SEM Diaries - 37

One thing leads to another!

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My Display Board at the Husbands Bosworth Meeting

I sometimes flit from subject to subject when it comes to imaging material on my SEM. If I see something that might make a good image, I tend to just collect it, prepare it and see what it looks like. You might call this a lack of concentration. I call it an "enquiring mind".

Readers of SEM Diaries - 36 will have read that I have been making quite a few images of honey bee anatomy recently, my interest having been stimulated by an article on the subject in BP142. Some time later I found a "bee-like" insect on one of my windows at home and wondered what it might be. It was larger than a honey bee worker and darker in colour. Could it be a drone (male honey bee) I wondered?

A quick look at the (now euthanised) insect under my stereo microscope disproved my drone theory, as it had a sting, but confirmed that it was bee-like. I was beginning to think it must be a "solitary bee", a group about which I had virtually no knowledge. Grabbing my trusty "Chinery" [1] I guessed it might be an *Andrena pilipes,* based on its size and

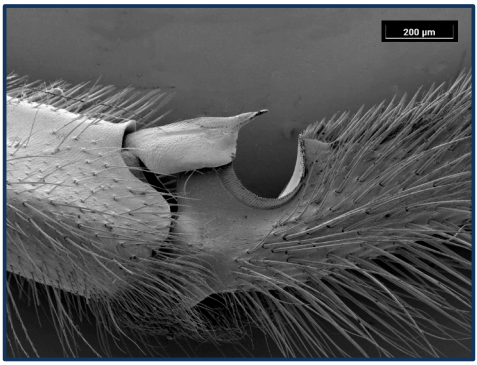
colour and the presence of a white pollen brush on its hind legs. This is not a particularly common species, but I do live less than 35 miles from the South Coast (of Britain) where it has been recorded.

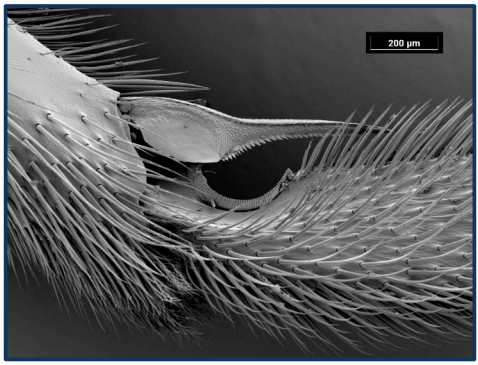
The next stage was to dissect and mount the unfortunate creature, and since I only had the one specimen I took extra care. In particular I kept the left and right legs separate, and when I mounted these I laid the legs of the left side in one orientation and the right legs in the opposite orientation, so that I could study any differences between the "inside" and "outside" faces of the legs.

When imaging the stubs I chose similar views to those I had already captured on the honeybee. I was amazed by the differences in the detail between the two species, which led to further research (on the Internet) as to possible explanations. One important difference between the two species is that solitary bees do not make wax. Another rather obvious difference is that solitary bees are solitary, rather than social, insects, living in holes in the ground rather than communal nests (or hives!).

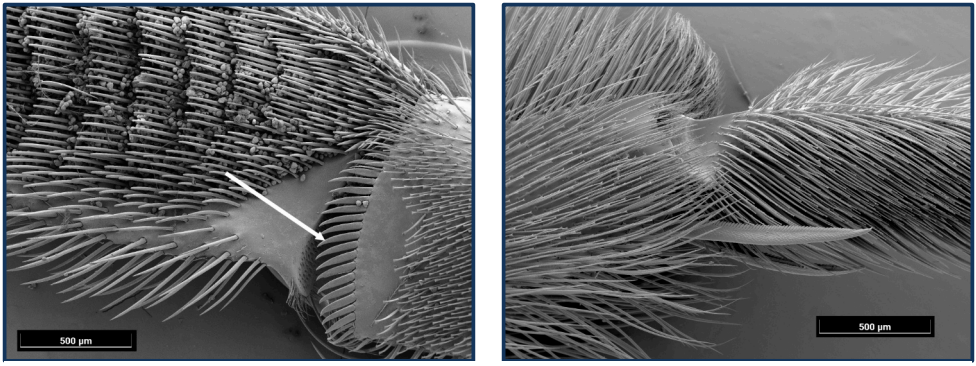
Regular readers of Balsam Post will know that I mercilessly plug face to face one-day meetings, such as those run by the Postal Microscopical Society or the Quekett Microscopical Club, as a means of learning new microscopical tricks, meeting like-minded people, buying microscopes at very reasonable prices and generally sharing ideas. These meetings are greatly helped by some members bringing along "gossip" exhibits. Given that all my microscopy is geared towards SEM these days, and that it would be impractical to carry around half a tonne of high technology to meetings, my gossip exhibits tend to consist of prints of electron micrographs illustrating my recent work. Thus when I went to the Penkridge meeting I took along a display board with around a dozen images of honeybee parts, and for Husbands Bosworth I updated this to illustrate the difference between the anatomy of the honeybee and that of a solitary bee. The frontispiece to this article shows the layout of the display board (photographed at home). The pairs of images below, and on the following page, which were included on the display board, illustrate just some of the differences of the anatomy of the two types of bee. I do not have an explanation for all the differences, and sometimes where I think I do have a reason it could be pure speculation!

Another "activity" of note during this period was the visit of a retired professor of geology, to view my laboratory. I had previously done some imaging and EDS analysis of some samples for him, and he was interested to meet me. After we had re-examined his samples we had a look at something I had been looking at with a different collaborator. That sample was, basically, some fossil bivalve shells trapped in a pyrite (iron sulphide) matrix.

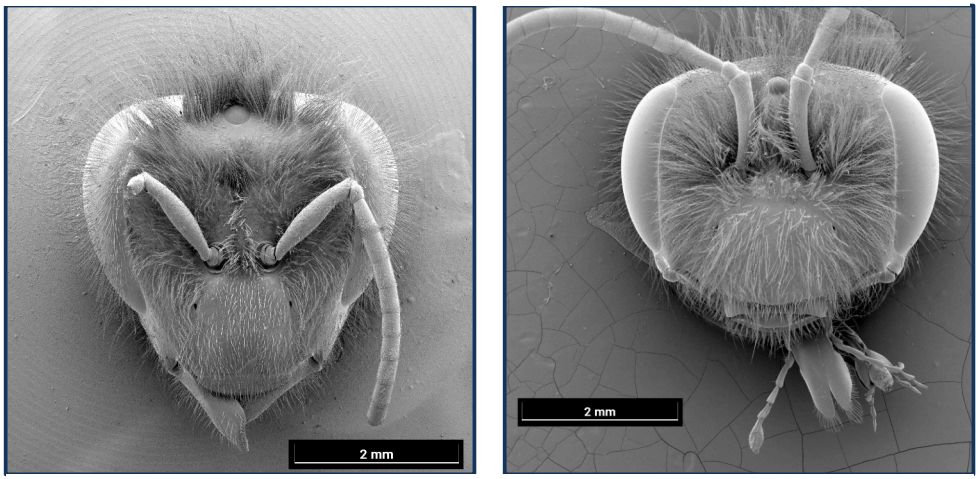




Antenna Cleaners: Left honey bee, right solitary bee. Although there does not appear to be much difference in the appearance of the antennae between the two species (not shown) the cleaner for the solitary bee has a much more elaborate "clamp" mechanism than that of the honey bee.



Pollen baskets (corbiculae) on the rear legs of the bees, seen to the left of each picture: Left - honey bee. Note the “wax shear” (arrowed). This comb-like structure is used to scrape newly formed wax off the wax glands on the abdomen of the bee and transfer it to the mouth of the bee for it to construct honey comb. This structure has a second purpose, which is to compact the pollen in the corbicula of the opposite leg. Right - The solitary bee does not make wax, but does nonetheless collect pollen. For this species the leg also has comb-like structures but of a significantly different design, no doubt optimised for compacting pollen.



Bee heads: Note how hairy the head of the honey bee is (left) compared to the solitary bee on the right. On the honey bee the hairs extend into the compound eyes, whilst the eyes of the solitary bee are free of hairs. Note also the very different shape of the jaws, which hide the mouthparts of the honey bee, but these are exposed on the solitary bee (at least in this particular image).

For that exercise I had thought that we had learnt as much as we could about the sample but my visitor commented on the disproportionately large quantity of carbon indicated by the EDS analysis of some areas.

Could this be organic matter, trapped in the sediment when the bivalves died, or alternatively, could it maybe just be down to the fact that the polished specimen had been rendered conducting by sputter coating it with carbon, which was interfering with the results? Further experimentation is pending!

Reference

1. Chinery, M., Insects of Britain and Western Europe. Collins Pocket Guide. HarperCollins 1986, 1993