Clubmosses belong to the group of plants called Lycophytes, spore-bearing plants that separated from ferns and seed-bearing plants more than 360 million years ago.

This group included tree-like plants in pre-historic times, like the one on the left, a Lepidodendron. They could grow to 45 metres high!

Today in Britain clubmosses are small plants found in mountain areas.

Clubmosses have simple leaves, with spores all the same size, in sporangia attached to the base of leaves at the top of the stem in Fir clubmoss, or in cones, as in Stag’s horn and Alpine clubmosses.

The spores need darkness to germinate, and then form large prothalli underground, in association with fungi that are called Mycorrhiza.

It may take years for the prothalli to produce male and female organs. A new plant develops following fertilisation of an egg by a sperm.

You can see a fossil clubmoss forest in the Museum’s fossil gallery.
Lycopodium Spores

The Stag’s horn clubmoss *Lycopodium clavatum* has *spores* that are very oily. The oil provides energy for the spore to grow into an underground *prothallus*.

The spores are shed from the *strobili* that grow on the tips of the shoots.

The oiliness of the spores makes them repel water. **Push your finger gently into the beaker of water covered with spores. What do you notice when you take your finger out?**

Your finger didn’t get wet because of the high surface tension of water, and because the spores repel water so well. They used to be used in medicine to coat pills to stop them from sticking together.

The high oil content also makes the spores burn very easily and brightly. Early photographers used to use them in flash powder.

Lycopodium powder is still used in Chinese medicine to treat some skin conditions. It is also available for use in ‘magic’ tricks involving bursts of flame.

Unlike *pollen* produced from flowering plants, Lycopodium powder does not cause hay-fever. Pollens have *proteins* on their surface that may trigger allergic reactions. The water-repellant oily coat of Lycopodium spores does not have these surface proteins.
Horsetails, or *Equisetums*, are closely related to ferns. They were very numerous more than 300 million years ago. Some grew to the size of trees, like the *Calamites* to the left.

Their leaves are reduced to *scales*. Some have branches and some just have stems.

Horsetails have extensive underground *rhizomes*. They can regenerate from small pieces of rhizome.

Horsetails produce *spores* in *cones* at the tops of the *spikes*. Two British horsetails have separate *fertile spikes* that are not green, the Field and the Giant Horsetails.

The spores have little arms called *elaters*. These help the spores to be carried on the wind. They curl up when the air is moist to allow the spore to fall to the ground.

The spores grow into *prothalli*, with male and female organs. A new plant develops from a fertilised egg, as in ferns.

Have a look at the spores under the microscope.
Dancing Spores

Look down the microscope and you will see the spores of a horsetail (Equisetum).

Each spore has four arms called elaters.

Ask someone to breathe GENTLY on the spores or say “Hello spores” whilst you watch through the microscope.

What happens?

When the air is dry, the elaters are spread out and help the spore to be carried on the wind.

When there is moisture in the air, the elaters wrap round the spore so that it will fall to the ground.

The spores need moisture to germinate, so the elaters work to spread the spores to a suitable place for germination.

Watch through the microscope to see what happens when the spores dry out.

The spores of the Field Horse-tail, Equisetum arvense, are released from cones at the top of the fertile spikes, which are not green.
Moonwort and Adder’s tongues are usually called ‘ferns’, but their ancestors may have divided from those of true ferns before the horsetails’ ancestors did.

They have an underground rhizome, small green fronds, and a separate fertile frond.

Unlike most true ferns, the young fronds are not coiled.

The spores are made in sporangia on the fertile fronds. The spores need darkness to germinate into a prothallus, which then needs help from a fungus in order to grow.

The prothallus can live for up to 20 years in the soil. Male and female organs form on the prothallus. When a sperm fertilises an egg a new plant can grow.

Moonworts were thought to have magical properties, such as being a key to open any lock, or causing horses to lose their shoes!
The Quillwort family divided from the ferns more than 360 million years ago.

Common quillwort, *Isoetes lacustris*, grows at the bottom of upland lakes, in water with very little nutrient.

Quillwort leaves have four air chambers that run the length of the leaf.

They have spore cases at the bottom of the leaves. The leaves are often washed up on to the lake shore.

The spores are shed when the leaves separate from the plant. Like fern spores, they grow into prothalli, but there are separate male and female prothalli.

Sperm swim from the male prothalli to fertilise eggs on the female ones, then a new quillwort plant grows.
Spikemosses are different from clubmosses in that they have two different sizes of spores, contained in microsporangia and megasporangia at the bases of leaves called sporophylls.

Like the clubmosses, spikemosses or Selaginellas also belong to the group of plants called Lycophytes.

There are about 700 species world-wide, but only one British native species, Selaginella selaginoides, known as Lesser clubmoss.

The microspores develop into male prothalli, and the megaspores into female prothalli.

The sperm have to swim to the female prothalli to fertilise the eggs, following which new plants can grow.
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SOCIETY

FERNS TO GROW IN YOUR GARDEN

Dryopteris wallichiana
Blechnum chilense
Polypodium vulgare
'‘Trichomanoides Backhouse’'
Onoclea sensibilis
Adiantum pedatum
Dicksonia antartica
Athyrium filix-femina 'Cristatatum Group'
Polystichum proliferum
Osmunda regalis
Asplenium scolopendrium 'Bolton's Nobile'
Athyrium x Ghost
Matteucia struthiopteris
Dryopteris wallichiana
Cheilanthes lindheimeri
Gymnocarpium dryopteris 'Plumosum'
Polystichum setiferum 'Bevis Group'
Dryopteris sieboldii
Athyrium nipponicum 'Pictum'
Athyrium x Ghost
Woodwardia radicans
www.ebps.org.uk

Photographs: Yvonne Golding
Linda Greening
Michael Hayward
THE BRITISH PTERIDOLOGICAL SOCIETY

SOME BRITISH NATIVE FERNS

www.ebps.org.uk
The British Pteridological Society for Fern Enthusiasts

The Society was originally founded in 1891 in the English Lake District but today it has members worldwide. The objects of the Society are to promote all aspects of pteridology by encouraging the appreciation, conservation, cultivation and scientific study of ferns, horsetails, clubmosses, selaginellas and quillworts through publications, meetings, the provision of grants and other appropriate means.

**Benefits of Membership**
- Four publications a year:
  - *Pteridologist* – a full colour magazine.
  - *Bulletin* – an annual account of the Society's activities.
  - *The Fern Gazette* – a twice yearly peer reviewed scientific journal.
  - Occasional Special Publications.
- Book sales, new and second hand.
- Society merchandise.
- Free spores and plant exchange.  

**Benefits of Membership**
- Field meetings led by experts throughout the UK and abroad.
- Indoor meetings, workshops and lectures on all aspects of pteridology.
- AGM which moves around the UK.
- Visits to gardens and nurseries.
- Horticultural advice.
- The opportunity to take part in surveys and help record ferns to inform conservation strategies.
- The provision of grants for scientific and horticultural research.

Membership is open to anyone with an interest in ferns and pteridology. Please write for details to:
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