COUNTING PHYTOLITHS FROM SONGO MNARA, TANZANIA

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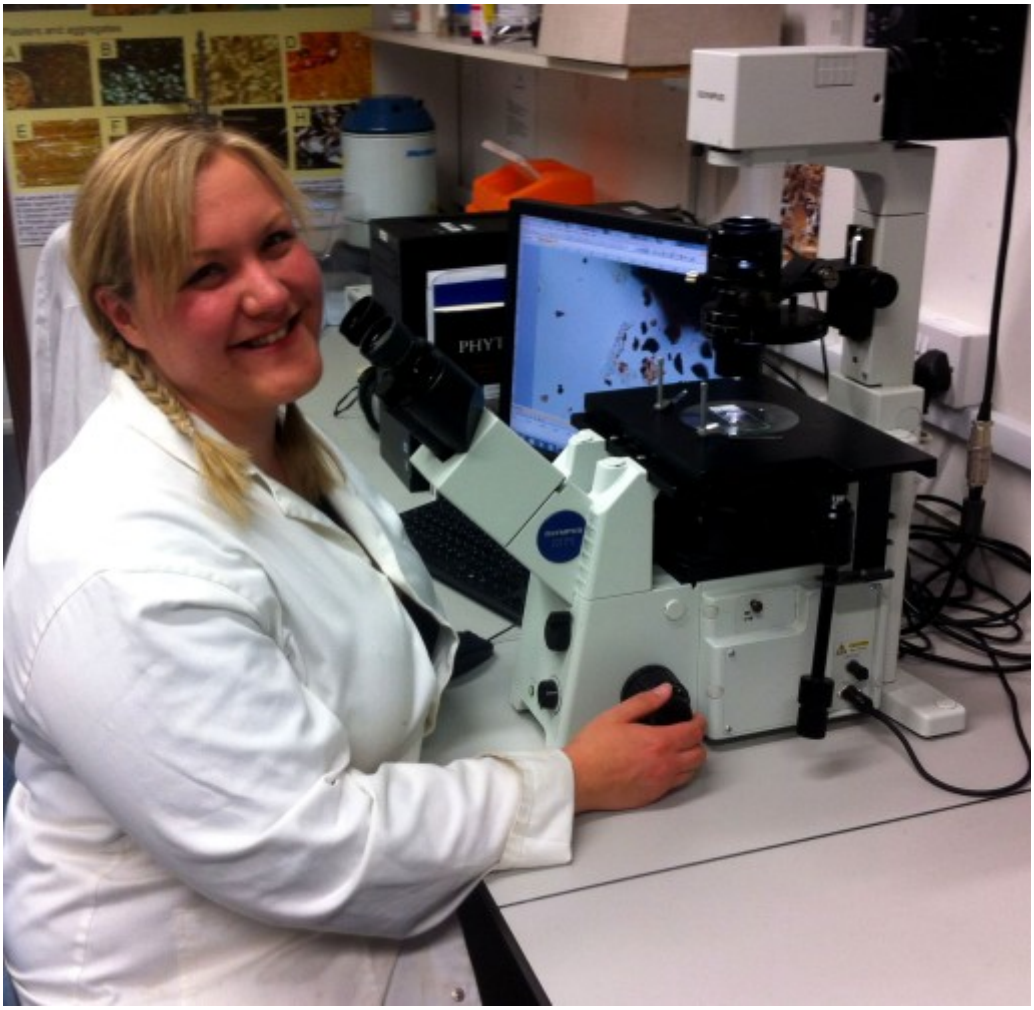
Right now, I spend my life counting phytoliths – over 3500 phytoliths so far….What's a phytolith and why does it get me out of bed and into the lab before 7am? How did you not realise this was such an exciting archaeological technique?



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Phytoliths are a bit like plant negatives; essentially the plant absorbs monosilicic acid (H_4O_4Si) from its water supply and during transpiration as the water 'leaves' the plant, the monosilicic acid becomes solid opaline silica. It has to go somewhere, so it fills in gaps within the cell structure of the plant. These gaps are either within the cells, or surrounding the cells, making silica negatives of the internal cell structure. Not all plants make phytoliths though, just like not all plants preserve well as charred plant macrofossils, and not all pollen grains enter the local archaeological record or preserve well. Plants have to degrade in situ for the phytoliths to be included in the archaeological record, no technique is perfect. But the key is, that phytoliths are well preserved in a variety of contexts and can add to our understanding of plant use; not only on sites with poor preservation of plant macrofossils and pollen, but also in contexts where plant remains may not have entered the archaeological record following charring. For example, organic crafts such as grass or palm matting may not be preserved by charring and therefore might be invisible on

archaeological sites without waterlogged preservation. These may be visible through phytolith analysis if they have degraded in situ. To help identify diagnostic phytoliths I collected lots of plant samples from the field and I'm now creating a phytolith reference collection in the lab. It's not a magic bullet to help us understand plant use in the past, but it is pretty cool!

I'm working on late 14th to early 16th Century samples from Songo Mnara, a Swahili stonetown in Tanzania, part of the [1] and my PhD project at the University of York. Songo Mnara is part of the Kilwa Archipelago and it's linked to other settlements and islands along the East African coast through the Indian Ocean Trade network. Songo Mnara has truly amazing preservation of stone buildings!! To get to the site you have to take a Dhow from Kilwa Masoko with a guide and once you arrive on the island you have to wade through a tidal Mangrove swamp, which can be anything between ankle deep and chest high! It's off the beaten track, for sure.

Songo Mnara © Hayley McParland-Clarke 2013

During the 2013 excavation season, two types of structure were excavated; a stone house divided into rooms and a collapsed wattle and daub structure, which appeared open plan. Initially it was thought that the monumental stone architecture in the town was standing in an open area, but extensive test pitting by Dr Fleisher combined with Geophysical and Magnetometer survey[2] revealed the presence of concentrations of daub within this space. Excavation exposed two wattle and daub structures with comparable finds assemblages to that of the stone structures.

The phytoliths I'm looking at today come from Trench 32, one of the daub structures. Spot samples were taken across the entire packed sand floor surface of the structure on a 1m grid, in order to assess

whether phytolith analysis can be used as a tool for spatial analysis and to understand the use of plant materials within the structure. Samples were also taken from the ‘outside’ of the structure in the open area to identify clear differences in the phytolith assemblage between ‘inside’ and ‘outside’ and to see if it was possible to recreate the environment immediately adjacent to and further away from the structure.

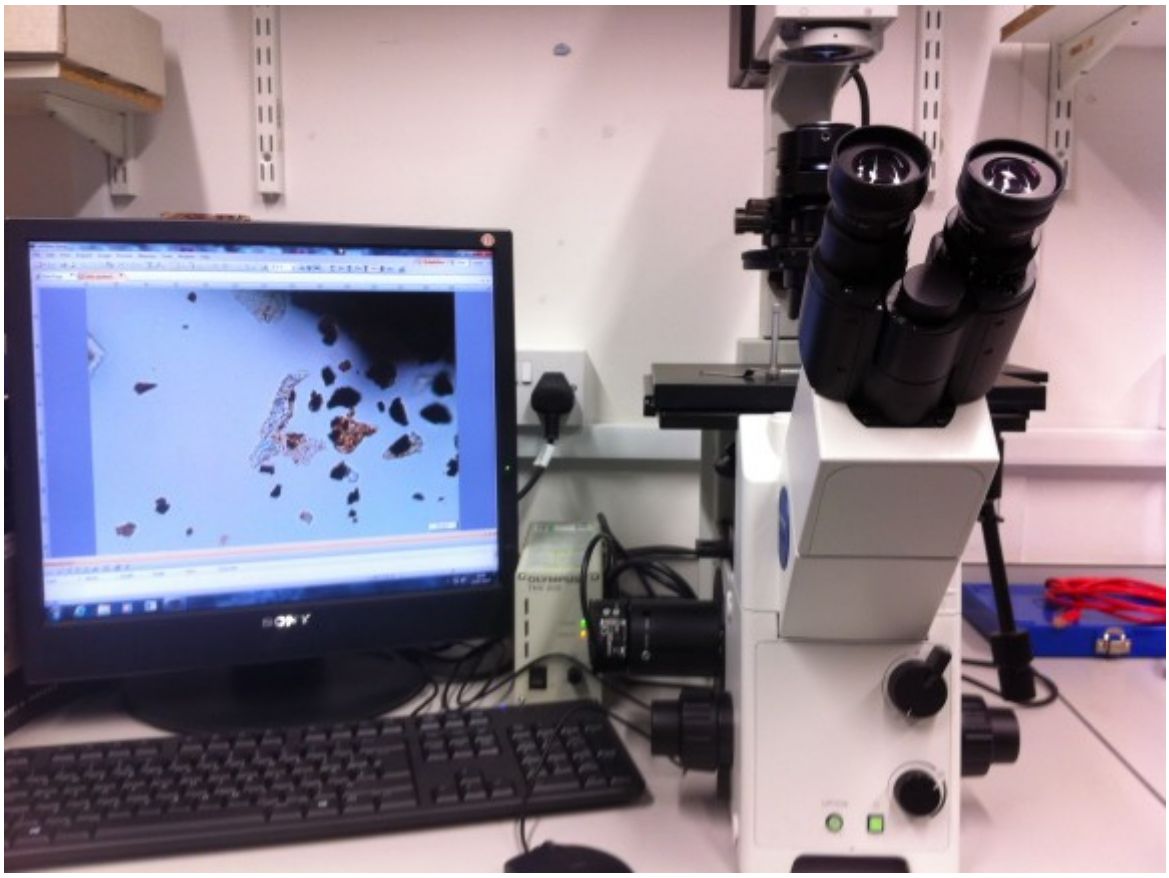
Sampling for Phytoliths at Songo Mnara © Hayley McParland-Clarke 2014

I’m really hoping that we’ll be able to see activity areas within the structure through the plant assemblage, for example food preparation areas or areas of matting. It may be possible to identify construction materials such as wood, or roofing materials such as palm thatch. I’m also hoping to see evidence of Indian Ocean Trade through phytoliths from imported edible plants within the assemblage, but as with all archaeology I can hope for lots of things, it doesn’t mean it’s there! We also sampled the stone house, which is really interesting, because it has clear rooms within it, whereas those divisions weren’t clear when excavating the daub structure. Phytolith analysis might enable us to see the limits of the daub structure by providing an ‘inside’ and an ‘outside’ botanical signature.

The process of counting involves using a high powered microscope at x400 magnification to identify phytoliths, photograph them, measure them and count them. I count around at least 250 per slide, which means that I’ve counted thousands from this site so far, and I’ve a lot more to do! Phytoliths are 3D objects, but when you’re looking down the microscope you only see the 2D image, which means that you have to remember that each phytolith type might look different depending on which angle you’re looking

at it from! Phytoliths aren't always round like pollen, in fact they're frequently not round at all, they come in all shapes and various sizes!

Although lab work is often thought of as completely different to fieldwork, it's sort of the same. I search through transects on the slide, much like layers of stratigraphy looking for microscopic evidence in the form of phytoliths rather than artefacts. It can take a long time, it's systematic and sometimes I don't find anything of interest. Recording stratigraphy on site tells you a lot about site formation processes and human actions, likewise recording information about the slide assemblage is useful. For instance, lots of phytoliths which are still articulated suggests that there was little bioturbation, or lots of microcharcoal might suggest burning episodes.



I'm on my last few slides from this pilot study now, and I've started to get an idea of what's happening in the structure which is really exciting. Each phytolith assemblage has a different character, which suggests that the spatial approach might be working!! I can clearly see a difference between the assemblages from the floor surface 'inside' the building and the outside; I can also see variations across the floor surface within the structure.

Future research will focus on the comparison of the stone house and the daub structure to see if there's a difference between the uses of each structure. I also hope to look at some of the open area samples to try to understand how the urban landscape impacted on the local environment. Follow my progress and find out more about phytolith analysis, archaeobotany and archaeology on my blog, or follow me on twitter @Hayley_McP.

[1] Managed by Dr Stephanie Wynne-Jones and Dr Jeff Fleisher, funded by the NSF and AHRC.

[2] Welham, K., J. Fleisher, P. Cheetham, H. Manley, C. Steele, and S. Wynne-Jones. 2014. Geophysical Survey in Sub-Saharan Africa: Magnetic and Electromagnetic Investigation of the UNESCO World Heritage Site of Songo Mnara, Tanzania. *Archaeological Prospection*.