

SEM Diaries - 46

I have the kit, friends provide the specimens!

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Fig. 1: My SEM on a “normal” working day. Note the new EDS sensor, and also the amplifier (centre) and screen (on the right). The main screen is displaying the SEM User Interface and the screen on the left is displaying a previously captured SEM image. Note also the two canvas prints on the back wall.

It still seems ridiculous, even to me, that I have a six-figure sum “invested” in my SEM and associated equipment. I put the word “invested” in inverted commas, since one normally expects an investment to grow in value or otherwise create an income, which is far from the case for this particular hobby of mine! Certainly, universities and other research institutions work their electron microscopes “hard” in order to justify their capital costs, not to mention an annual maintenance contract and the salaries of those trained to use them. They also bid for external contracts or grants to generate income to justify ownership of their SEMs and TEMs to the financial gods.

So, it does make me feel a bit guilty if I have not fired up my SEM in any particular week. Fortunately, as I write this in mid-August, I am coming to the end of the first phase of a collaboration with one PMS member and am well into another quite large exercise with another. Both these involve EDS analysis and it feels good that the latest addition to my kit (the Oxford Instruments EDS system - see Diaries-44) is actually being used.

“Why do you not charge for your services?” you might ask. I did briefly consider looking for work to help defray the running expenses and depreciation of

my equipment, but I had too many negative thoughts. For example, what if I damaged a sample provided by a customer, or if an EDS analysis came up with the “wrong” result. Would I need to employ a solicitor to check over any contracts and non-disclosure agreements and make sure they covered such eventualities? My insurance brokers also raised questions about third party liability, and who knows, business rates might come into play as well.

And anyhow, if I became a contractor, then I would have to spend even more time than I currently do writing reports and updating spreadsheets.

I am also asked occasionally why I do not market my book (see Diaries - 23). Similar considerations of time and clerical work arise here. The cost to me of a single copy of my print-to-order book is in excess of £70 including postage, direct from the printer. I could order in bulk, say 20 copies at a time and get a small discount, but then I have the complication of packing individual copies and taking them to the Post Office. If I wanted to make a profit I would probably still have to charge more than £70. Who would buy a copy at that price, given that it only has 63 pages? A bolder option would be to have 1,000 copies printed and ask Amazon to handle the sale and dispatch. Although this would reduce the per-copy cost a lot, it would require a significant investment up front, with no guarantee of recovering the costs.

So, as regular readers of “Diaries” will know, my “business model” is to gather and image samples I find myself or act as the microscopist for specimens collected by friends in the PMS or other groups, such as the Quekett Microscopical Club (QMC) or University of the Third Age (U3A). Although I do not expect payment for this, I do receive the reward of being provided with specimens of which to

make “pretty pictures” (or graphs and tables!) and to learn new subjects. I even sometimes find my name in print on learned papers, magazine articles, or even a book! This is reward enough.

Much as I enjoy creating images, particularly when I can post-process them in Adobe Photoshop to become “pictures”, I seldom have the patience to trawl through reference books to identify the species of the foram or diatom (for example) that is the subject of the picture. I tend to rely on other people (hopefully the sources of the samples) to provide that information as well as other useful data, such as when and where they were collected. I am extremely grateful to one QMC member for going through a large number of images of diatoms collected during a field weekend at the Cranedale Centre in Yorkshire in 2023. These are available to view on my website [1] complete with identities for species in the “Diatoms from North Yorks” galleries.

The one exception to this “rule” is when I image spiders. Arachnology is my “specialist subject” and thus I feel better placed to determine those to species level.

So, I have some pictures, and I have an ID for the subjects of the pictures (some of the time) - what do I do with them? A very reasonable question. The answer is more complicated! When I create an image in the SEM I save it to my SEM data drive (backed up to DropBox). I then import the image to Adobe Lightroom. This software not only includes a powerful post-processing engine (which I tend not to use for my SEM images!) but also an excellent system for inserting keywords. This can be hierarchical, so given that I am an arachnologist I have a category of “Spider”, and below that I have a category for each of the 31 families found in the UK. One further level down in the hierarchy I have a list of all the species of spider in a particular family for which I

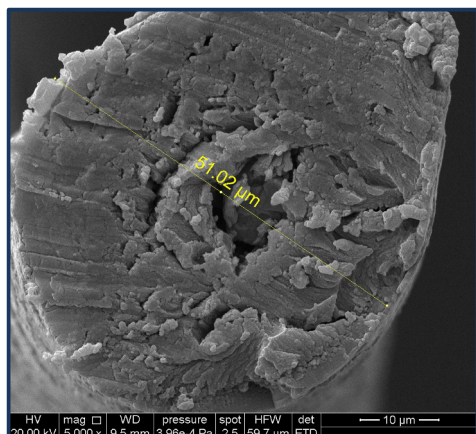


Fig. 2: Cross Section of a fine mammoth hair

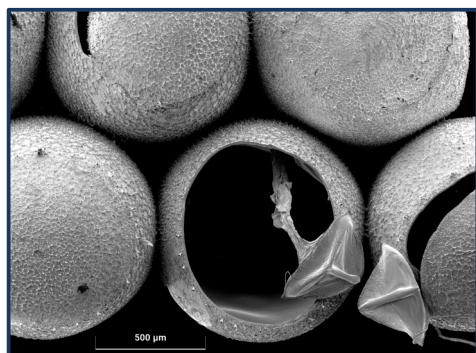


Fig. 3: Closely packed eggs of the green shield bug. Note the triangular “egg burster”.

have images. Separately, I have a list of geographical locations, and I could use those keywords to further define the diatom. This enables me to locate all images of a particular spider species or alternatively I could search for all species recorded as being collected at a given location. I can also search on file parameters such as the date the image was made or the number of the SEM stub containing the specimen (which I include in the file name).

At the time of writing I have just under 20,000 images, although some of these



Fig. 4: Coiled proboscis of the Box-tree moth.

could be of the same scan in various stages of photographic post-processing. Allowing for this, I expect I still have in excess of 10,000 distinct images. Of these, a few find their way into SEM Diaries, of course, and some are given to the providers of the specimens and other collaborators. Some are printed onto canvas and used to adorn the walls of my house and lab, as can be seen in Figure 1. I also have galleries on my website, although I have to admit that I do not add to these very often!

I have carried out a number of successful collaborations with members of the groups mentioned earlier, on subjects including foraminifera, pseudoscorpions, the green shield bug, the box tree moth, mammoth hair and a newly recorded spider on the Falkland Islands. Images from some of these projects are reproduced as Figures 2 to 5 of this edition of “Diaries”.

As mentioned in the introduction, I am currently involved in two separate collaborative projects. Both involve the creation of “pretty” SEM images, but they also involve EDS analysis. One is to image and analyse a large number of tiny crystals of minerals gathered from mines

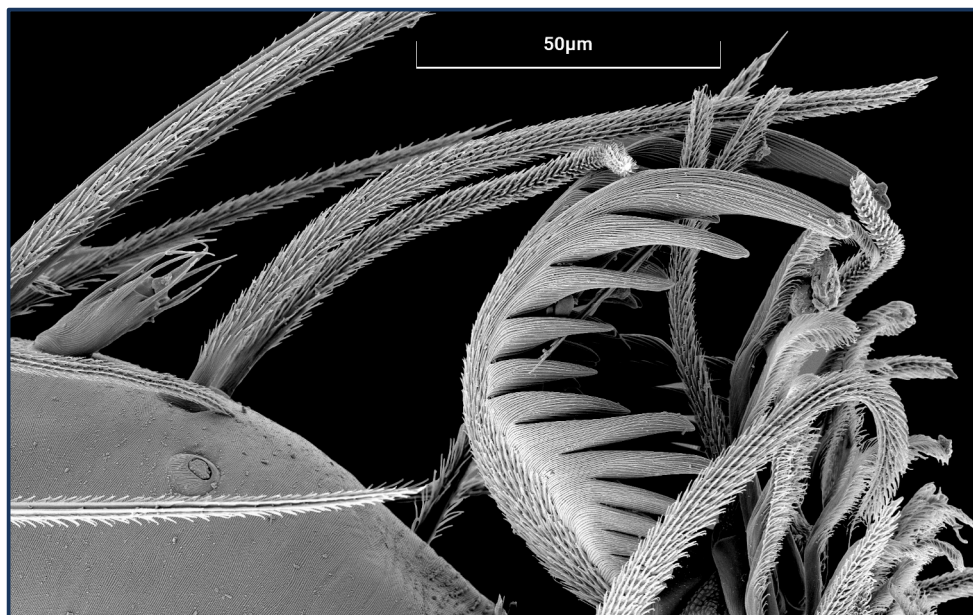


Fig. 5: Tarsus and meta tarsus of spider *Orsonolobus otariorum*

in Yorkshire. (Initial comments from the originator of the project suggest that some of these might represent the first occurrence of the mineral in the region. So, there is some responsibility to achieve the correct result. This collaboration, like many others, is really valuable for me outside the context of the particular project. I am learning some of the pitfalls of EDS analysis of specimens that are not polished flat, and taking full advantage of the knowledge and experience of my “co-worker” to improve my technique.

The other project is to image monothalamid foraminifera, and to analyse the sediment that they take up as an outer coating rather than to make their own tests (or shells). These protists are very “under-studied” given that they are difficult to locate and equally difficult

to differentiate between species. This project should result in a significant paper, of which my work would be but a small part.

These projects took a bit of a back seat during June and July, as I was spending time photographing birds and other wildlife in Iceland and Northumberland. However, they are now taking off again, and it feels great to be able to spend significant time using my “investment” once more.

Reference

1. My SEM website can be found at:
<https://jeremypoolesem.org.uk>