



The World of Lichens

Alan Potter

From Algae and Fungi



To a new life-form – Lichens

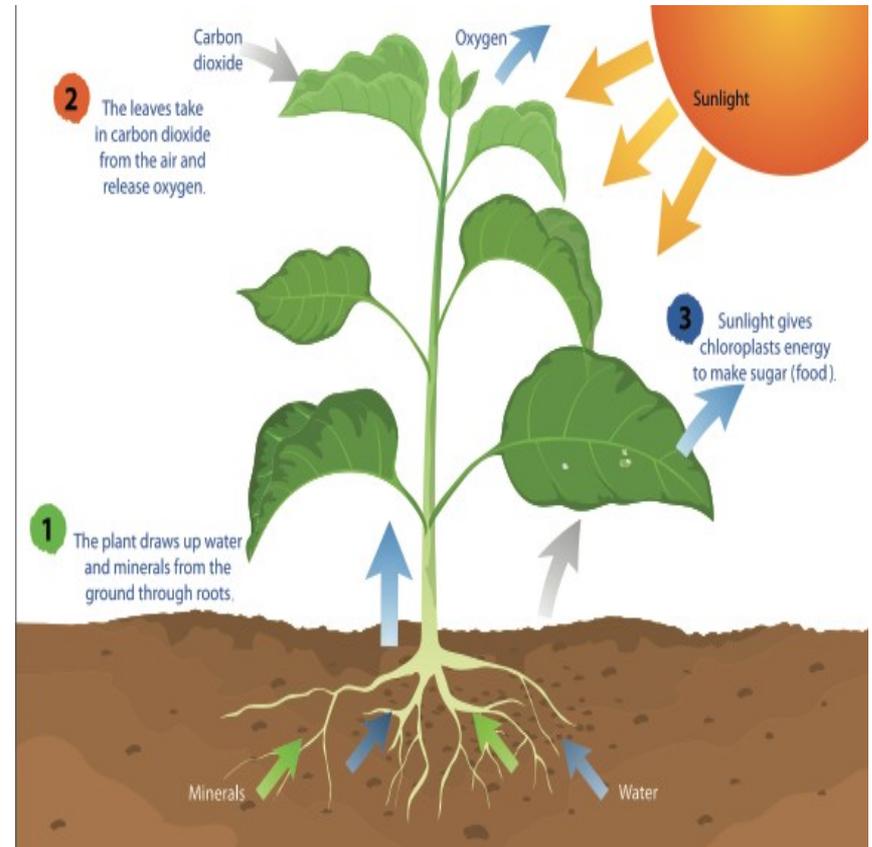


What are Lichens ?

- A lichen is not a single organism. It is, in fact, a `mini-ecosystem consisting of at least two organisms; a fungus (mycobiont) and a photosynthetic partner (photobiont).
- The photobiont, which contains chlorophyll, may be either a green alga or belong to an entirely different kingdom – a cyanobacterium (these are bacteria that contain a blue-green photosynthetic pigment).
- They are symbiotic (are in symbiosis) – where two or more organisms living in a close physical partnership. Typically to the benefit of both.

Photosynthesis

Photosynthesis is the process by which green plants and some other organisms use sunlight to synthesize nutrients (food) from carbon dioxide and water. Photosynthesis in plants generally involves the green pigment chlorophyll and generates oxygen as a by-product.



Fungi

- A fungus is any member of the group of eukaryotic organisms (with cells containing organelles such as a nucleus and mitochondria) that includes microorganisms such as yeasts and molds, as well as toadstools and mushrooms.
- These organisms are classified as a kingdom, which is separate from the other eukaryotic life kingdoms namely plants, animals and protozoa.



Algae

Algae are a diverse group of aquatic organisms that have the ability to conduct photosynthesis.

Certain **algae** are familiar to most people; for instance, seaweeds (such as kelp or phytoplankton), pond scum or the **algal** blooms in lakes.

Such **algal** blooms are often described as **looking like** pea soup or spilled green paint. However, blooms aren't always large and dense and can sometimes cover small portions of the lake, trees or walls with little visible **algae** present.



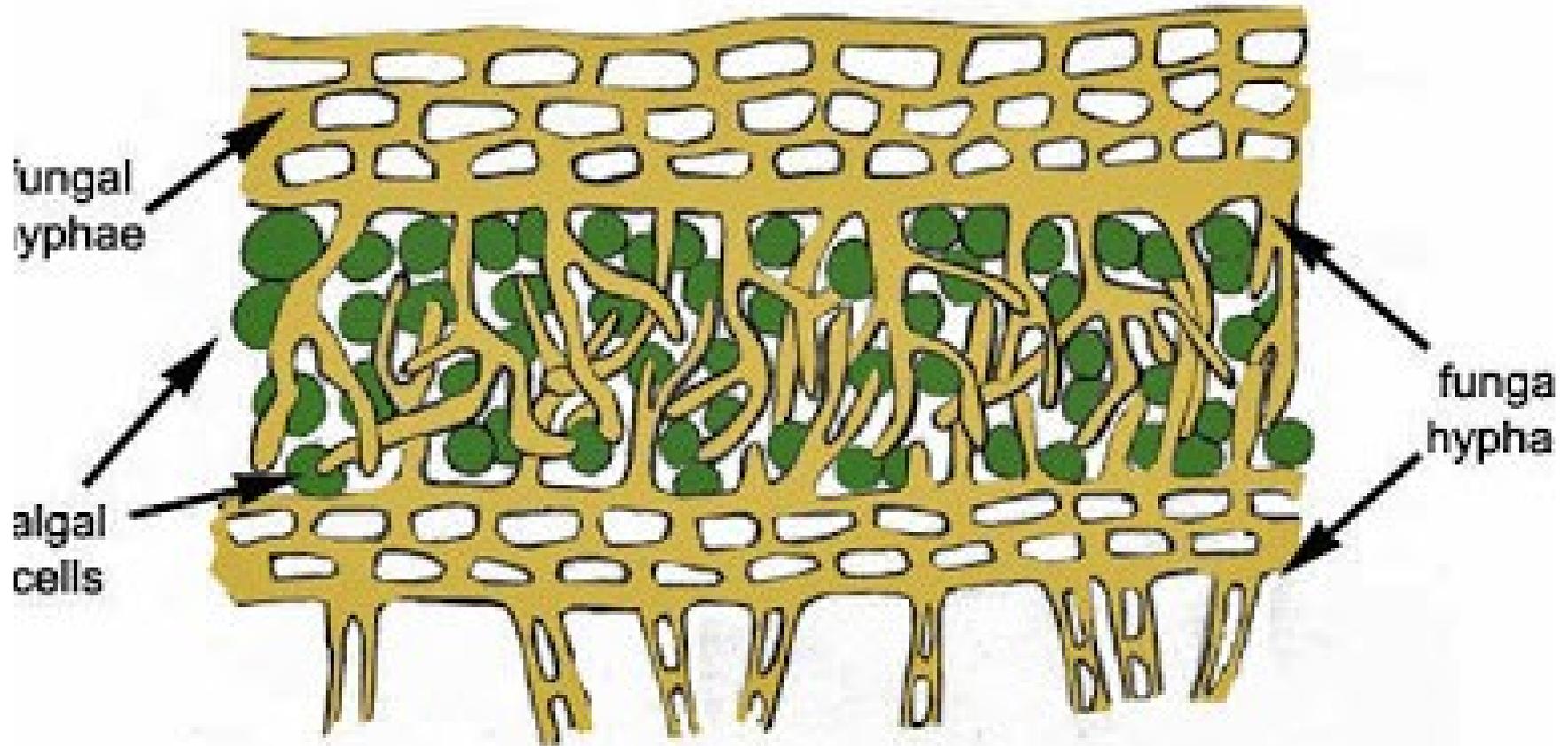
Cyanobacteria

Cyanobacteria are a division of microorganisms that are related to the bacteria but are capable of photosynthesis. They are prokaryotic (lacking a distinct nucleus and other organelles) and represent the earliest known form of life on the earth.

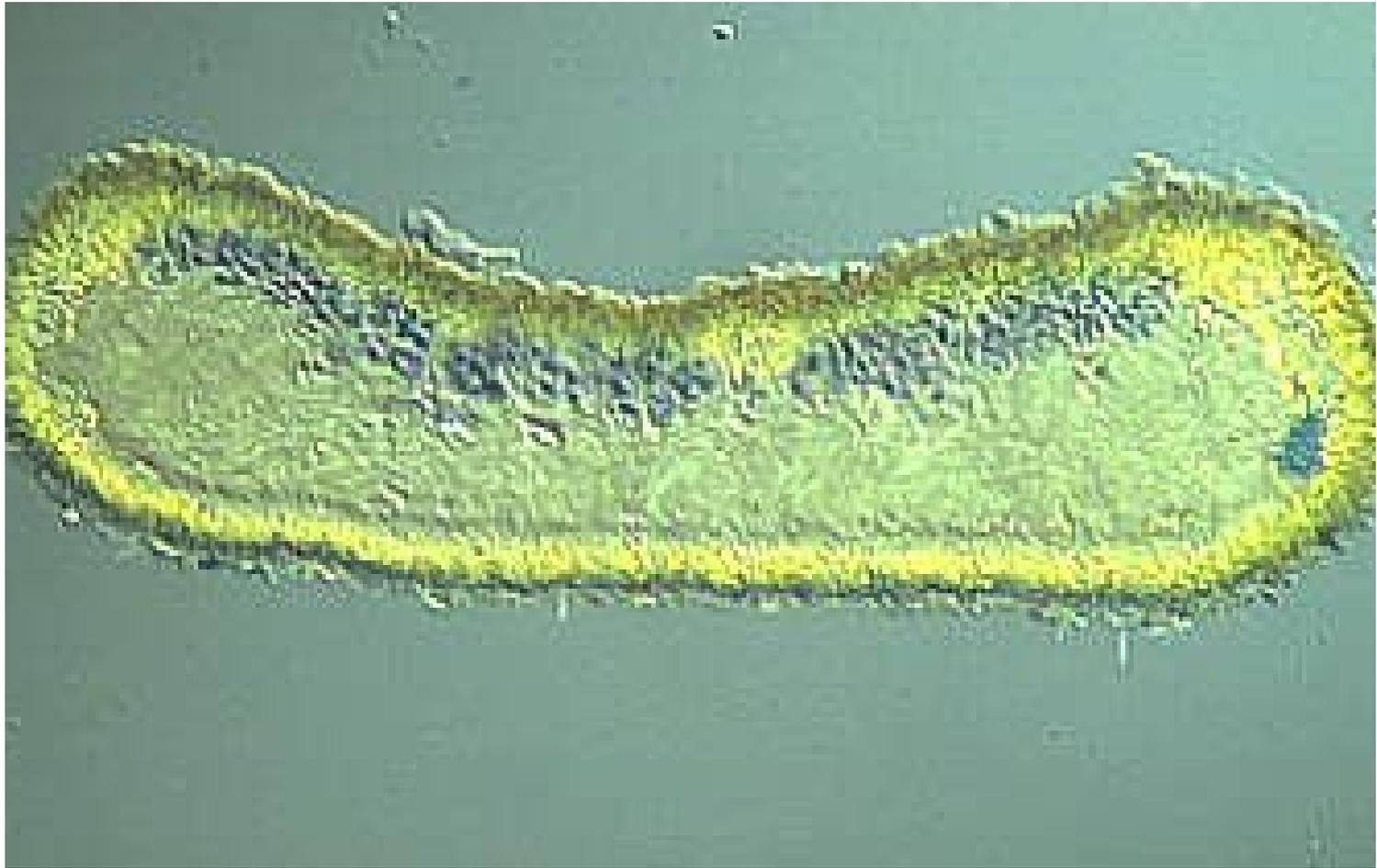
Because they are bacteria, they are quite small and usually unicellular, though they often grow in colonies large enough to see. They have the distinction of being the oldest known fossils, more than 3.5 billion years old



Lichens - Organisms Working Together



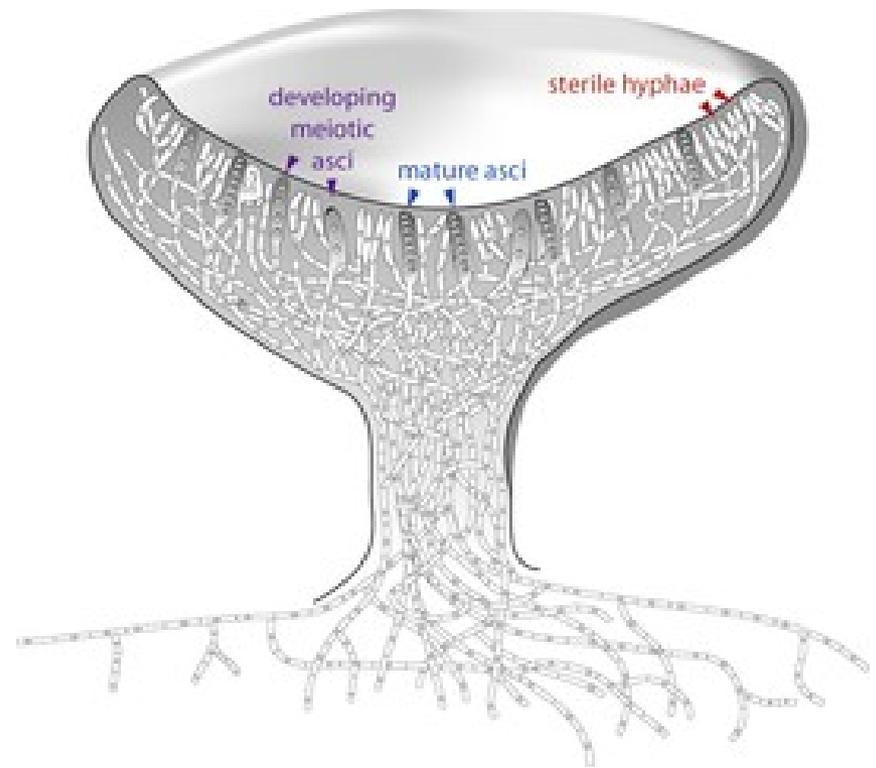
A Typical Cross-section View



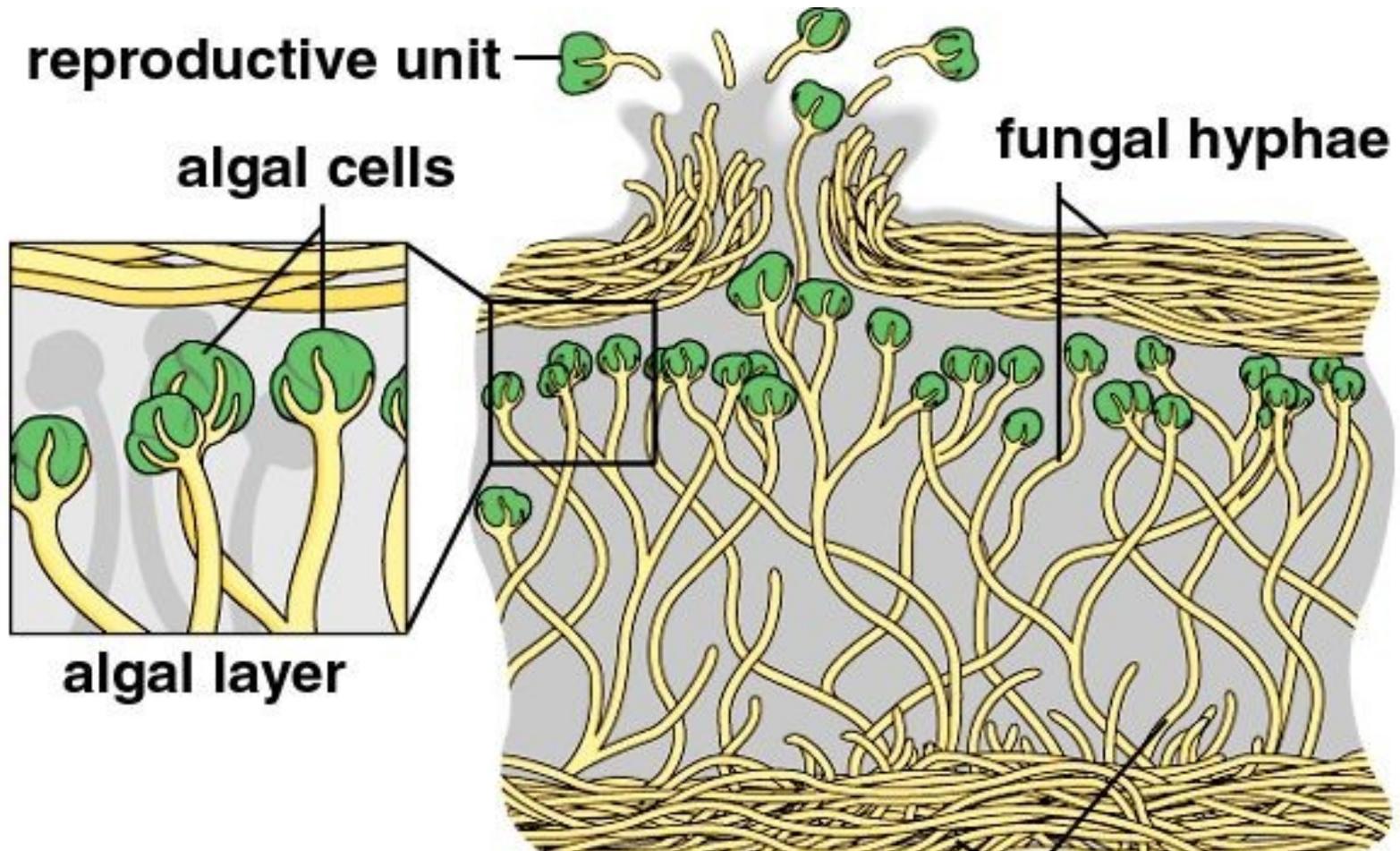
Reproduction

Lichen associations can **reproduce** in two main ways:

1. Sexual **reproduction** and spore production by the fungi, followed by re-association with a photobiont.
2. Vegetative, or clonal, **reproduction**, when both partners disperse together, maintaining a symbiotic relationship across generations.



Modeling lichen Reproduction



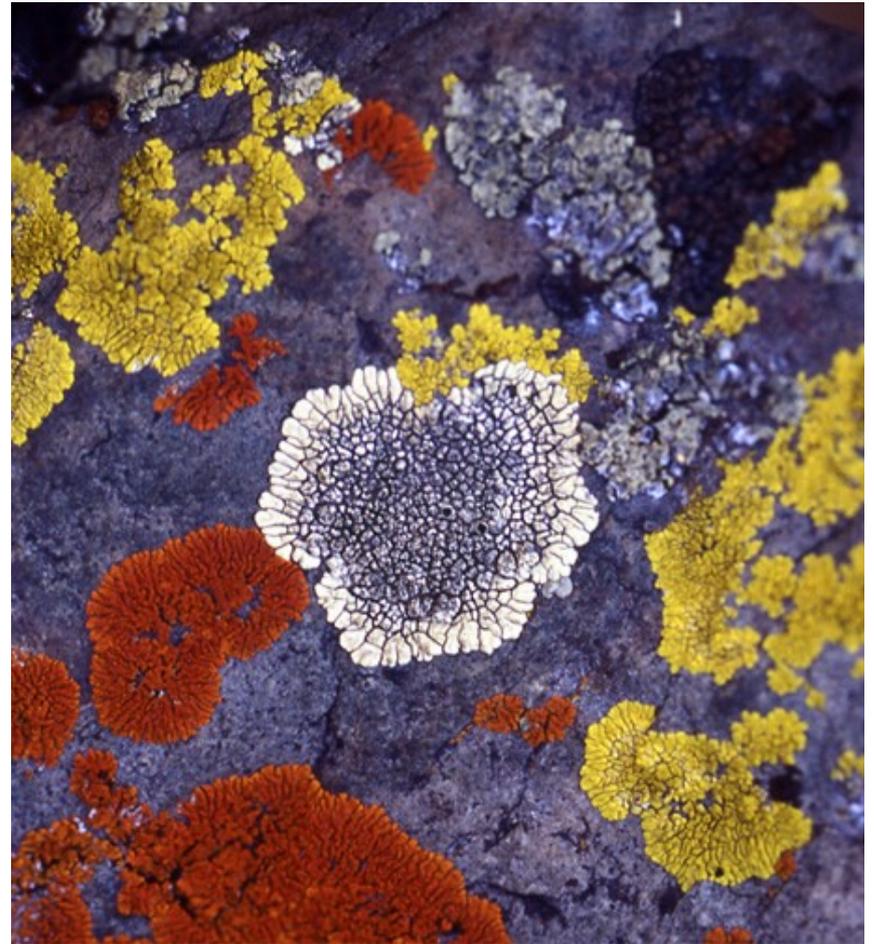
Fruiting Bodies

- The structure of the fruiting bodies and of the asci and spores themselves is the basis of most **lichen** classification. The “**fruiting bodies**” are often long-lived and continue to produce spores for many years, while others are seen briefly when conditions are cool, and moist



Lichen Colouration

Lichens come in many **colours**. Coloration is usually determined by the photosynthetic component. Special pigments, such as yellow usnic acid, give **lichens** a variety of **colours**, including reds, oranges, yellows, and browns, especially in exposed, dry habitats.



Benefits to the Fungi

The lichen needs carbon to make food like sugars and the algae can provide this through photosynthesis. It takes carbon dioxide gas from the air and together with water uses the sun's energy to make food for the whole plant. It does not need soil to live and can take other nutrients from the air



Benefits to the Algae / Cyanobacteria

The lichen is able to live in environments that algae or cyanobacteria alone would not be able to survive in. It can live in very dry areas such as deserts, wet areas such as marshes, salt water areas such as by the sea, very cold areas such as the arctic or where there is very little air such as at the very tops of the highest mountains on earth.



This togetherness is called Mutualism

- A lichen therefore is not a plant – it is an association between a fungus and an algae and/or a cyanobacterium.
- It forms an entirely new living system, which can now live and reproduce in a variety of new settings.
- The symbionts together benefit in different ways.
- They are very slow growing and cause no harm to anything.
- They often go unnoticed but have great variety and beauty.

They are found in ... Woodlands



... on Rocks



... on Stonework

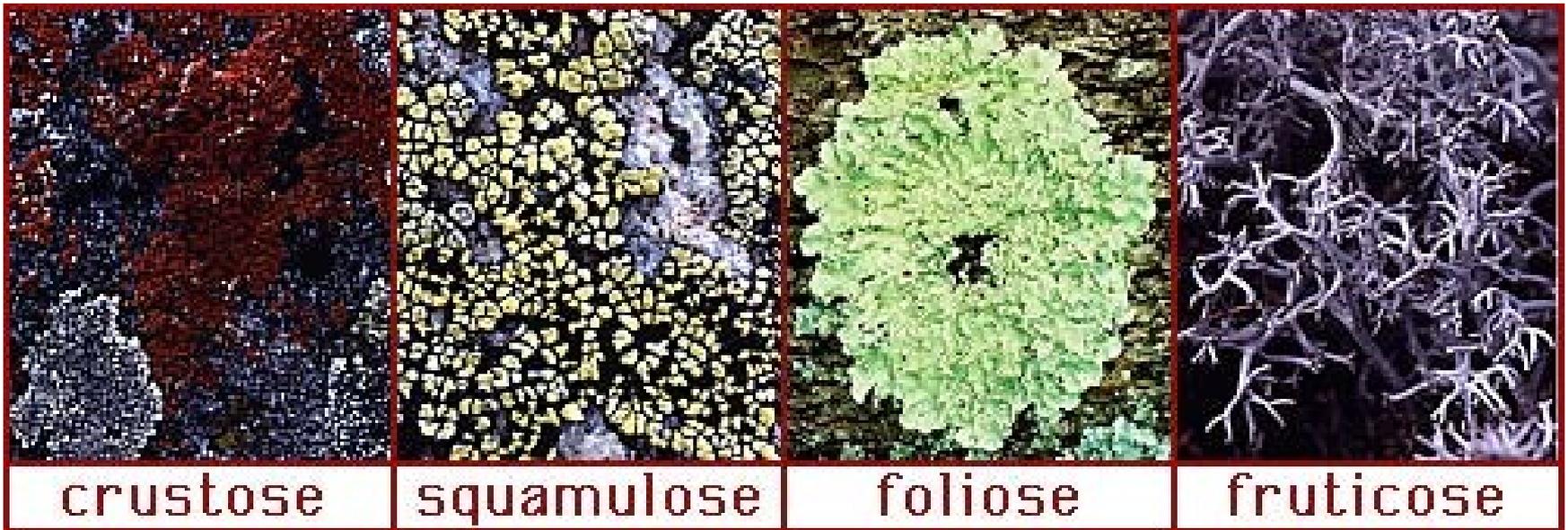


Lichens are Classified using Latin Names

- Like your **name**, Latin **names** have two parts. The first part is the **name** of the genus in which closely related **lichens** belong, like your surname (e.g. Xanthoria).
- The second part is the species **name**, like your first **name**, which belongs to organisms sharing the same features (e.g. parietina).



Four Varieties or Types of Lichens



Crustose – appear like a ‘crust’



Squamulose – like tiny ‘squares’ together



Foliose - are like 'folding leaves'



Fruticose – like small ‘fruit bushes’



Using Lichens to testing for Acids



Arctic Lichen Sustains Reindeer



Lichens are used in Dyeing



Other Uses for Lichens

As Medicines

Especially such as antibiotics and ointments

As Cosmetics

Especially as perfumes and body lotions

As Animal Bedding

Especially for farm animals and kept birds

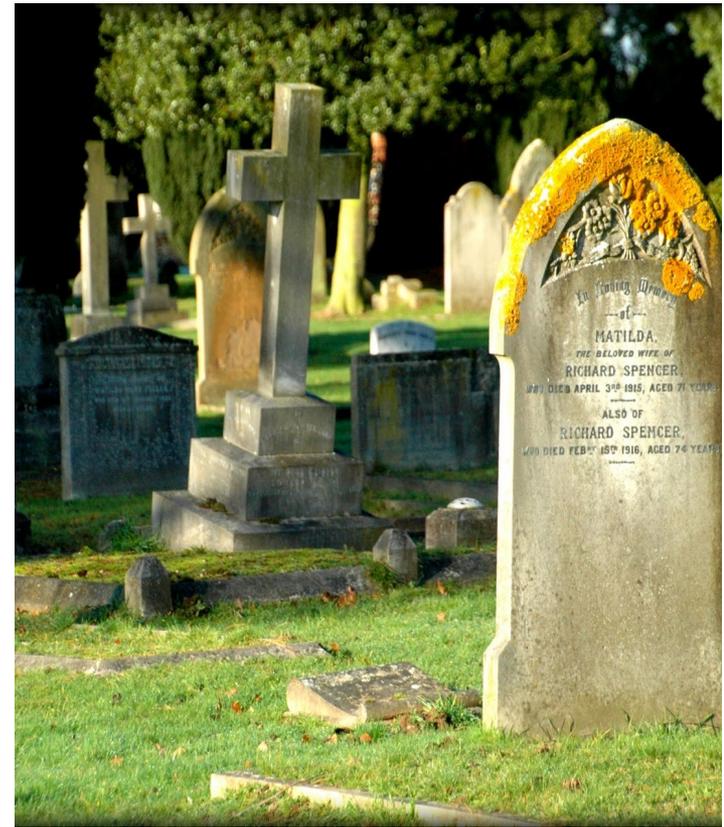
As Pollution Monitors

Especially in industrial towns and cities

As Habitats and Shelter

Especially for insects vital to the food chain

Telling the Age of Lichens



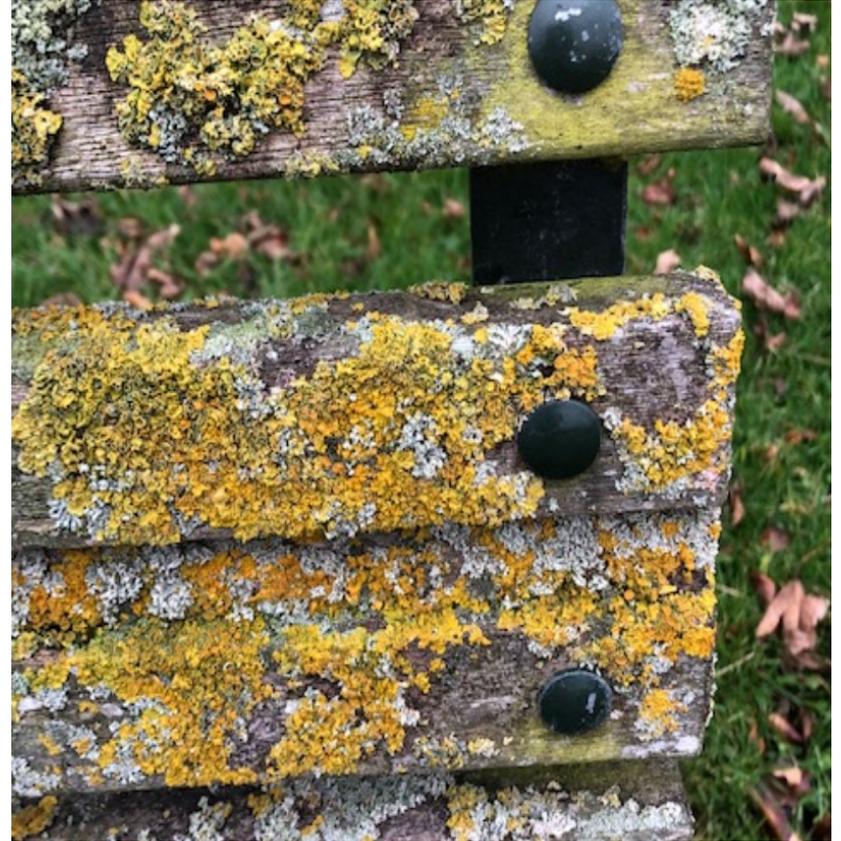
In the Botanic Gardens (Southport)



On Lord Street (Southport)



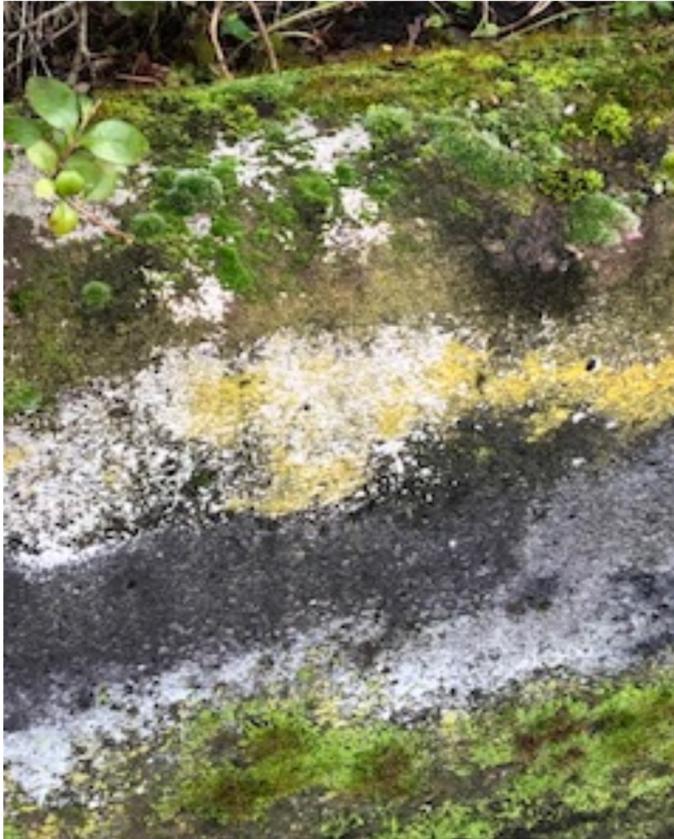
At Lakeside (Southport)



On the Marine Way Bridge (2004)



In Hesketh Park (Southport)



An Interesting Future for Lichens



Next Steps

- Enjoy spotting lichens
- Recognising their types
- Seeing sizes and shapes
- Looking at specific parts
- Identifying patterns
 - substrates types
 - height from the floor
 - geographical position
 - seasonal changes
 - as pollution monitors
- As specific genres



Seven lessons for us from Lichens

- Be Better Together
- Give Mutual Benefits
- Pioneer – Start Anew
- Resist Rapid Change
- Always Be Resilient
- Do No Harm
- Show Your Beauty



A Timely Contemplation from Bill Bryson

It is easy to overlook this thought that life just is.

As humans we are inclined to feel that life must have a point. We have plans and aspirations and desires. We want to take constant advantage of the intoxicating existence we've been endowed with. But what's life to a lichen ? Yet its impulse to exist, to be, is every bit as strong as ours - arguably even stronger. If I were told that I had to spend decades being a furry growth on a rock in the woods, I believe I would lose the will to go on. Lichens don't. Like virtually all living things, they will suffer any hardship, endure any insult, for a moment's additional existence. In short, it is enough just to be.