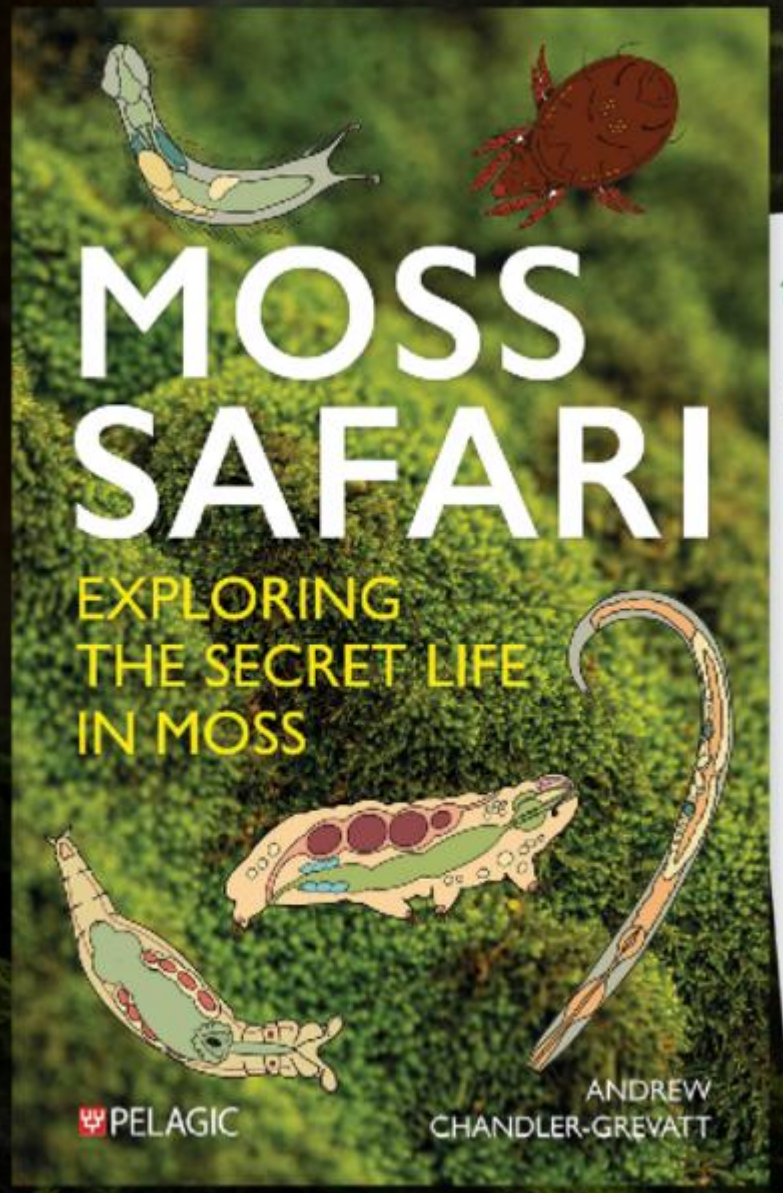


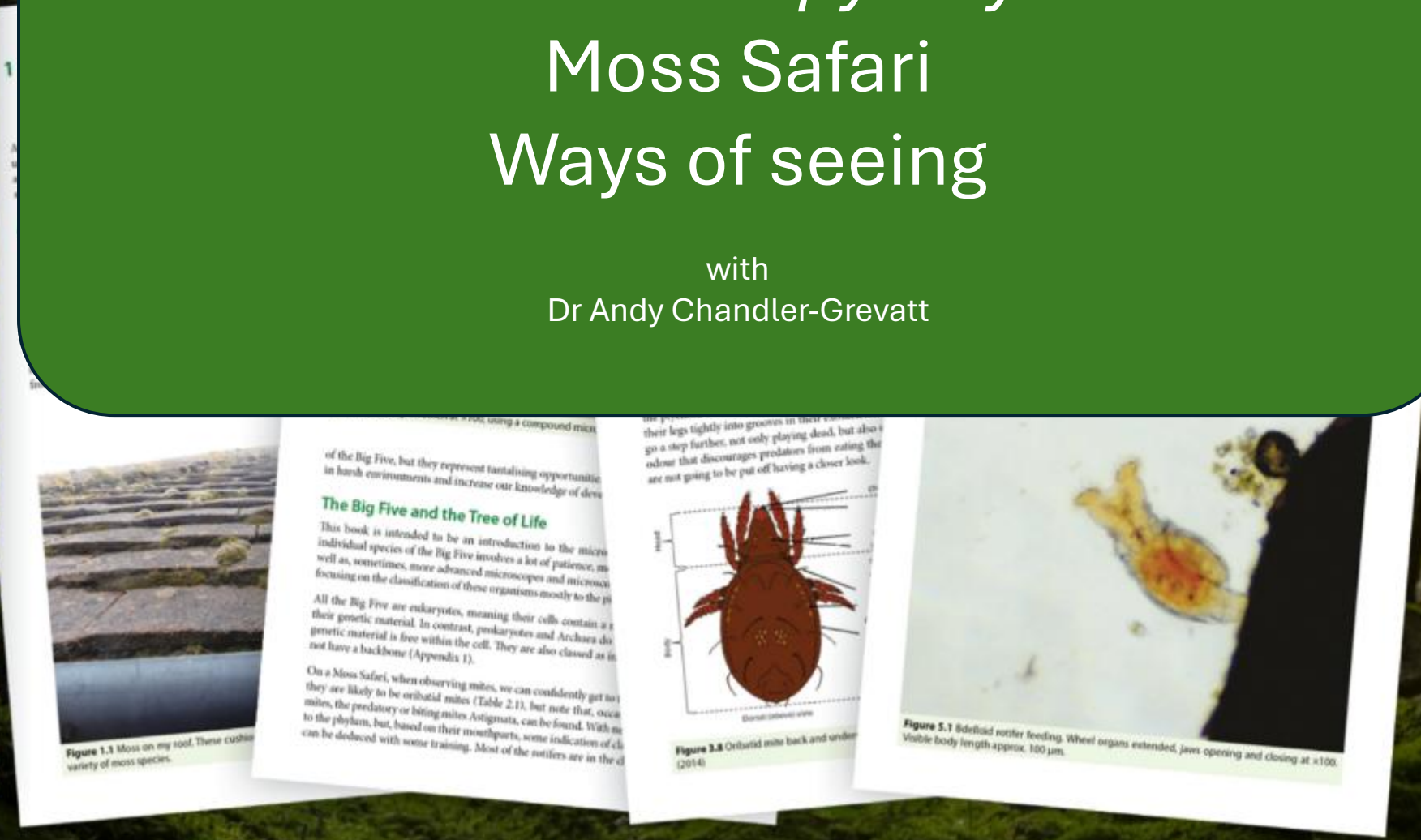
World Microscopy Day 2026

Moss Safari

Ways of seeing

with

Dr Andy Chandler-Grevatt



Session Outcomes

Revisit Moss Safari as a teaching strategy

Consider not just what we see but *how* we see

Present a framework to highlight how we might see the natural/microscopic world

Challenge assumptions and questions about how we see and how we encourage others to see.

Techniques: Sampling

Moss squeeze: Pipette

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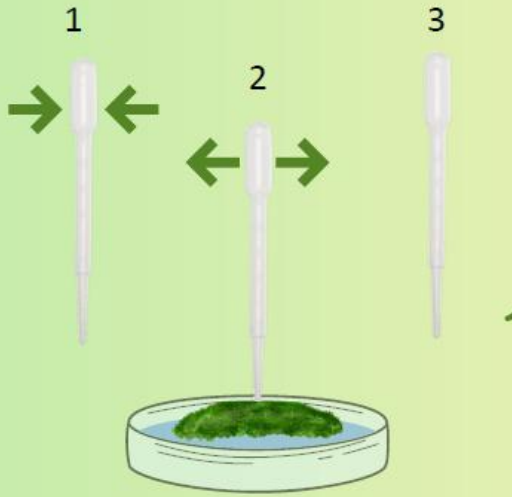
Promote microscopy
Inspire STEM

Stage 1: Collect

If the moss is not wet, soak it in mineral water for at least 24 hours.

1. Squeeze the pipette bulb.
2. Place pipette tip into the wet moss. Release the bulb, so it sucks up some water.
3. Raise the pipette and sample. Hold it vertical for 30 seconds.

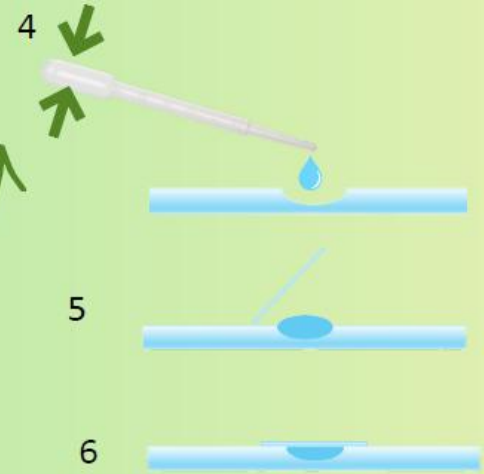


Wash your hands after handling moss

Stage 2: Prepare

Lay a glass 'dimple' microscope slide on a flat surface. Have a clean coverslip ready.

4. Squeeze 3-4 drops of sample into the dimple on the glass slide.
5. Take a cover slip and place an edge next to the sample.
6. Carefully lower the coverslip onto the sample.

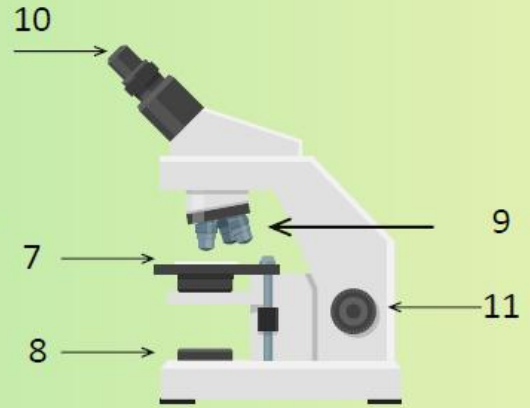


Clear up and dispose of broken glass carefully and responsibly

Stage 3: Observe

Observe at magnifications x40 to search and x100 for more detailed view.

7. Place the prepared slide on the stage, with the dimple over the hole.
8. Switch on the light source.
9. Set the objective to the lowest magnification.
10. Look through the eye piece.
11. Use the focus knob to lower the stage and get the sample into focus.



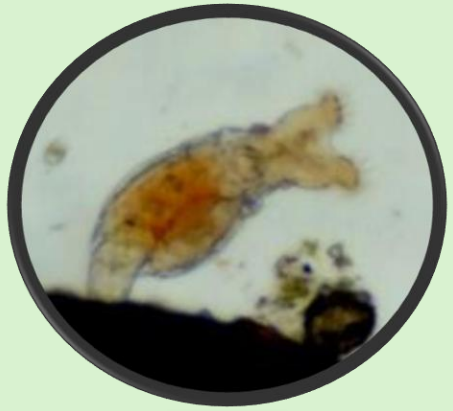
While looking through the eye piece, always lower the stage to focus.

The microscopic Big Five

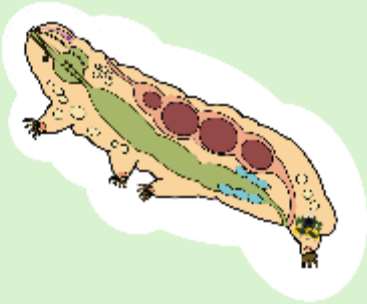
Oribatid mite

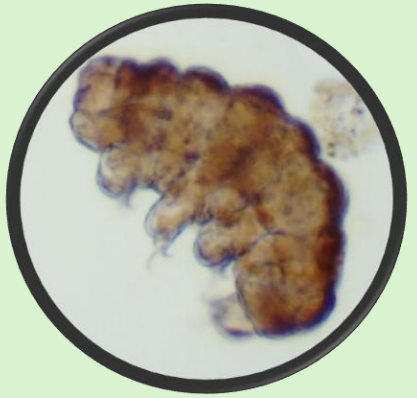
Nematode

Rotifer



Tardigrade





Gastrotrich

Microscopic Big Five Identification

Doing your Moss Safari: Identification (Beginner)

The microscopic Big Five at 40 x

Look through your microscope at magnification 40 x.
Read the descriptions carefully and look at the pictures to identify the animal you have found.

Mites
Look for:
- A dark pear shaped body
- 8 legs with hooks on the end
- Long hairs on the body and legs

SEEN

Nematodes (thread worms)
Look for:
- A long worm
- Pointed head end
- A see through body with darker patches

SEEN

Rotifers (wheel animals)
Look for:
- A crawling worm-shaped
- Sometimes two open 'wheel organs'
- Two toes at the end of the body

SEEN

Tardigrades (water bears)
Look for:
- A sausage-shaped body
- 8 short legs with claws
- A pointed 'snout' shaped mouth

SEEN

Gastrotrichs (hairy bellies)
Look for:
- A hairy flat worm
- A forked tail
- Fast and graceful swimming

SEEN

Find out more at www.mosssafari.com

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Doing your Moss Safari: Identification (Intermediate)

The microscopic Big Five at 40x

These five multicellular organisms are commonly found in moss. Read the descriptions carefully and look at the pictures to identify the animal you have found. Images are not to scale.

Mites
Look for:
- A dark pear-shaped body
- 8 legs with hooks on the end
- Long hairs on the body and legs
- Legs can be moving or tucked away

SEEN
Length range 0.4-1.0 mm

Nematodes (thread worms)
Look for:
- A long worm
- Pointed head end
- See-through body with a darker gut
- Eggs may be seen in the body as ovals

SEEN
Length range 0.4-1.0 mm

Rotifers (wheel animals)
Look for:
- A crawling worm-shaped
- Sometimes two 'wheel organs' open
- Two toes at the end of the body
- Egg may be seen in body as a dark oval

SEEN
Length range 0.2-0.6 mm

Tardigrades (water bears)
Look for:
- A sausage-shaped body
- 8 stubby legs with claws
- A pointed snout-shaped mouth
- Maybe two red or black eye spots

SEEN
Length range 0.4-0.8 mm

Gastrotrichs (hairy bellies)
Look for:
- A hairy flat worm
- A forked tail
- Long 'whiskers' from head
- Fast and darting when swimming

SEEN
Length range 0.2-0.4 mm

Find out more at www.mosssafari.com

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Doing your Moss Safari: Identification (Advanced)

The microscopic Big Five at 40x

These five multicellular organisms are commonly found in moss. Images are not to scale.
This is a starting point. For genus and species, specialised keys are required.

Oribatid Mites (Phylum: Arthropoda) *Length range: 400 µm -1.0 mm*
Look for:
- A dark pear-shaped body and head
- 8 legs with hooks on the end
- Long and short hairs arranged on the body and legs
- Exoskeleton is brown, orange or red in colour

Nematodes (Phylum: Nematoda) *Length range: 400 µm -1.0 mm*
Look for:
- A long worm
- Pointed head end, tapered tail
- Mouth, pharynx, digestive system can be visible within the body
- Darker oval eggs may be seen in adults

Rotifers (Phylum: Rotifera) *Length range: 400 µm - 600 µm*
Look for:
- A crawling worm-shape, sometimes contracted into a ball
- Sometimes two ciliated 'wheel organs' open
- Body is in pseudo-segments, with two toes at the end
- Body often has a pink or red colouration

Tardigrades (Phylum: Tardigrada) *Length range: 400 µm - 800 µm*
Look for:
- A soft, four segmented body
- 4 pairs of short legs with claws
- A pointed mouth, buccal pharyngeal apparatus visible inside
- Some types are red and ornamented

Gastrotrichs (Phylum: Gastrotricha) *Length range: 200 µm - 400 µm*
Look for:
- A flat worm covered in cilia
- A distinctive forked tail
- Fast and darting when swimming
- Cilia are longer around mouth and head

Find out more at www.mosssafari.com

Images from:
A.Chandler-Grevatt (2025) *Moss Safari. Exploring the secret life in moss.* Pelagic Publishing

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“What is a tardigrade for?”

- *New Scientist Live* encounter with an adult – the purpose of organisms
- Pedagogical challenge: How can we support people to see differently?
- The conceptual lenses before the objective lens
- Explore our assumptions of the natural world
- Linnean Society’s Queer Natural History Symposium

Physical limitations of light microscopy

- Limited resolution (~200 nm) due to diffraction of visible light
- Optical aberrations (spherical, chromatic, lens imperfections)
- Low natural contrast in biological tissues
- Sample distortion from preparation (staining, slicing, squashing, dehydration)
- Coverslip pressure altering shape/behaviour
- Depth of field extremely shallow at high magnification
- Light scattering and absorption in thicker specimens
- Bright illumination altering behaviour or causing bleaching
- 2D projection of a 3D structure
- Image influenced by observer perception and camera processing

Philosophical Assumptions

- **Objectivity as an ideal:** assuming we can observe without bias, even though all perception is filtered through human interpretation.
- **Reductionism:** believing complex living systems can be understood by breaking them into smaller parts.
- **Empiricism:** privileging what can be measured or seen, and treating unmeasurable aspects as less real or less important.
- **Anthropocentrism:** assuming humans are the central reference point for interpreting other organisms.
- **Dominion and hierarchy:** cultural or religious ideas that place humans "above" other species, shaping how we frame and value them.
- **Patriarchal and heteronormative norms:** projecting human social structures (e.g., gender binaries, dominance models, mating norms) onto animal behaviour.
- **Technological faith:** assuming better instruments automatically reveal "truer" reality, rather than another constructed view.
- **Stability and typicality:** expecting organisms to have a single "normal" form or behaviour, even though variation is natural.
- **Neutral language myth:** believing scientific terms are purely descriptive, when they often carry cultural assumptions.
- **Observer–observed separation:** assuming we can study life without influencing it, despite the act of observation altering conditions.

Why is this important?

- Disconnection with nature
- Lack of trust in / understanding of science
- Young people seeing science as for them
- Improving STEM pipeline
- Climate change and agency

Moss Safari Monthly

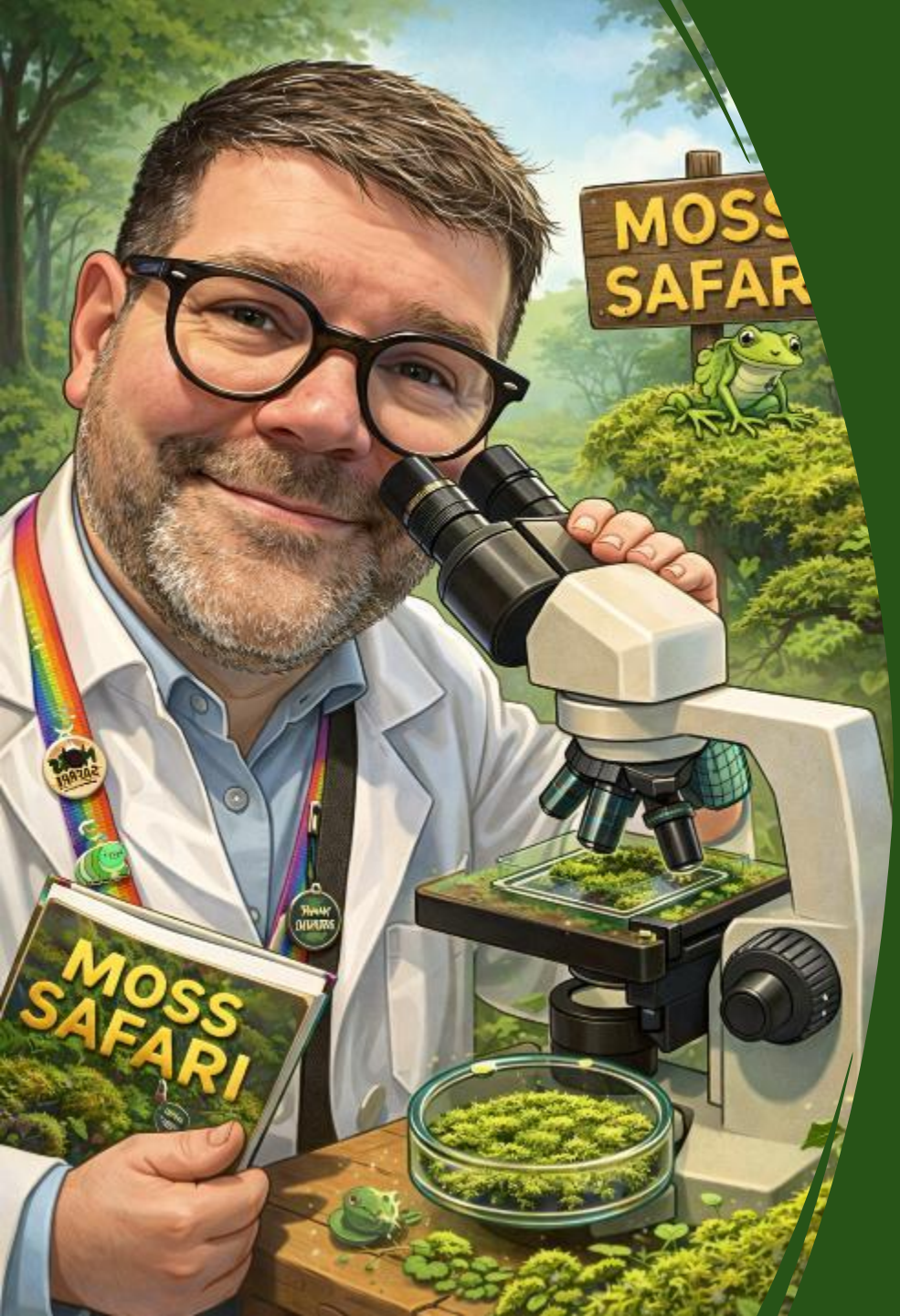
Date	Session Title	What We'll Explore	How We'll Look
Wed 25 Feb 2026	Learning to See	Meeting the microscopic organisms living in moss	**Noticing:** slowing down and spotting what's there
Wed 25 Mar 2026	Watching What Happens	How these organisms move, feed and behave	**Following:** staying with one organism and watching what it does
Wed 22 Apr 2026	Everything Is Connected	How organisms share space and interact	**Connecting:** noticing relationships
Wed 20 May 2026*	Knowing Our Limits	What microscopes can show us, and what they can't	**Questioning:** being curious about what we don't fully understand
Wed 24 Jun 2026	Watching Without Taking	Life continuing on its own terms	**Witnessing:** simply observing, without needing all the answers

Familiar lenses (natural science)

Identifying Representational Seeing	**Attentive Behavioural Seeing**	**Relational Ecological Seeing**
Matching perception to existing categories	Time now a factor, we now notice behaviour	We now appreciate this is a snapshot, there are unseen connections between organisms
Identify, classify , recognise, describe, label	attend, follow, track, observe, notice	relate, situate , connect , trace, map
Clear outlines and stable forms Taxonomic features Reproducibility (“others would see the same thing”)	Motion and rhythm Repetition and pause Response to environment	Proximity and interaction Indirect effects Shared space and disturbance

Less familiar perspectives?

Questioning (Knowing our limits) **Reflexive / Situated Seeing**	**Witnessing** **Withholding /Ethical Seeing**
Questioning, hesitating, acknowledging limits Seeing turns back on itself. Vision is recognised as mediated, partial, and contingent. The observer becomes visible within the act of observation. Question, hesitate, doubt, reflect, acknowledge Uncertainty Ambiguity Awareness of mediation	**Withholding, witnessing, allowing** Seeing is no longer directed towards knowledge production at all. Vision becomes an ethical practice: remaining present without appropriation, interpretation, or closure. The organism is neither explained nor resolved. Witness, allow, remain, attend (without analysis) refrain, Presence without purpose Duration without outcome Existence on its own terms



Let’s go on a Moss Safari

Reflection and Questions

- How do you see?
- What are your assumptions?
- What impact has this session had on how you observe, how you think about microscopy, how you engage others with microscopy?

Thank you for watching

Moss Safari Monthly

Live microscopic adventures. One moss. Five months

- Connect with nature
- Promote microscopy
- Inspire STEM

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One hour of your evening, experiencing a microscopic adventure.
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New Scientist Live, ExCel
Natural History Museum, London

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- **Live on Zoom | 7:00–8:00pm (UK time)**
- **£10 per session**
- **Recording available as part of ticket**
- **Limited to 25 participants per session**

Wed 25 Feb 2026
Wed 25 Mar 2026
Wed 22 Apr 2026
Wed 20 May 2026*
Wed 24 Jun 2026

*Wed 20 May 2026 is the 3rd Wednesday in May to avoid half term

A calm, expert-led hour of nature, noticing, and learning — designed to amaze, inspire, and shift perspective.

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Booking is for individuals or families viewing together in one location. Non-refundable.

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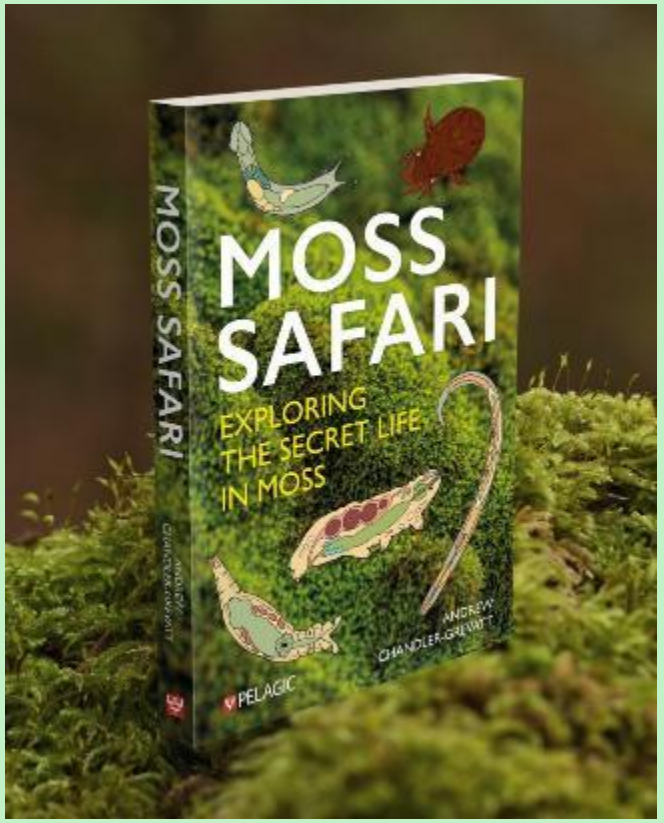

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