

# *SEM Diaries - 13*

## *Now what on earth was on that stub? - and another shaggy dog story*

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Fig. 1: Multi-Compartment plastic box, containing numbered stubs, sorted in groups of 10 and 50.

Since acquiring my SEM I have gained significant experience in its use (though as I said in Diaries - 12, I am still learning). I have been imaging any potentially interesting samples I can

lay my hands on and generally having a “fun time” with it. However, I have resolved this year to start putting some serious work into the project that I had in

mind when embarking on my initial research into owning an SEM.

This project is to image key parts of the anatomy of as many species of UK spider as I can lay my hands on. Having made a start on this, the key parts I have identified are: male and female sexual organs, tarsus, chelicerae and fangs, and the layout of the eyes on the head. I have also become interested in the tarsal end of the female pedipalp and might add this to the list. So far I have, in some cases incomplete, libraries of images for just seven species - so only another approximately 643 species to go!

In May I attended the AGM weekend of the British Arachnological Society (BAS), at the Margham Discovery Centre, a Field Studies Council centre in South Wales. This, in addition to the half-hour annual general meeting itself, provided the chance for a day out in the field collecting specimens and a couple of lectures as well. I took along my growing folder of images of spider bits and passed this round some of those present in the bar. The reception was positive, although I was not flooded with offers to provide specimens for my grand project. On my return from Margham I immediately got round to updating my SEM website. I had not changed this for some time, but I had given its URL ([www.jerempypoolesem.org.uk](http://www.jerempypoolesem.org.uk)) to a number of BAS members, and wanted it to reflect my latest work.

Having set myself the goal of imaging British Spiders (and I am not naïve enough to expect ever to end up with a set of images for every species) I am determined that the minimum number of errors (hopefully none) appear in my libraries. Thus, if I say that a particular tarsus comes from a named species, then it is essential that this is accurate. So, what's the problem?

Many readers will have attended one or more of the slide making courses given by Ernie Ives. Often Ernie would provide a

large number of different species, none familiar to me, to mount in quick succession. To keep track of which species was on which slide, Ernie named and numbered each species on the revolving blackboard and we would carefully transcribe the number onto the relevant slide and into a notebook. This would be done by writing on a temporary sticky label applied to the slide or, for slides with frosted ends, by writing in pencil directly onto the slide.

Unfortunately, there is considerably less free real-estate on SEM stubs than there is on a glass slide, and, of course, the entire upper surface is coated with gold during the sputtering process. I have occasionally tried writing on the base of the stub in permanent ink, but the space available is tiny and the ink soon rubs off.

The solution I have adopted to this conundrum is to purchase a supply of pre-numbered stubs. These are laser-etched in a numerical sequence specified by the purchaser. In my case I ordered 1,000 stubs numbered from A000 to A999. When these are exhausted I shall probably specify B000 to B999, but I hope that will not be any time soon.

Given that the cost of these stubs is in excess of £1 each, about five times the cost of conventional ones, I did look into other possibilities. I figured that I could print a set of sequentially numbered discs on a sheet of acetate or paper. All I would need then would be a punch to stamp out the disc from the sheet, and another to punch a small hole in the middle, so it could be slid onto the shaft of the stub and be retained by friction. This would really have required a purpose built punch, similar to that used to make the slide boxes used on circuits, and my enquiries came to nothing.

Once I had ordered the stubs there was a short delay while they were etched to order and then they were delivered - 1,000 stubs enclosed in a thick polythene bag. No attempt had been made to pack them in

numerical order, but then I cannot imagine how that could have been done at an economical cost. So, I had to make a decision - do I laboriously sort the stubs in order, or do I just use them in the order they come out of the packet. After all, I can record the numbers in a database, so there is no need to start at number A000. Eventually my "ordered mind" came to the fore and I spent a not unpleasant couple of hours listening to Mozart and sorting the stubs into consecutively numbered groups of 50. These were then stored in two compartmentalised plastic boxes purchased for this purpose (Figure 1). In fact I sorted the first 50 into groups of 10 to save time when selecting stubs for a particular set of specimens. The etched numbers, though small, are easily legible and these stubs will, I hope, save a lot of time over the coming years by reducing uncertainty as to what they contain. One disappointment with the stubs was that the package contained fine dust, no doubt a by-product of the etching process. This will need to be cleaned off prior to mounting specimens to avoid contaminating the chamber of my SEM.

### The Story of my Desiccator

I guess all readers are aware of the cartoon strip depicting the design of a swing - from the picture in the mind's eye of the person wanting to use it through the different ideas of all branches of a company involved in its design and construction (as well as billing!). For those who would like to remind themselves of this, you could visit: <https://www.tamingdata.com/2010/07/08/the-project-management-tree-swing-cartoon-past-and-present/> .

I spent a significant amount of my working life specifying and implementing methods of writing requirements so that they are clear, unambiguous, and can be tested, in order to avoid just such a disastrous outcome. It seems that, in retirement, I am not as rigorous! When I asked my service engineer, Don, if he had any desiccator on

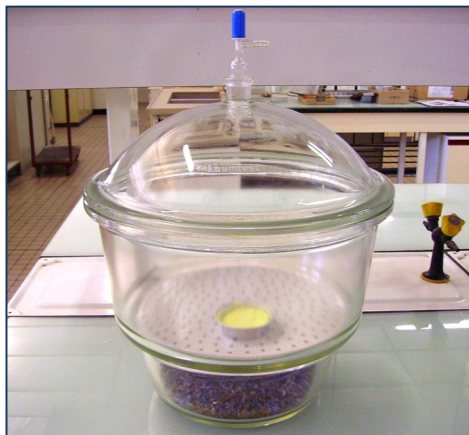


Fig. 2: The desiccator in my mind's eye (with added vacuum attachments)

his shelves of equipment rescued from laboratories, he said he was sure he could help. Now, I had seen a desiccator in Dave Spears' lab, so I knew what I was talking about(!) It looked something like Figure 2, though without the addition of the vacuum glassware on the top. In effect, all it consisted of was a glass casserole-like vessel with a close-fitting lid and a perforated tray in it. Specimens to be dried were placed on the tray and a quantity of silica gel drying agent was placed below the tray, to absorb any remaining moisture.

The item Don brought with him is illustrated in Figure 3 (on the next page). This was extracted from a scrap cryo unit for a transmission electron microscope. However it does not bear much resemblance to Figure 2. Well, it does and it does not..... It is cylindrical, has a lid, and also has some vacuum apparatus. I challenged Don on this and he said that, yes, it will work as a desiccator. All I would need to do is to connect it to a vacuum pump and it would prove very useful; oh, and I could use the vacuum pump attached to my sputter coater when the latter was not in use.

Well, the thought of struggling under my bench to disconnect the sputter coater



Fig. 3: The unit Don brought with him

vacuum hose and connect the pump to the desiccator really did not appeal, so some time later I asked Don if he might have a small vacuum pump (pre-owned of course) and some hose, so that I could have a stand-alone system. I had in my mind's eye a  $1\text{m}^3$  / hour pump similar to one I had seen attached to a sputter coater someone was trying to sell me. This was quite compact and weighed less than 10 kg. Sure, he said, he would bring a pump on his next visit along with some fittings.

The next visit duly came and, true to his word, Don came armed with a reconditioned vacuum pump, some vacuum hose and various other fittings. The pump was a  $5\text{m}^3$  / hour version, identical to that used with my sputter coater, weighing in at 20kg (Figure 4). At least it could act as a spare for my sputter coater, should that pump break down.

Unfortunately, despite Don's having brought a variety of fittings with him these were insufficient to complete the "daisy chain" between the desiccator and the pump. This little issue was resolved some weeks later when I was able to visit Don at his industrial unit while I was in the area on other business.

All that was then required was a holder, easily lowered into the desiccator, to support stubs in the chamber. I fabricated



Fig. 4: Reconditioned vacuum pump

something suitable from sheet aluminium and steel rod, and the result is shown in Figure 5, sitting on a twice life size engineering drawing for the same part.

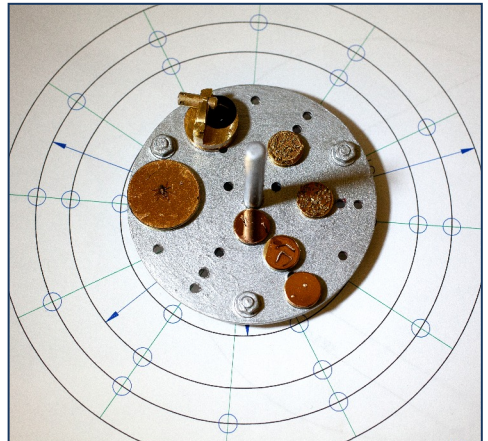


Fig. 5: Support to suspend stubs within the desiccator

The complete assembly is now mounted in a flat surface and connected to its pump. As I write it holds, under vacuum, seven spider stubs, which have been through the drying process but await sputter coating. I am sure this will make a useful contribution to the quality and consistency of my images. I intend to make it normal practice to desiccate previously mounted stubs prior to imaging from them. These would inevitably absorb atmospheric moisture, while stored in my drawers.