



# Microscopy LIVE!



## Art Supplies

We used our JEOL NeoScope to look at  
different art supplies.



UNIVERSITY OF  
PLYMOUTH

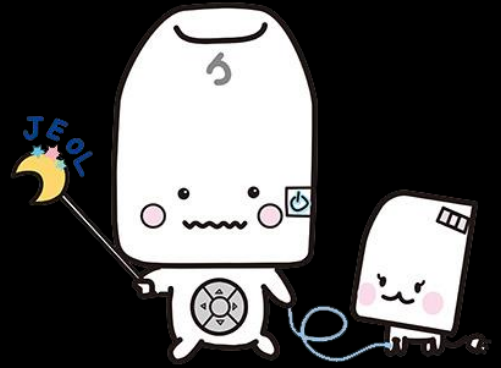
Have any questions? Email Jen or Lorelei  
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[loirelei.robertson@plymouth.ac.uk](mailto:loirelei.robertson@plymouth.ac.uk)



Microscopy Live is proudly  
partnered with JEOL UK

We used both secondary electron imaging and backscattered electron imaging to investigate the appearance and composition of art supplies, and introduced you to our new JEOL NeoScope benchtop scanning electron microscope.

Secondary electron imaging (SEI) uses the electron beam to look at the shape of the sample surface, revealing the tiniest textures.

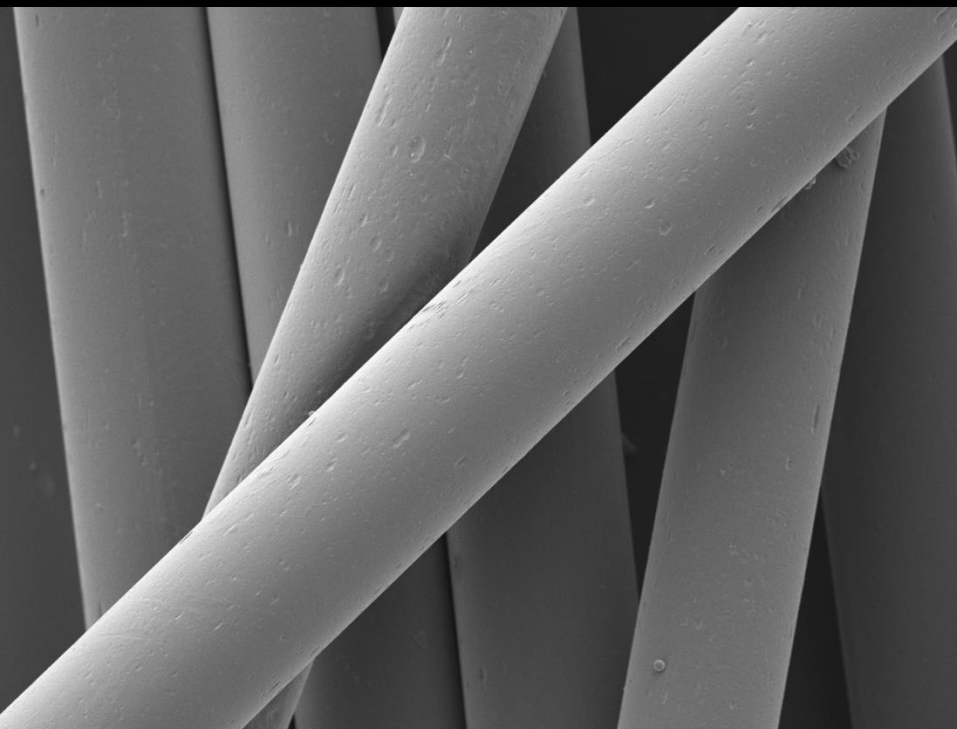


*Nanamaru-kun is the JEOL NeoScope mascot character and is always with Ms. Power Supply.*

Backscattered electron imaging (BSE) creates images based on atomic number contrasts, generating a greyscale in which heavy elements show as white and light elements show as dark grey. The BSE detector uses characteristic X-rays that are released by the sample during analysis, and lets us find out exactly what our materials are made from.

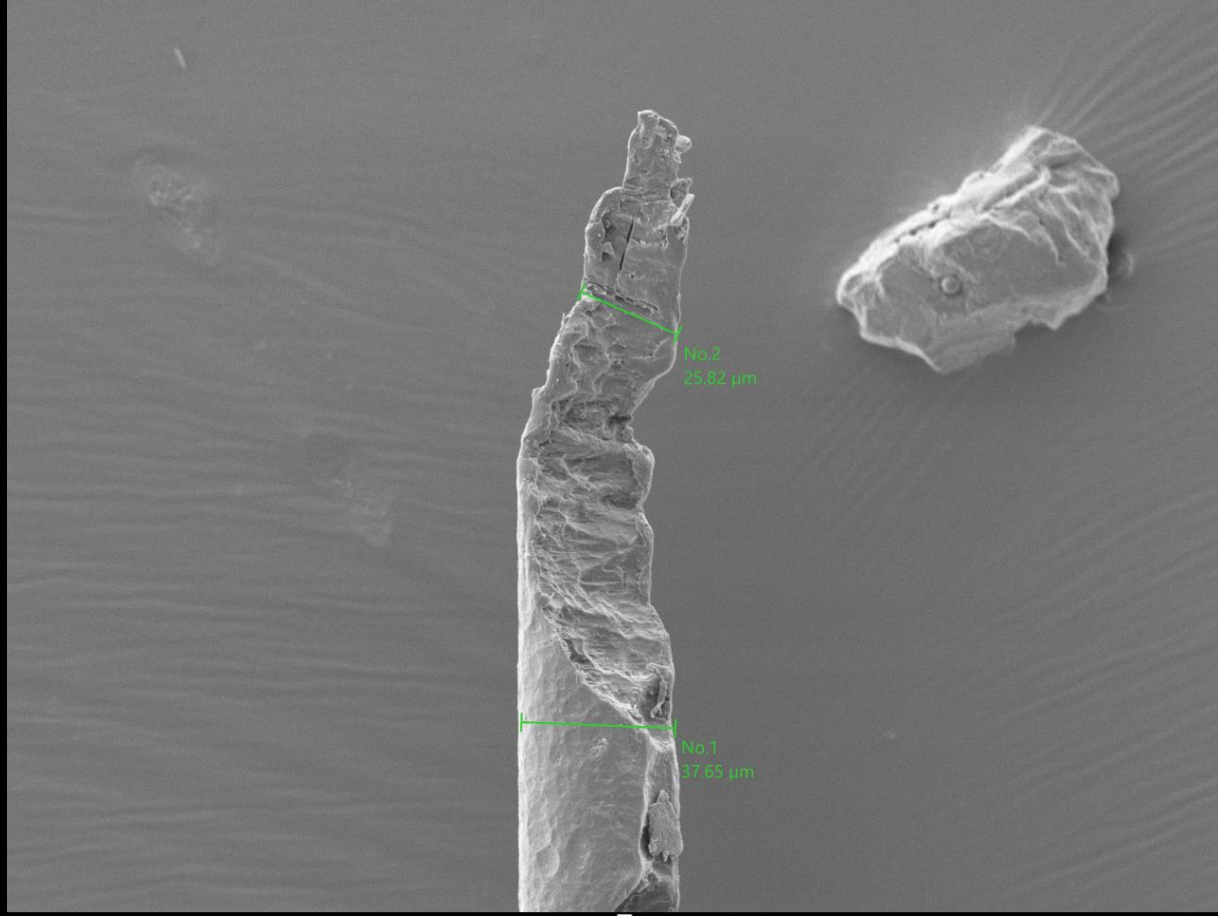


# Paintbrush Bristles



This synthetic paintbrush had very uniform bristles. Although they feel smooth to the touch, secondary electron imaging revealed that the bristles had a number small pits.

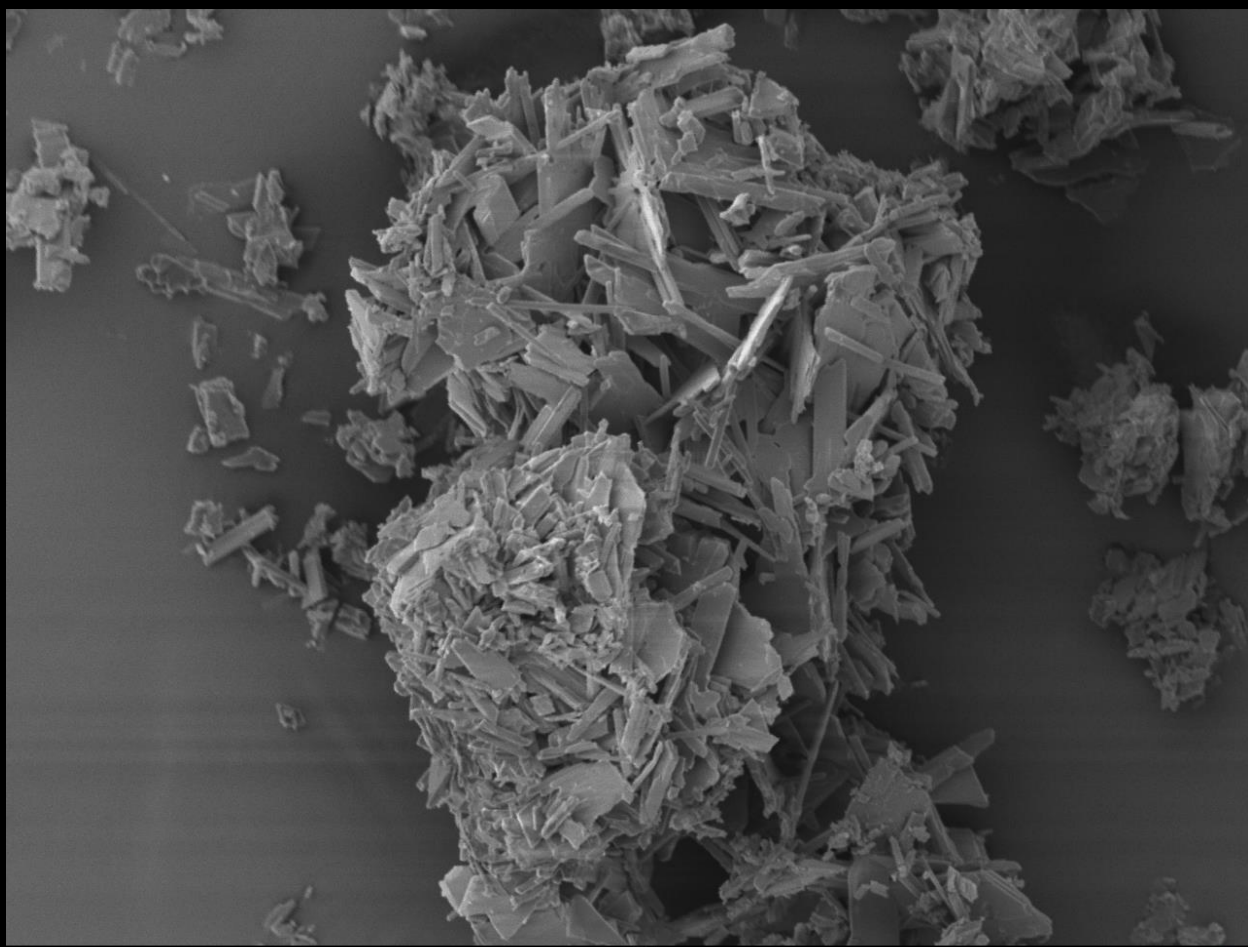
SED 5.0 kV WD 12.9 mm Std.-PC HighVac. x270 50 µm  
STD 0194 25 Mar. 2022



SED 5.0 kV WD 13.2 mm Std.-PC HighVac. x430 50 µm  
STD 0195 25 Mar. 2022

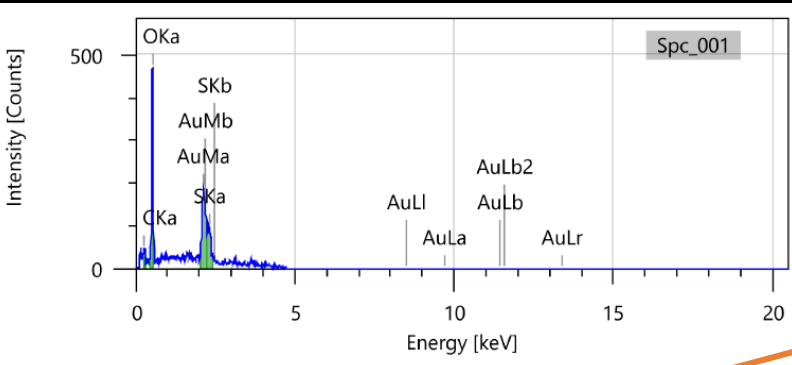
This end of the bristle was cut by scissors whilst Jen was getting the samples ready for analysis, letting us see inside. It measures 37.65 µm in width, which is 0.03765 mm.

# Chalk



SED 5.0 kV WD 13.2 mm Std.-PC HighVac. x1,000 10 μm

We were surprised to see how platy the chalk looked in secondary electron imaging, and even more surprised to see sulfur in the spectra during our compositional analysis. This probably comes from including a mineral called gypsum into the chalk mix.

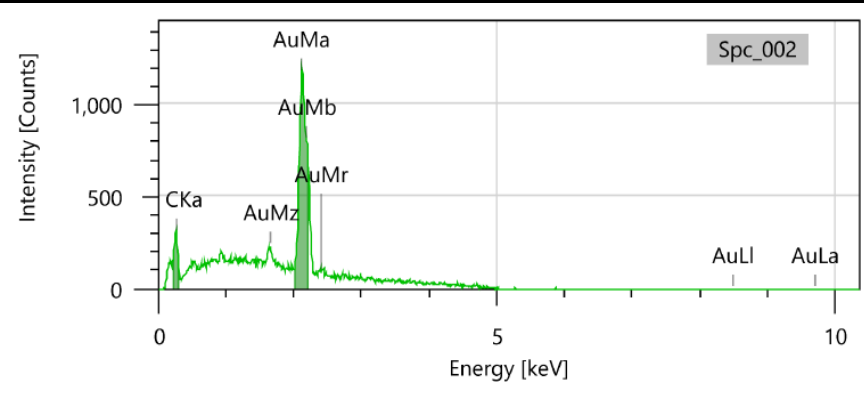


We coated the samples in gold to make them conductive – there’s no gold in your typical art-store chalk!

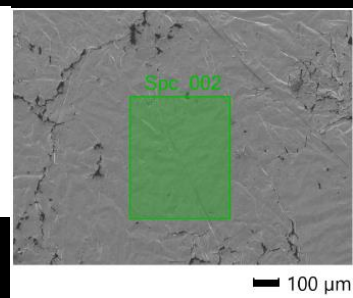
| Element | Line | Mass%      | Atom%                |
|---------|------|------------|----------------------|
| C       | K    | 1.40±0.05  | 5.94±0.19            |
| O       | K    | 17.47±0.28 | 55.44±0.88           |
| S       | K    | 13.36±0.64 | 21.15±1.01           |
| Au      | M    | 67.77±2.10 | 17.47±0.54           |
| Total   |      | 100.00     | 100.00               |
| Spc_001 |      |            | Fitting ratio 0.0887 |

# Real Gold Leaf

Compositional analysis of real gold leaf shows that it is indeed made out of gold (Au)! The small amount of carbon that shows up in the data is the sticky carbon tape Jen used to hold down the gold leaf so it didn't get sucked away in the microscope's vacuum.

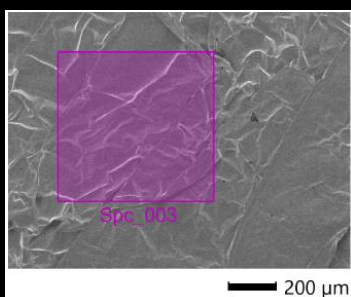
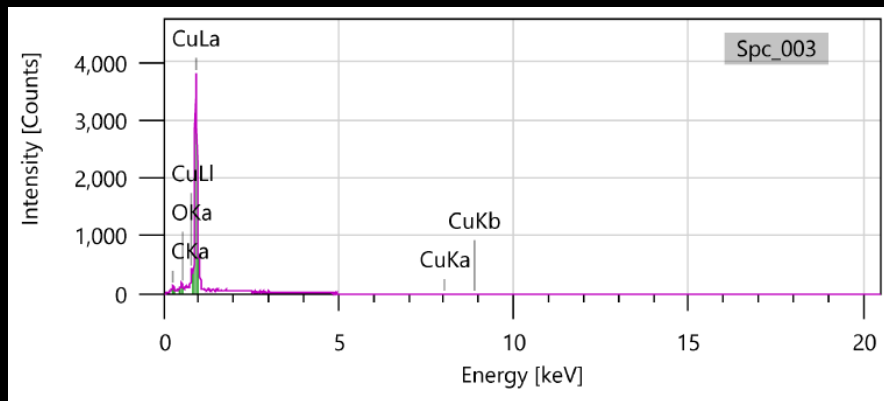


| Element | Line | Mass%      | Atom%                |
|---------|------|------------|----------------------|
| C       | K    | 1.62±0.02  | 21.25±0.28           |
| Au      | M    | 98.38±1.06 | 78.75±0.84           |
| Total   |      | 100.00     | 100.00               |
| Spc_002 |      |            | Fitting ratio 0.1159 |



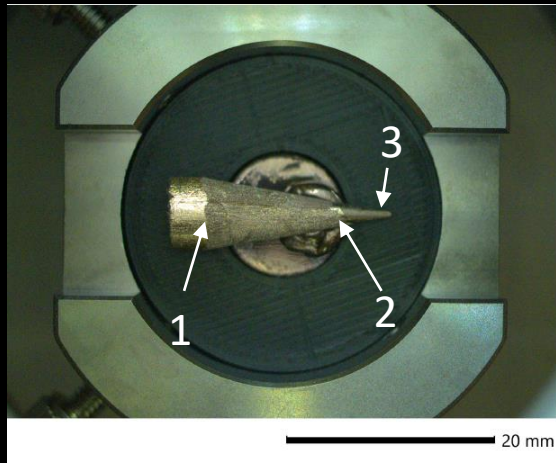
# Imitation Gold Leaf

The imitation gold leaf does a pretty good job of pretending to be gold if you're just looking at it, but our compositional analysis reveals it's actually made out of copper (Cu)!

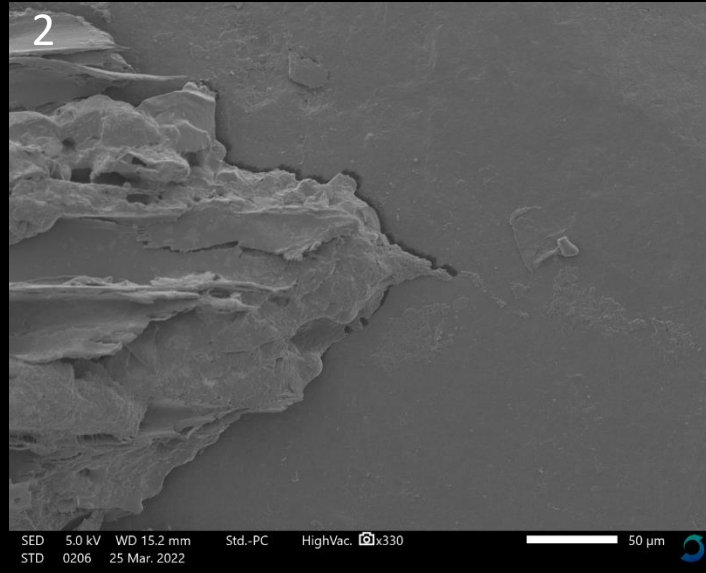
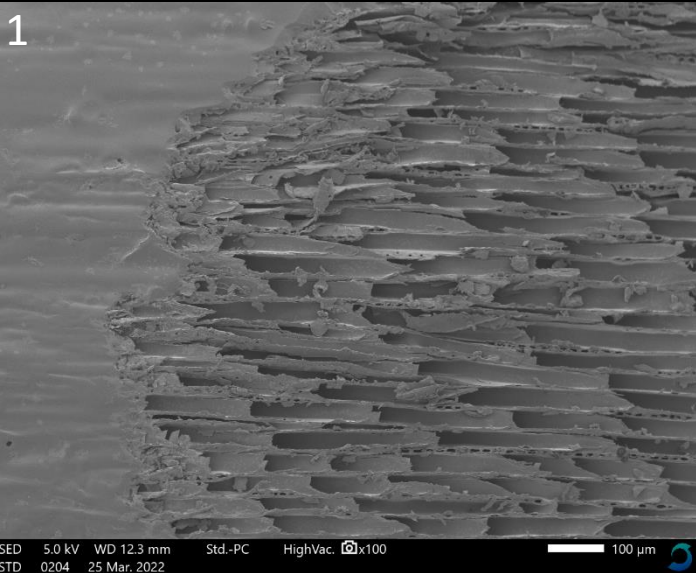


| Element | Line | Mass%      | Atom%                |
|---------|------|------------|----------------------|
| C       | K    | 1.57±0.03  | 7.48±0.16            |
| O       | K    | 1.38±0.06  | 4.94±0.22            |
| Cu      | L    | 97.05±0.70 | 87.57±0.63           |
| Total   |      | 100.00     | 100.00               |
| Spc_003 |      |            | Fitting ratio 0.0492 |

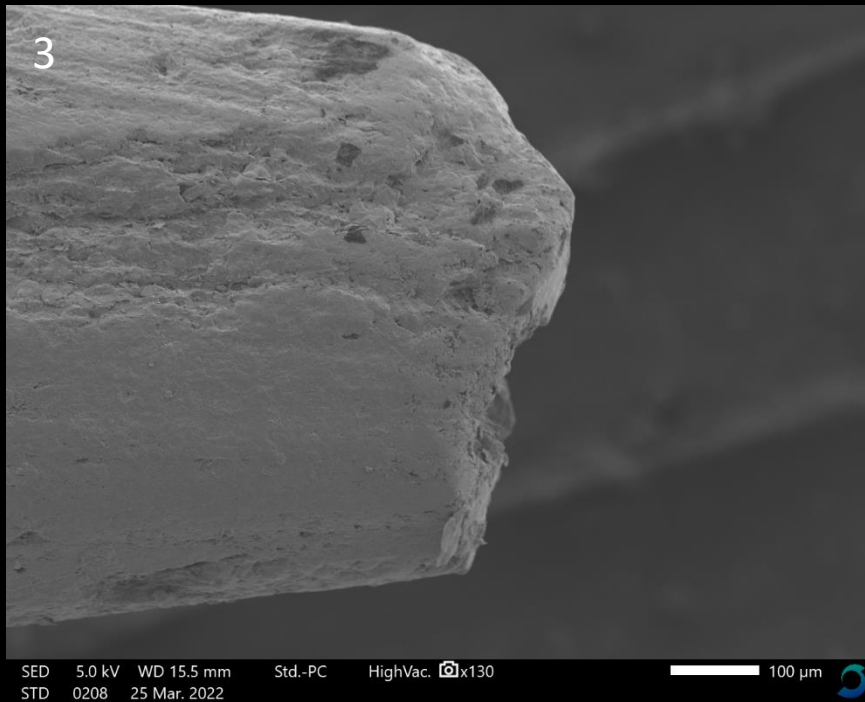
# Pencil



Our last sample was a the end of one of our PEMC pencils, so make sure you enter the quiz on the next page for a chance to win some! We'll even throw in this gold-coated sample for the winner...



The varnish on the wood is very smooth, and the texture really comes out on the sharpened parts of the pencil. Even through the pencil was freshly sharpened, the tip is still pretty blunt – around 600 μm width which is huge in electron microscopy terms!



**Next time on Microscopy LIVE! we'll be looking at pollen! This spring-time edition is on the 29<sup>th</sup> of April. Make sure to register at**

**[www.plymouth.ac.uk/whats-on/microscopy-live-pollen](http://www.plymouth.ac.uk/whats-on/microscopy-live-pollen)**

**For a chance to win some JEOL and PEMC goodies, head on over to the quiz at the link below! The winner will be announced at the next event...**

**[bit.ly/3iTbq2x](http://bit.ly/3iTbq2x)**

**If you missed the live session, don't worry! You can watch the recording here at [youtu.be/Y6iJKujRl3g](https://youtu.be/Y6iJKujRl3g)**

**Micro****scopy**  
**LIVE!**  
