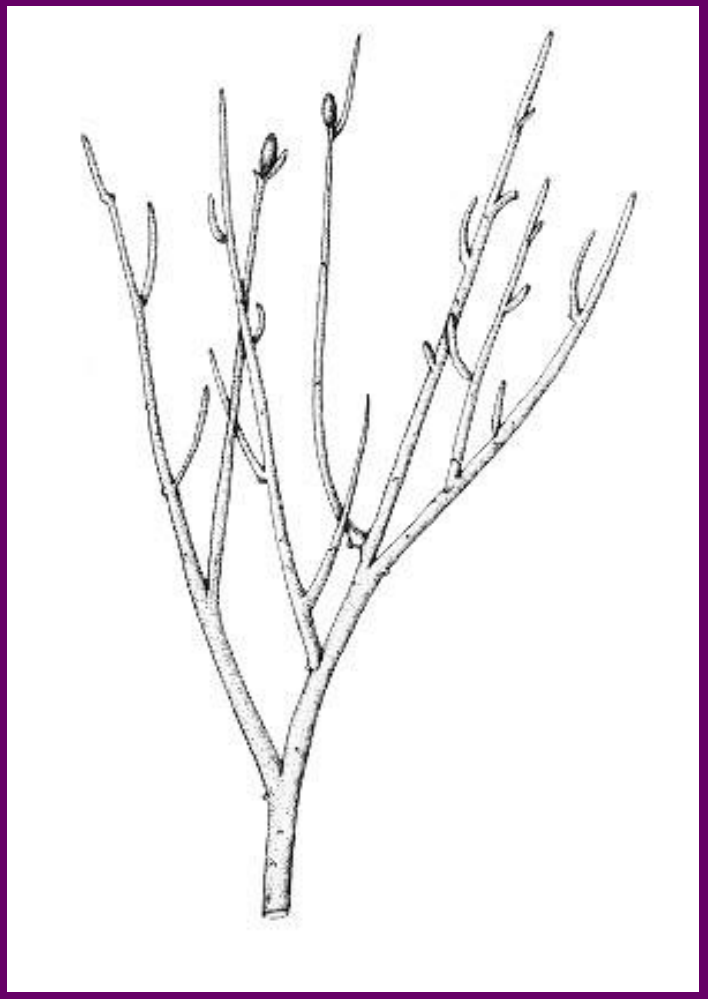
- **Chaloner (1968) : Pointed out the marked absence of demonstration of antheridia**
- **Bierhorst (1971): regarded the so called stomata as hydathodes**
- **Mehra (1976): opposed such a large gametophyte in a primitive plant like *Rhyia***
- **Edward (1980, 1986) :Found organically connected sporangia with the axes of *Rhynia gwynnevaughanii.***

Change of nomenclature
Rhynia major---Aglaophyton major by Edwards

Reasons:

- **Edwards (1986) regarded Rhynia major is not a vascular plant since it lacks true xylem and phloem. It has hydroid (working as xylem) and leptoid (working as phloem) like bryophytes.**
- **It does not resemble any bryophyte or pteridophyte**
- **It is regarded as intermediate between bryophytes and pteridophytes**

New Reconstruction of *Rhynia gwynnevaughanii* by Edwards



Peculiar feature

Rizhome absent

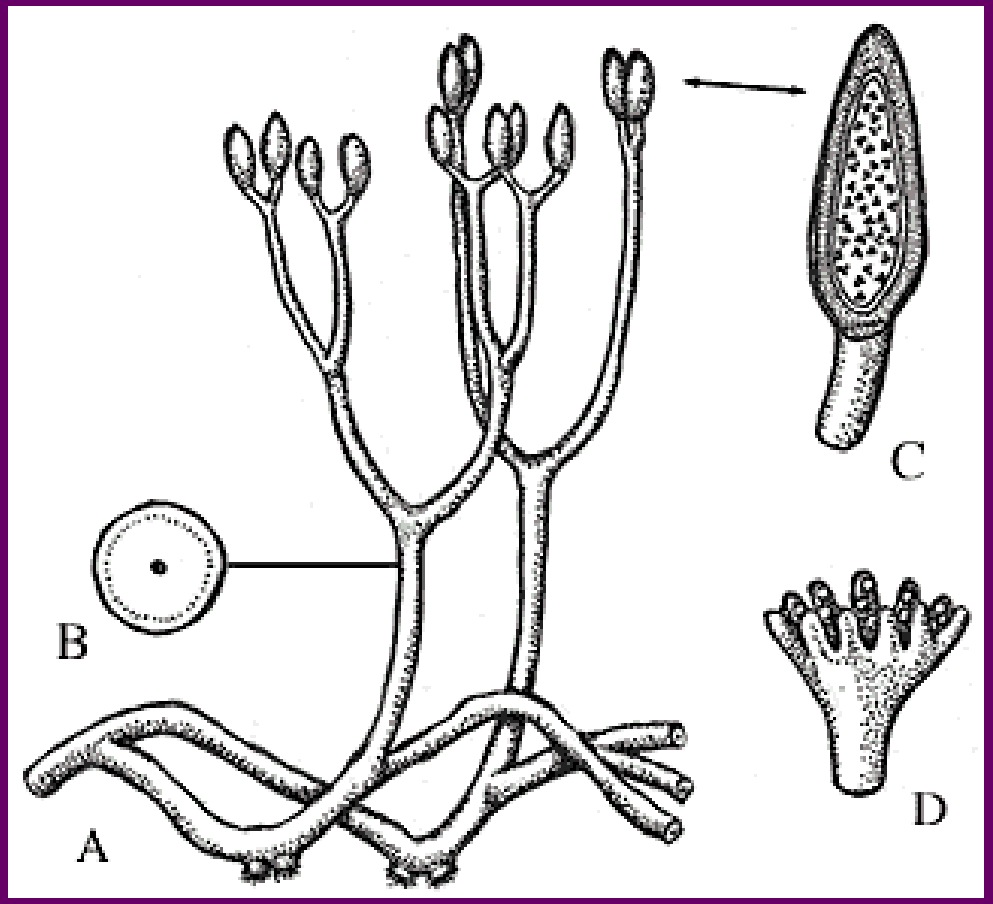
Premature fall of sporangia (very Few sporangia are seen)

Sporangia leave abscission scar

Adventitious branches leave scar

Aglaophyton major

new name for Rhynia major and new reconstruction by Edwards



Aglaophyton major was the sporophyte generation of a diplohaplontic, pre-vascular, axial, free-sporing land plant of the Lower Devonian (Pragian stage, around 410 *mya*). It had anatomical features intermediate between those of thebryophytes and vascular plants or tracheophytes.

Peculiar features:

Rhizome arched,
wide angle dichotomy-
20-33 degree,
Sporangia at short distance above dichotomy,

Axis twisted below sporangia

Life cycle *Aglaophyton major*

Gametophyte of *Aglaophyton:* ***Lyonophyton rhyniensis*** Remy & Remy, 1980

Dioecious gametophytes *Lyonophyton rhyniensis* (Remy and Hass, 1980b). This free-living gametophyte consists of an aerial axis that widens and terminates in a conspicuous cup-like structure which bears either antheridia or archegonia. Although smaller in size, the axis of the gametophyte is very similar to the sporophyte in its anatomy

Gametophyte of Rhynia : *Remyophyton delicatum*

(Kerp et al., 2004)

Remyophyton delicatum
(Kerp et al., 2004)

- **Gametophyte of Rhynia**
- **Both male and female structure known**
- **Small axis with projection bearing antheridia or archegonia in terminal cup**
- **Dioecious gametophyte, Axis 0.4-0.6 cm x 0.24-0.42 cm, vascular unlike modern gametophytes of pteridophytes except Psilotum. Weiss (2010) *Rhynia* gametophyte might have been larger and vascular with S-type tracheids.**
- **Pedicel legnth 0.04-0.09 cm of disc**

Antheridia and archegonia on flat top of axis.

New reconstruction of *Aglaophyton major*