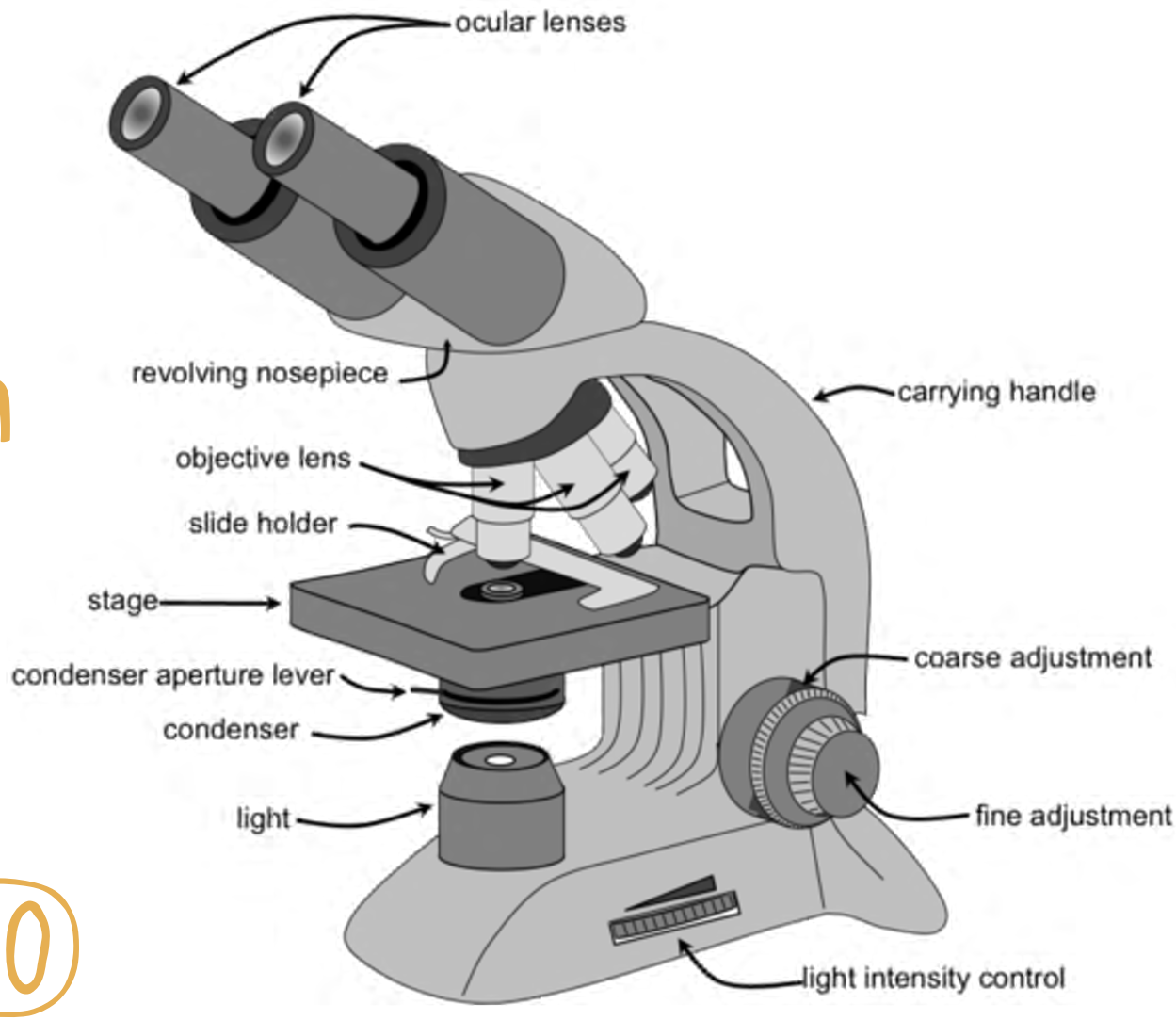
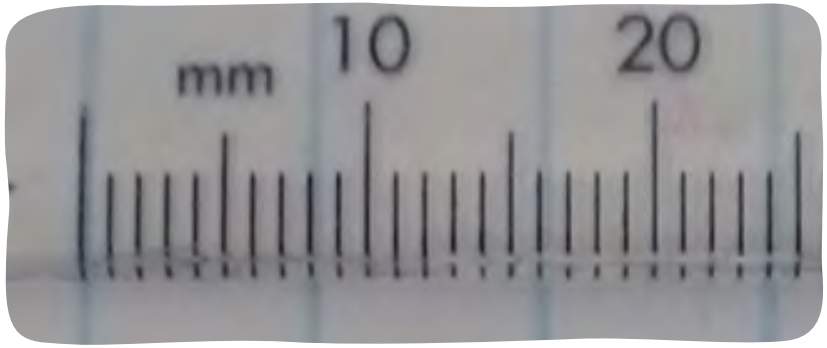
Magnification

Light microscope



LEARN AT CHESTER ZOO

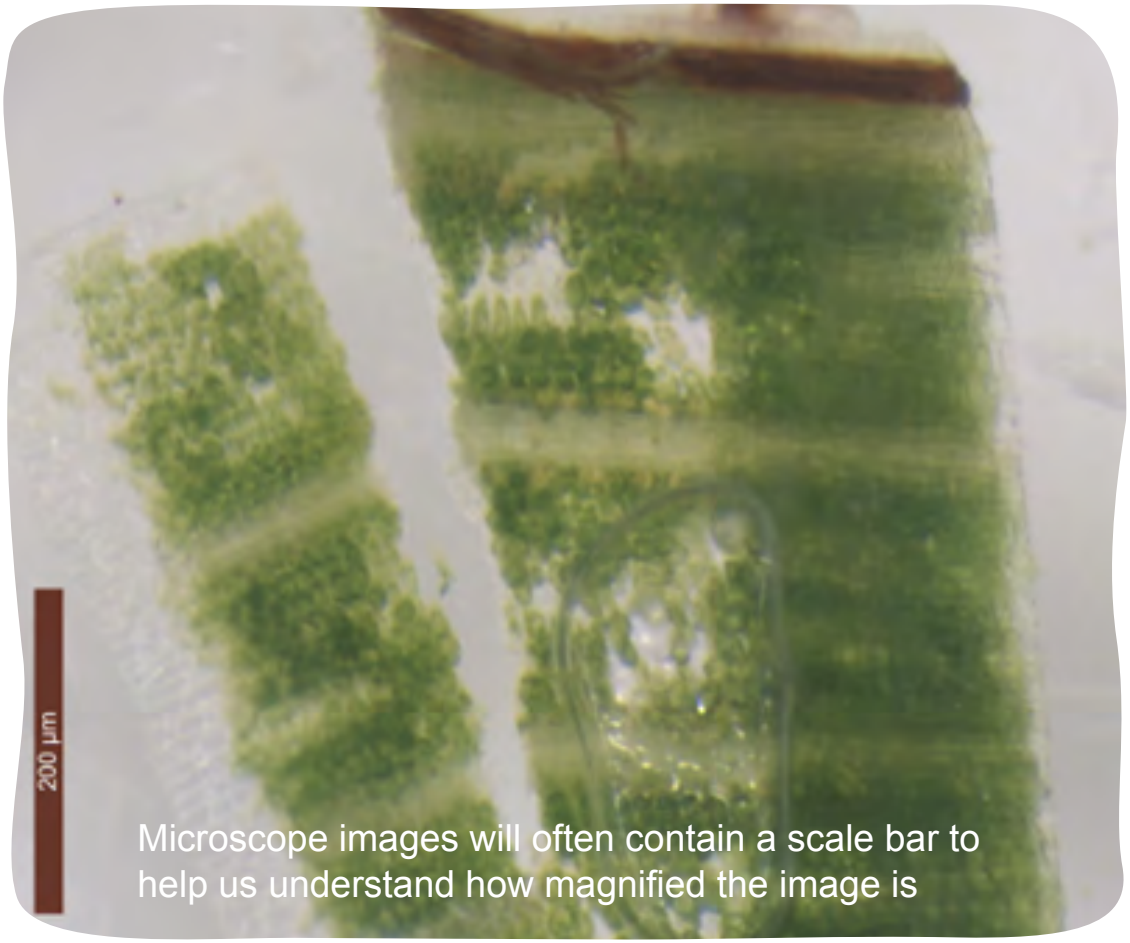
Some points of reference



- Standard (SI unit) of length = metres (m) - not very practical when working with small objects, so we have names for fractions of a metre.
- 1/1000 of a metre, (1 x 10-3) m, = millimetre (mm)
- 1/1000 of a mm, (1 x 10-6) m, = micrometre (μm)
- 1/1000 of a micrometre, (1 x 10-9) m, = nanometre (nm)

In this presentation, we are going to use a microscope to look in detail at the fronds/leaves of a young Oil Palm plant (sampled from a pot grow example at Chester Zoo). They are usually much bigger than this as seen in the image on the right taken in a plantation in Indonesia (c/o).

A light microscope allows magnification up to about 1000 times to see single cells



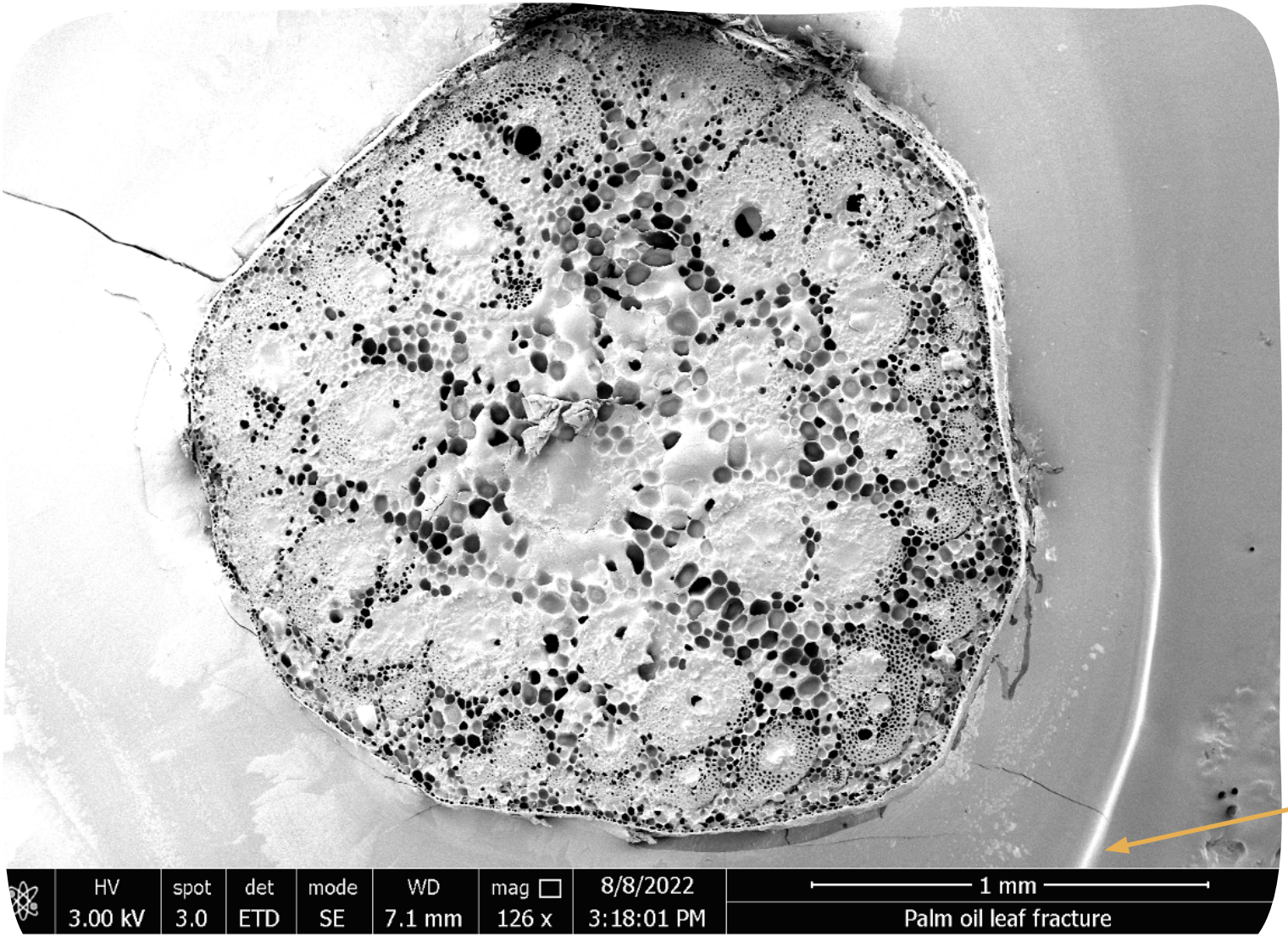
Microscope images will often contain a scale bar to help us understand how magnified the image is

Zooming in on the stem of the frond (petiole)

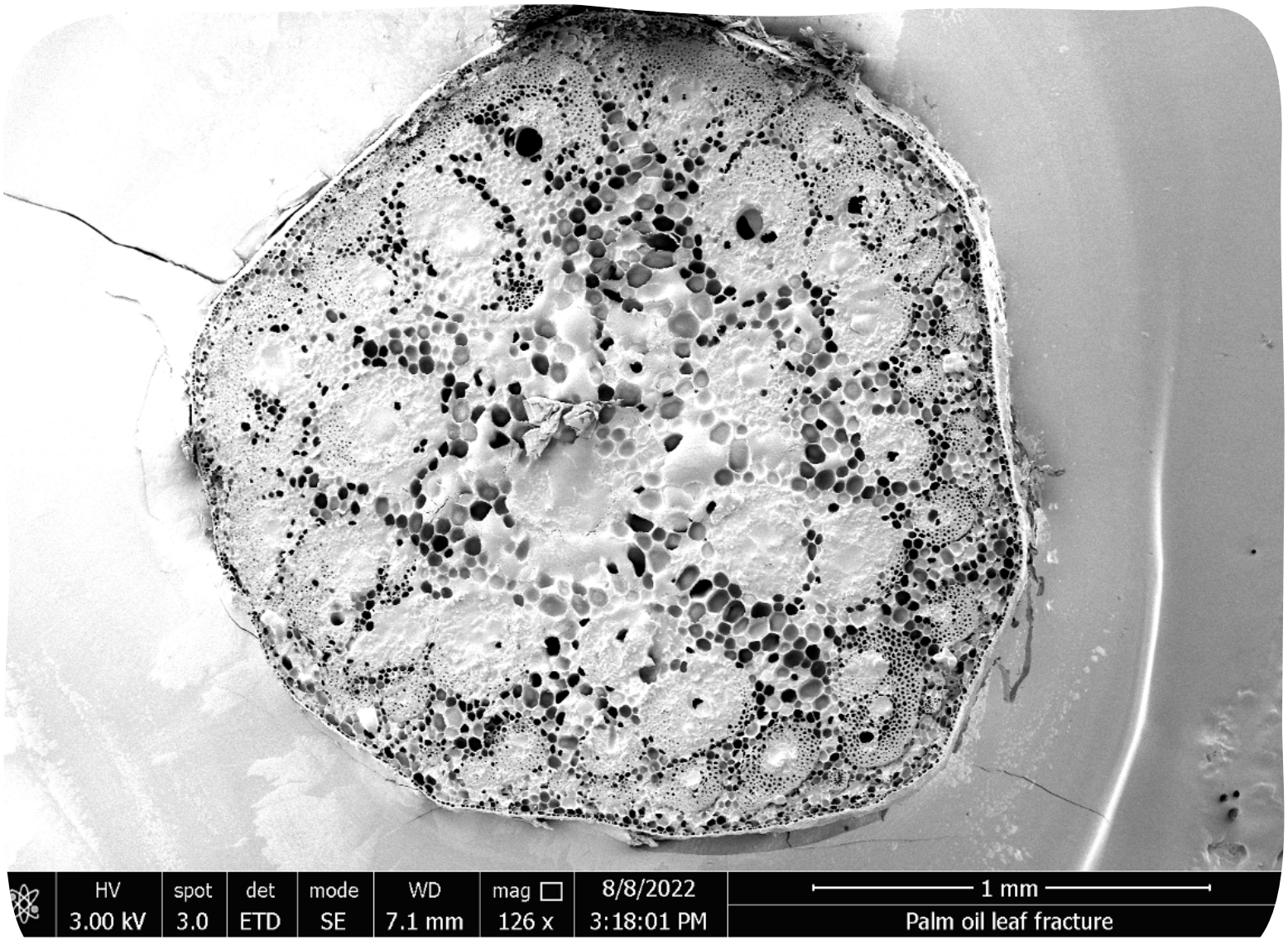
Samples of petiole, stuck to a stub to be viewed under an SEM. Each sample was approx. 2/3 mm.

Light Microscope image

Scanning Electron Microscope (SEM) view of the petiole

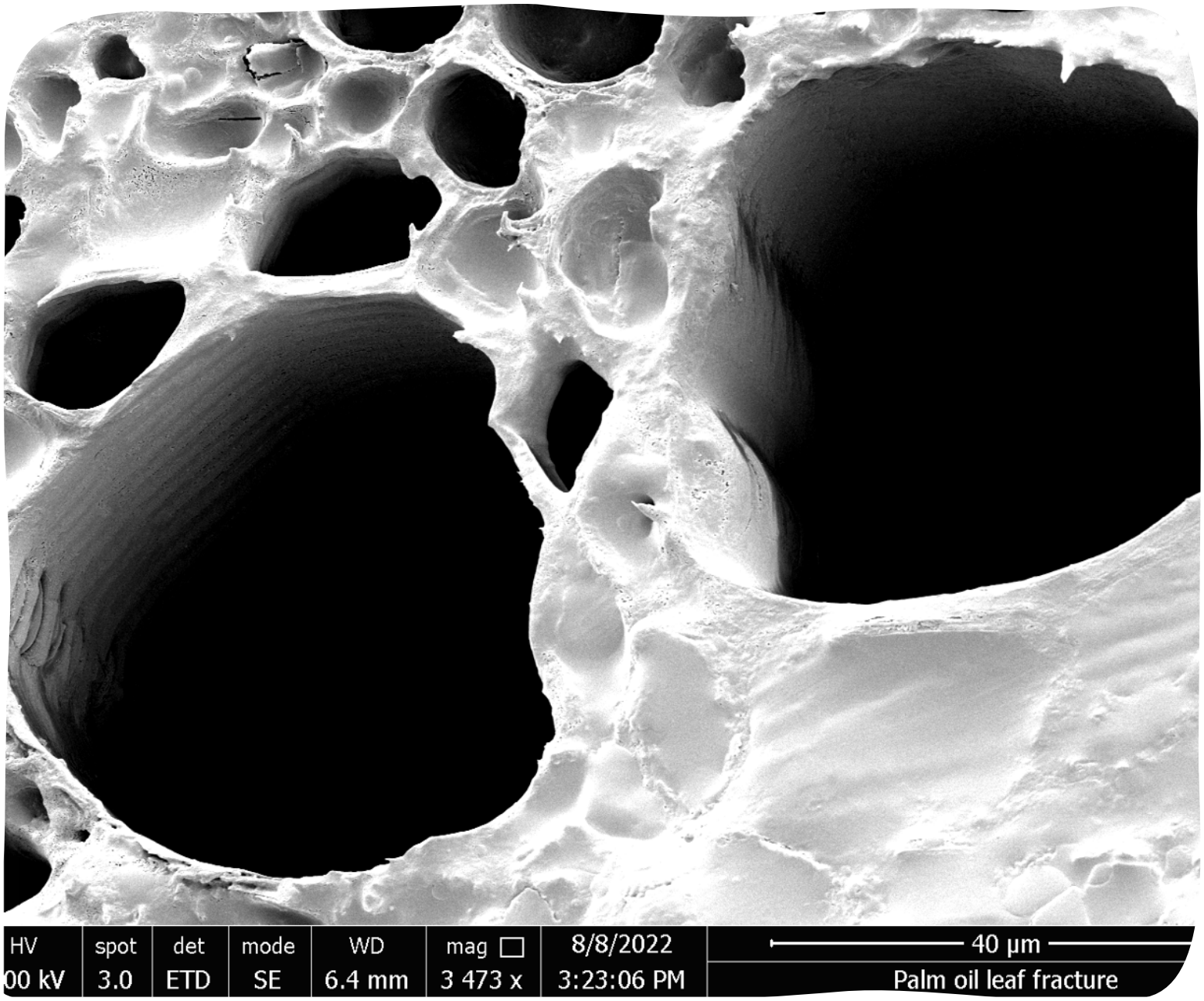


Use the scale bar to estimate its maximum width.



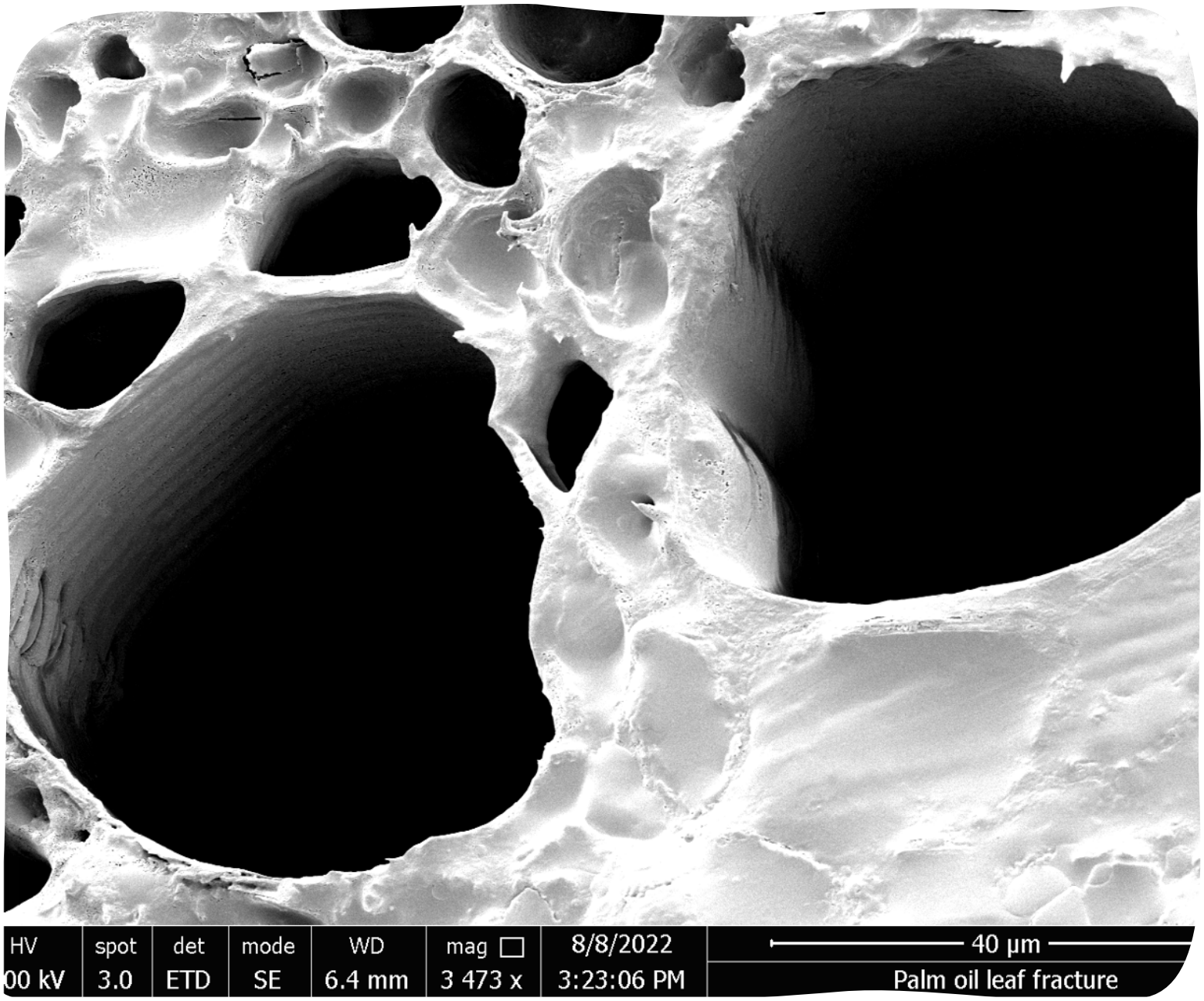
What are the holes in the stem?

Now you can measure their width – small or large ones.



Zooming in further, increasing the magnification, allows us to look inside the holes and realise they are not just holes but have some structure.

Using the scale bar, estimate the width of this xylem vessel.

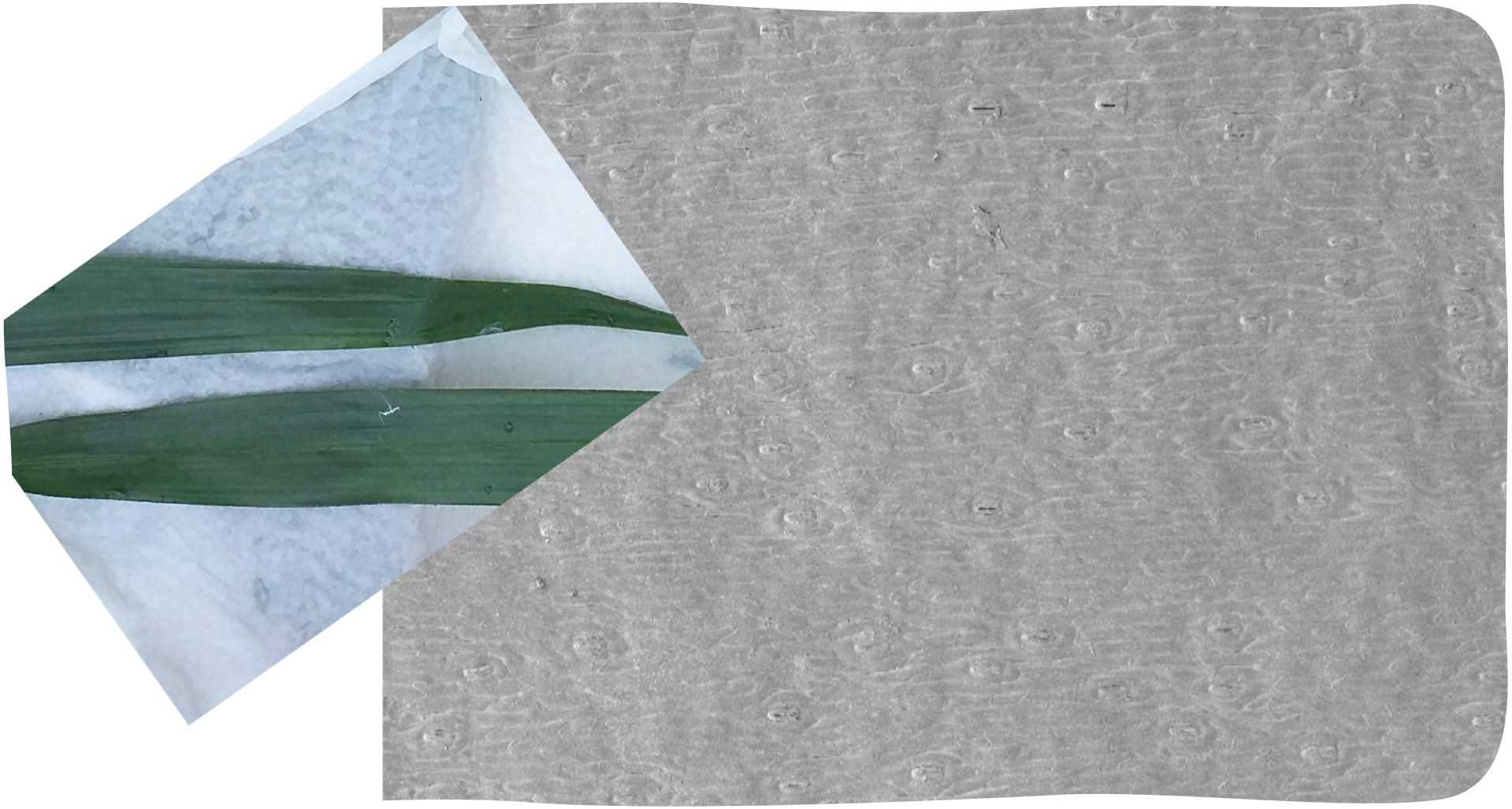


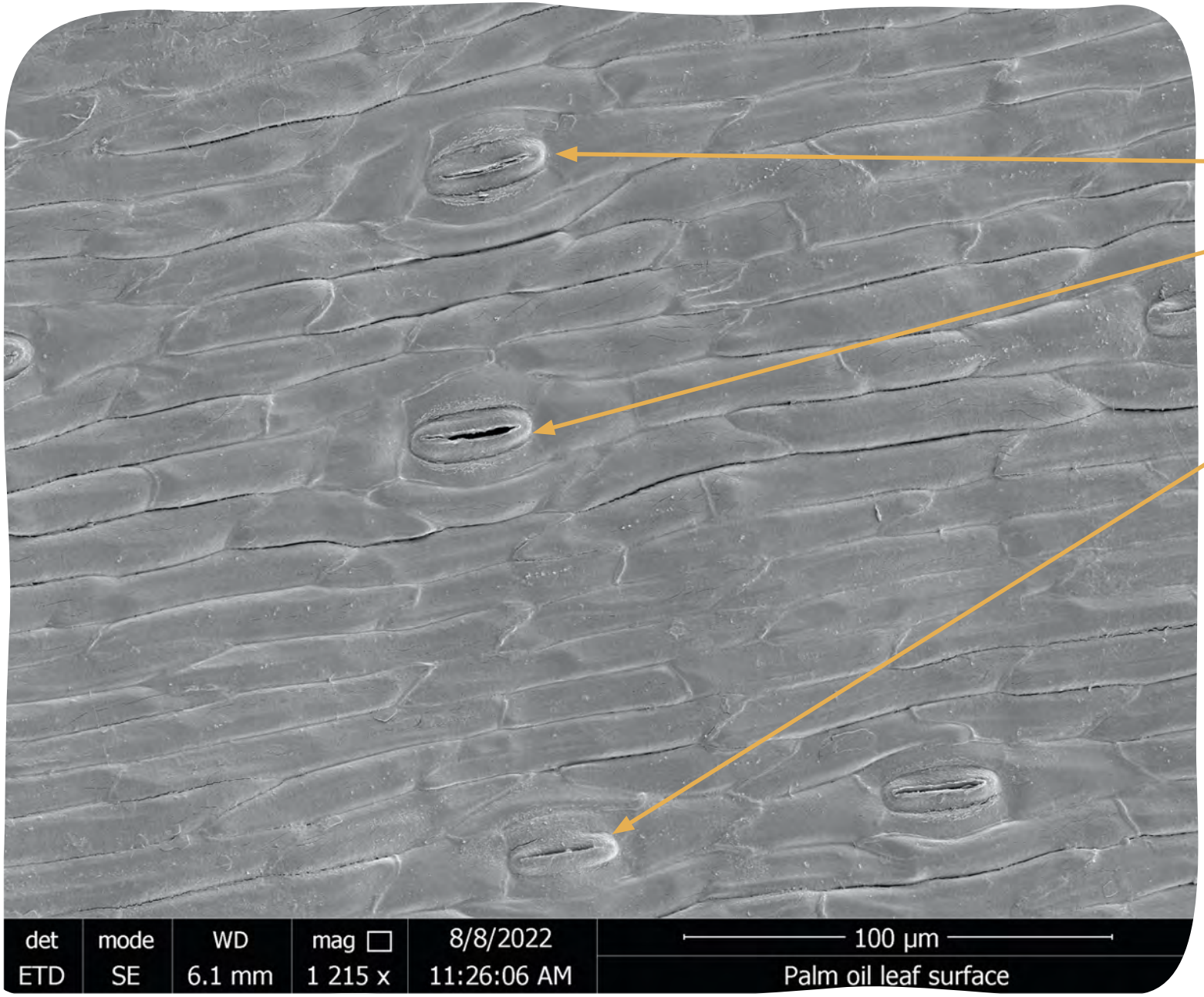
Why might a plant have these structures?

These are xylem vessels and used to transport water through the plant.

Using the scale bar, estimate the width of this xylem vessel; it's about the width of a human hair.

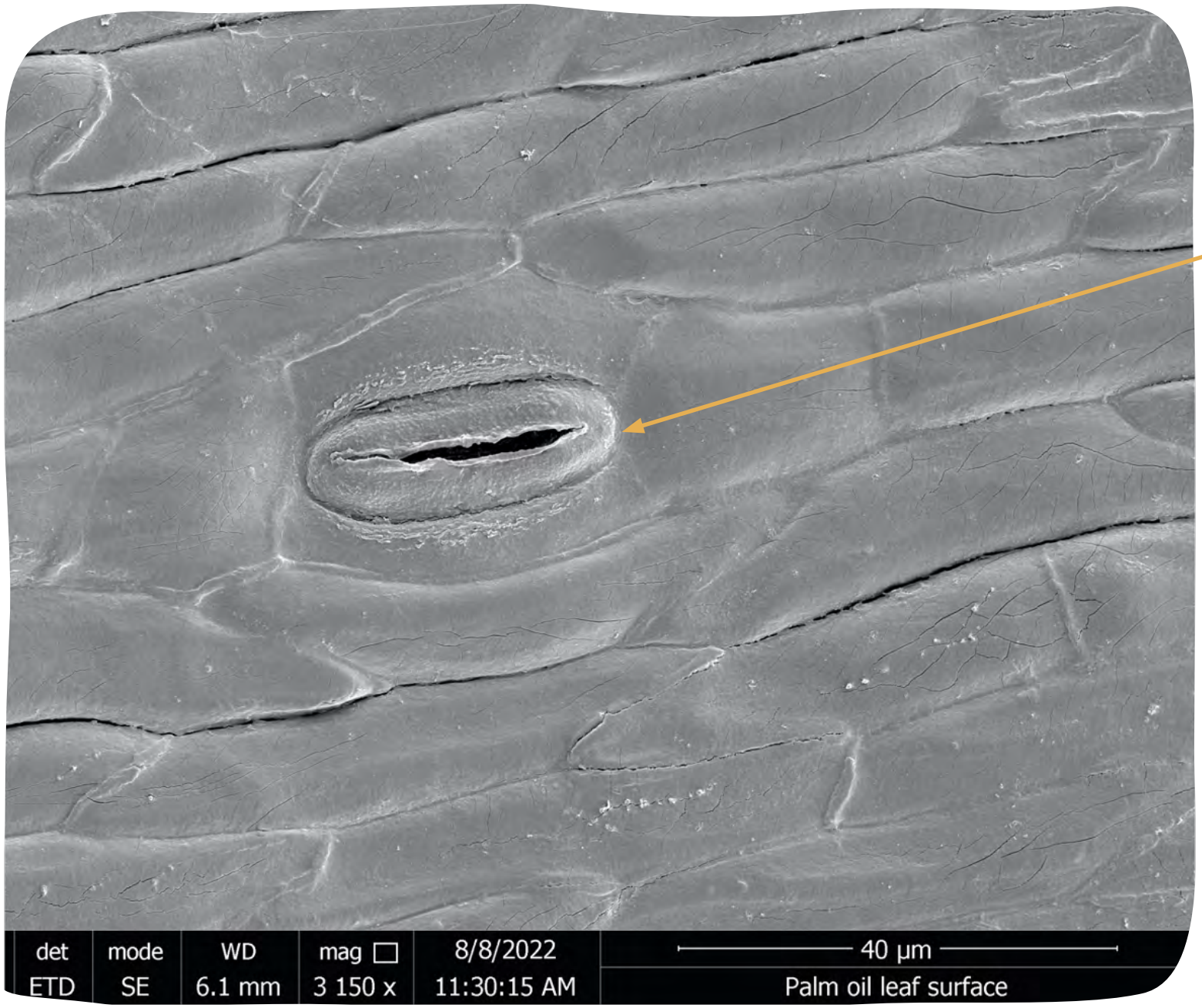
Lets look closer at the leaf surface using our SEM





Stomata (singular stoma) are tiny pores on the surface of the leaf that allow gaseous exchange.

Using the scale bar, estimate the size of the opening and the outer cell boundary of the guard cells.



Zooming in some more on a stoma and its guard cells.

Using the scale bar, estimate the size of the opening and the outer cell boundary of the guard cell.

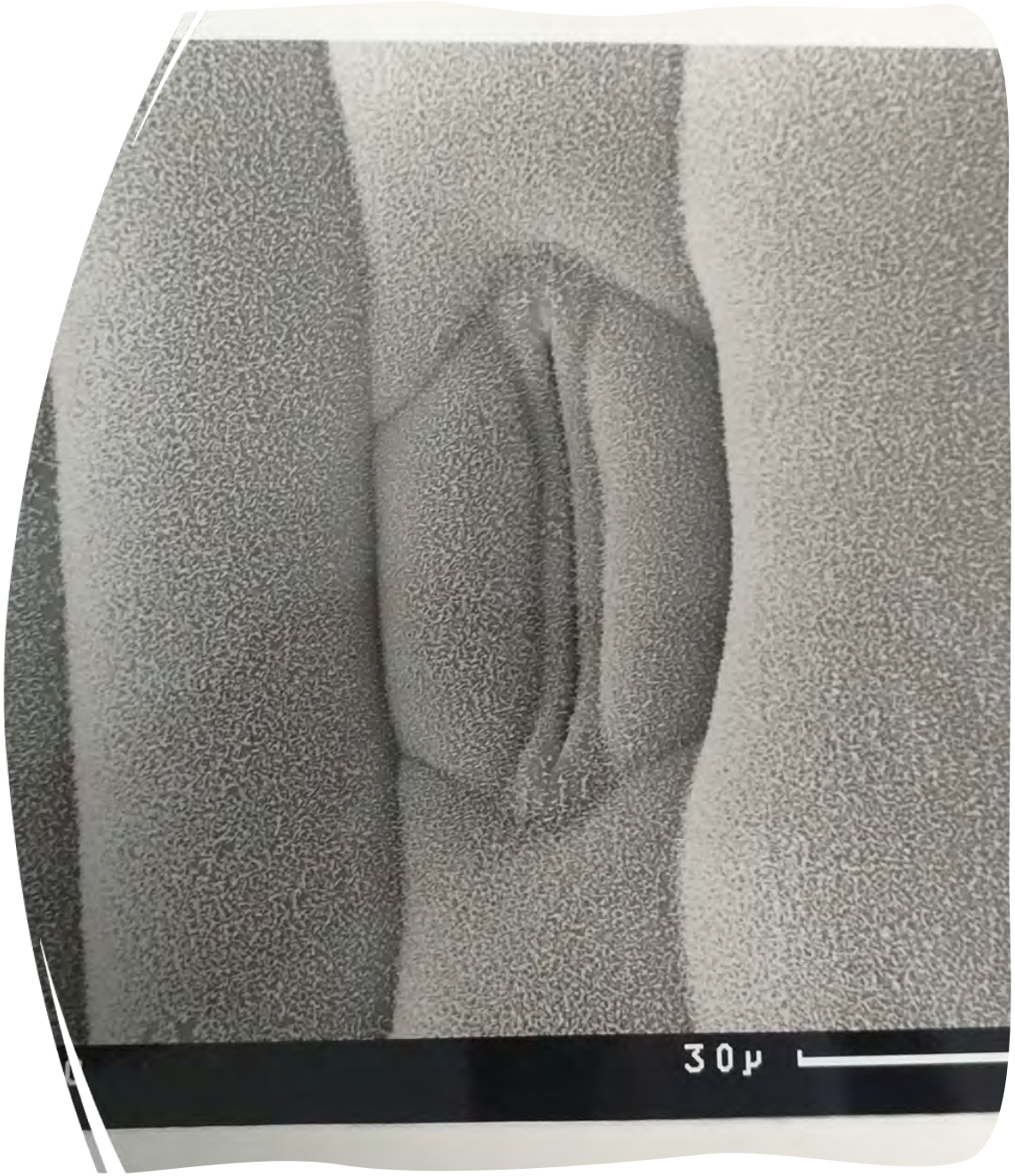
Stoma & Guard Cells

Using the scale bar, estimate the size of the opening (stoma) and the outer cell boundary of the guard cell.

In this image you can clearly see disruption to the smooth waxy layers around the stoma, created by the opening and closing of the guard cells.

Barley Stoma

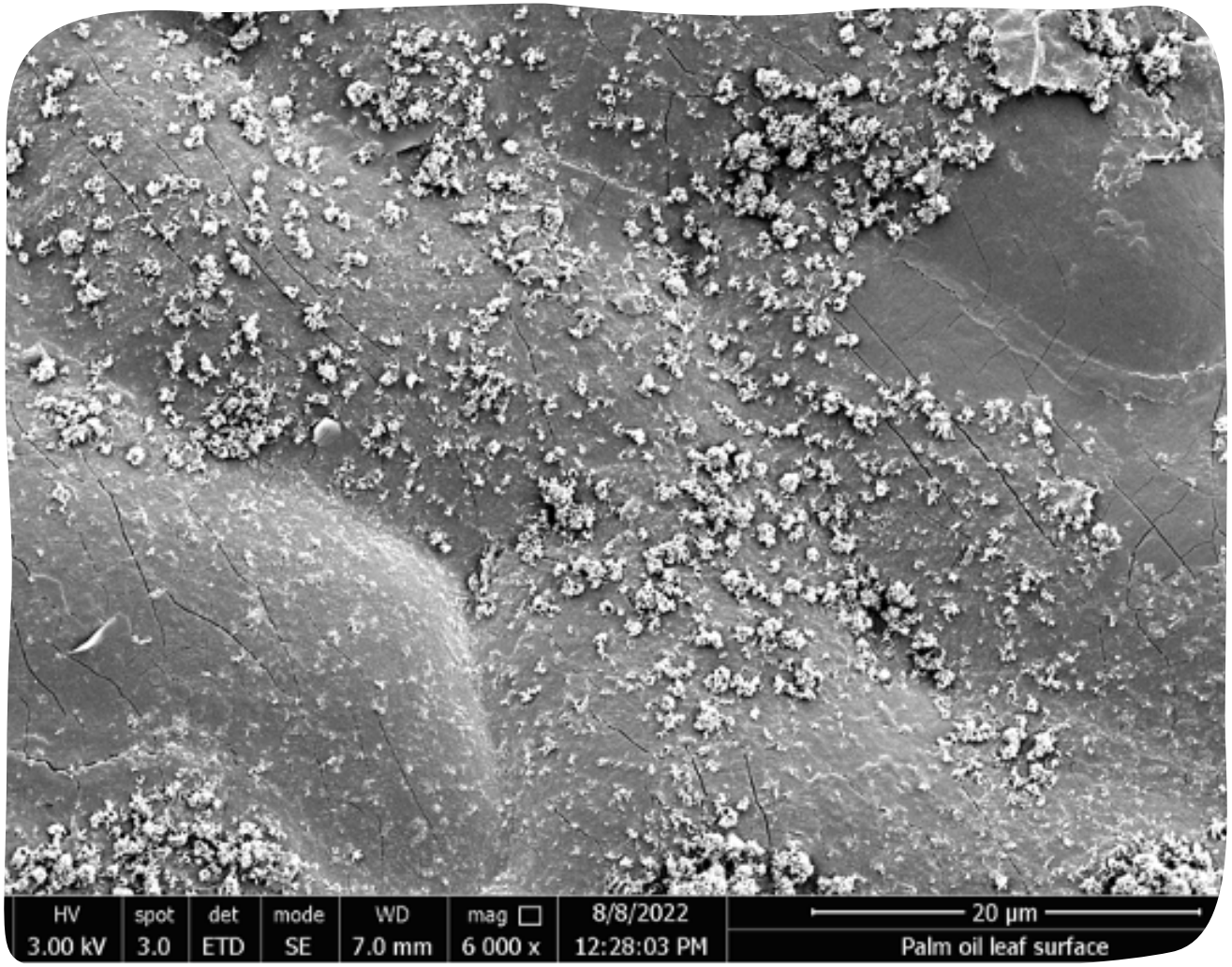
- Guard cells and stomata vary in plants.
- Barley – another monocot - is shown here.
- The Guard Cells are more typically ‘dumbbell shaped’.
- Again you can use the scale bar to determine the size of the stomatal pore opening.

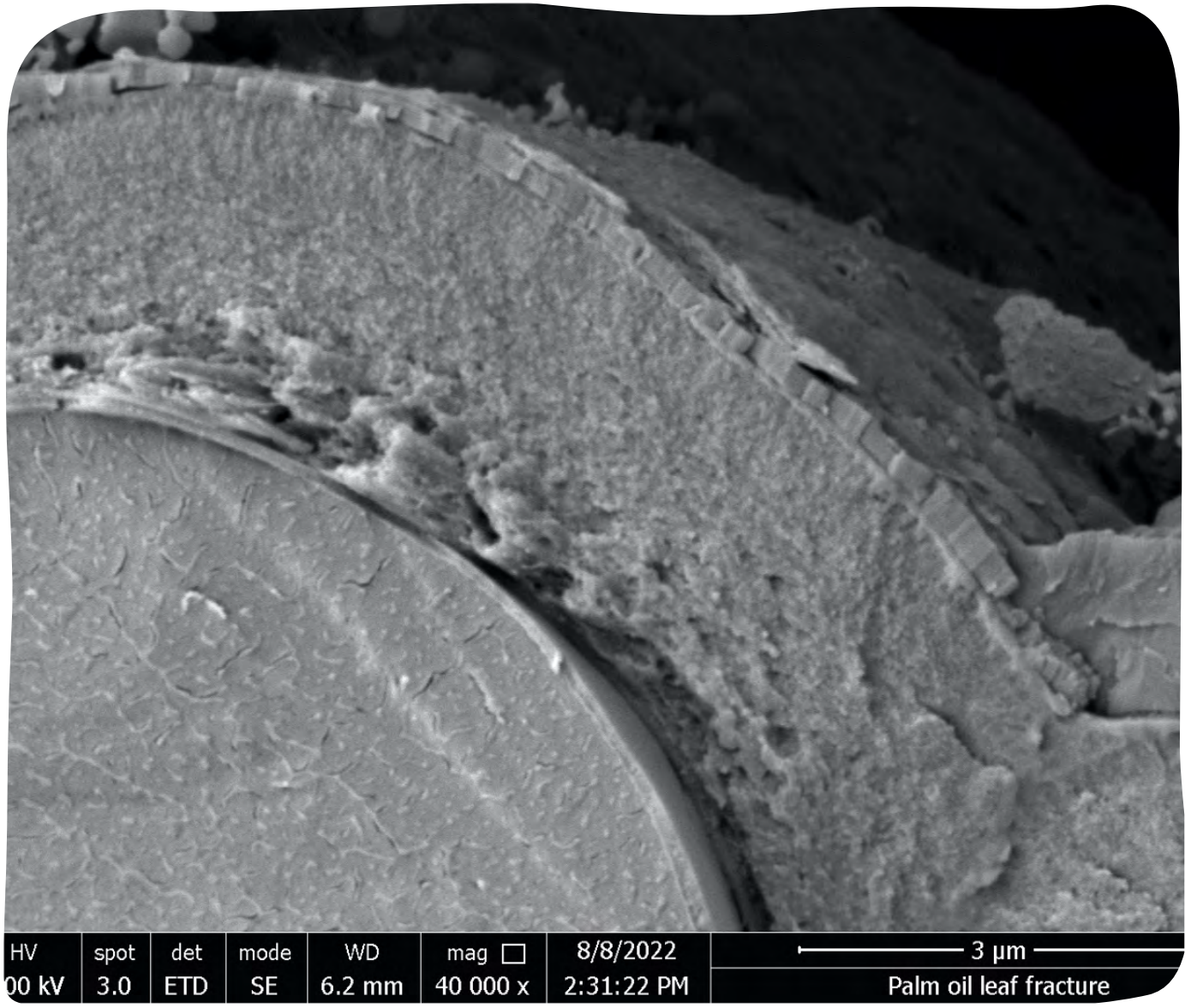


Looking even closer at the surface of the plant...

Zooming in

and we see disruption to the surface waxes and how undulating the surface is, what might it look like if we snapped this leaf in half?





Waxy Cuticle

It is even possible from this leaf-fractured image to see the very thin cuticle (layer of wax) on the leaf surface, and again you can estimate its thickness by comparing against the scale bar.

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