Pivotal Images and Visualisations

Pushing Boundaries: Spectral Imaging of Archaeological Small Finds

Brief Narrative

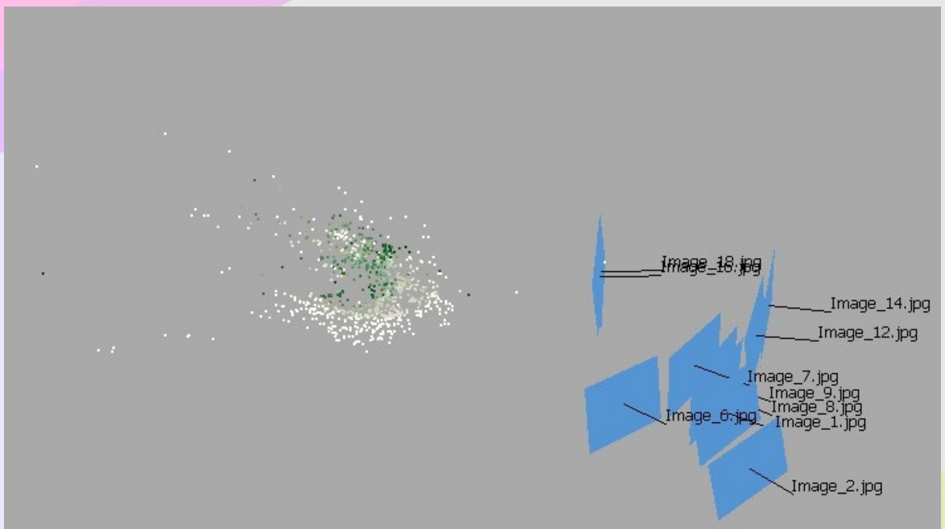
This document contains specific images and visualisations from my research, *Pushing Boundaries: Spectral Imaging of Archaeological Small Finds*. The intention is to highlight the influence these images had on the research process and to highlight the inherently aesthetic nature of these visualisations that are not necessarily conveyed through individual files or in the printed thesis. It also presents these visualisations in chronological order to show the interrelated nature of research into all of these methods, which cannot be conveyed well in the text.

Most of the images and models highlighted here do still follow certain conventions of archaeological small finds photography (e.g. Chapter 2.2). Some of this is due to certain images being taken for other projects and only edited for use here (e.g. Fig. 4.3). However, this following of convention is largely because these standards do provide a visual representation of an object that captures as much of that object as possible in a single shot. Since many of the images presented here are intended to highlight the contrast between an object's reaction to different imaging techniques, that contrast is best portrayed through images capturing large portions of the object. This demonstrates that archaeologists should be investigating new or different ways of visualising archaeological subjects, but it also emphasises the point made throughout this thesis: that current methods are not to be discarded or dismissed, but rather that they should be added to and built upon.

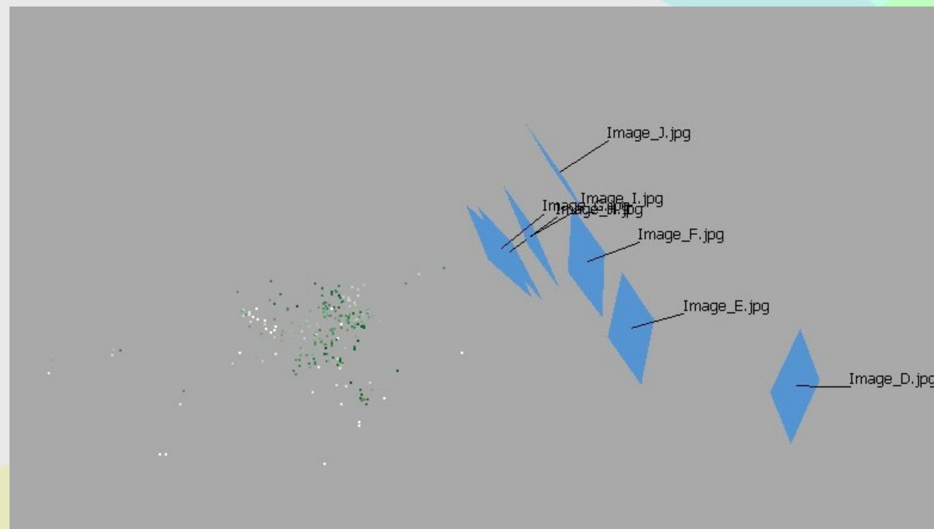
See pages 33 - 34 of the main text for further contextualisation.

Replica Green Eye Bead (Fig. 6.19)

These are the first two photogrammetric models of a bead I ever attempted, both of which failed. I expected the failure due to the difficulties associated with imaging glass beads. I did not expect the attempt with masking to produce worse results than that without, however, as this goes against conventional wisdom (Agisoft 2017, 60). There is something particularly disheartening about waiting several hours to generate what conventionally *should* be a better a model only to have it result in fewer aligned points than the original. I have replicated what I can of this sensation (without the wait-time) by producing a video first exploring the original (better) model before examining the masked (worse) model. (Reproduced as images in PDF).



No Masking

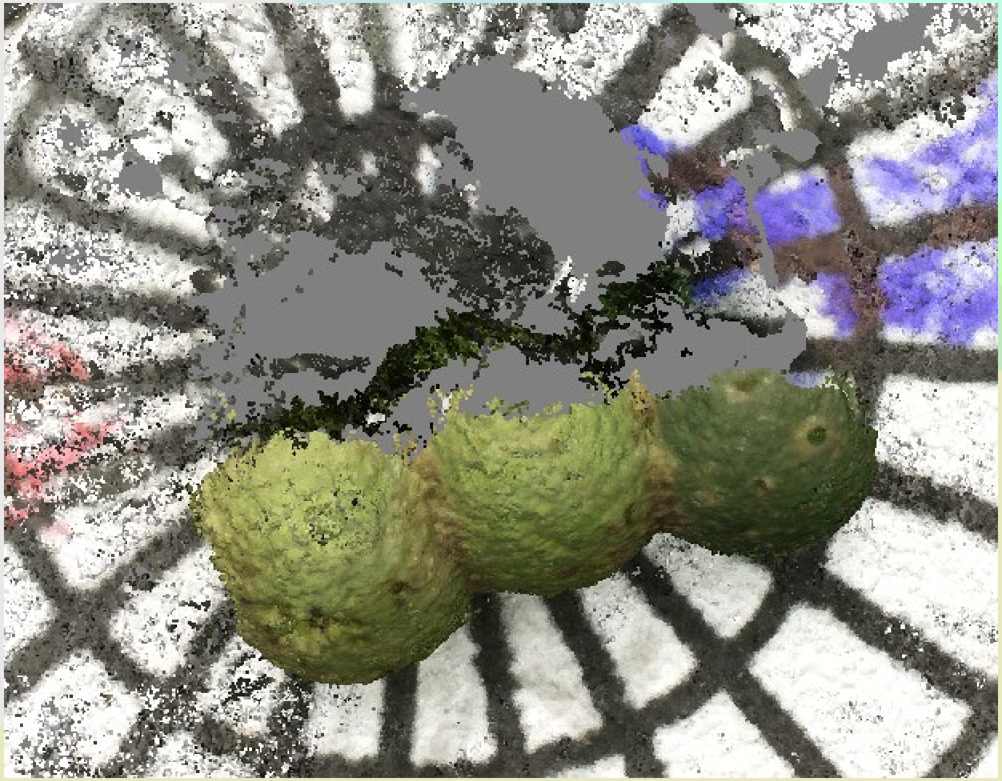


Masking

RO 001

Targets (Fig. 6.15)

This model was particularly painful, since the photogrammetry software's algorithm appeared perfectly capable of aligning the cameras to model the paper, but not to model the object at its centre. While one half of the bead is well-aligned, the other is either missing or poorly aligned underneath the model, leaving a gaping hole where the object should be. The manner in which gaps are rendered in Agisoft Photoscan emphasises this failure: where many programs would fill the resulting holes, Agisoft leaves a disappointing void.

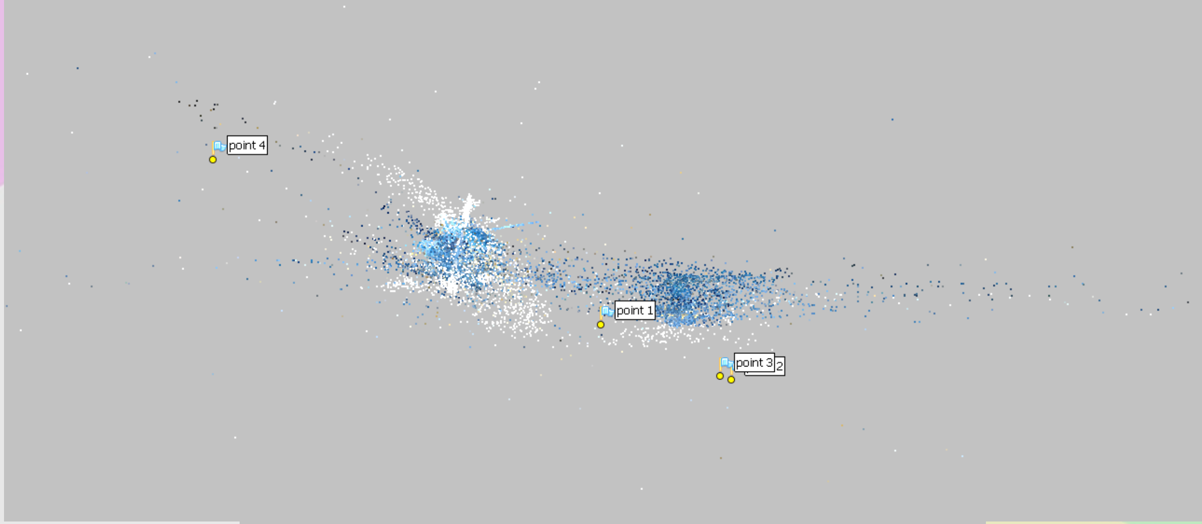


Glenshee, NH Unknown #

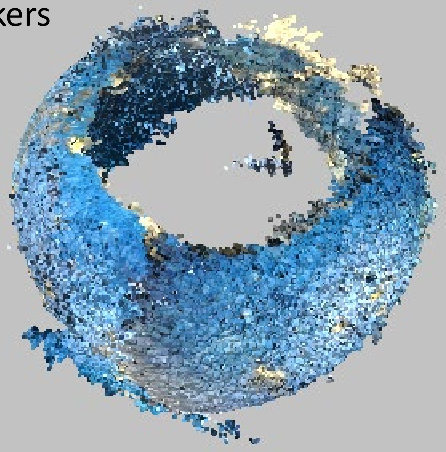
Markers (Fig. 6.16)

This particular model also demonstrated the lack of success conventional ‘fixes’ had for models of glass beads. While the model without markers is not necessarily successful, it is far more so than that with markers. This and the failures with targets and masking all led to the conclusion to break from convention rather than allowing it to continue breaking the models.

Markers



No Markers



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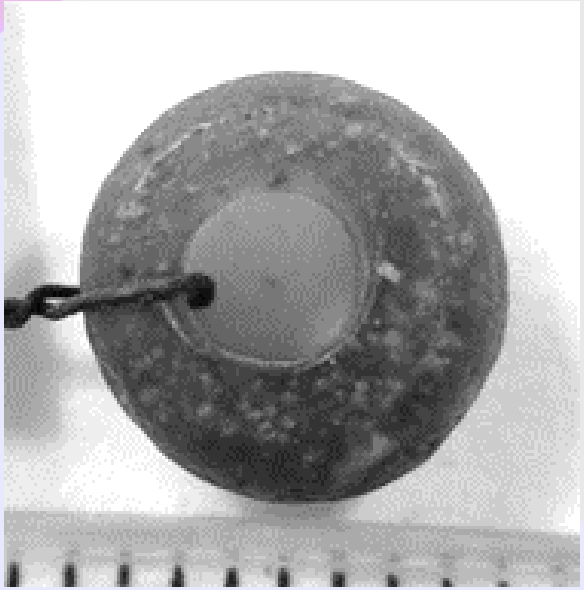
Bubbles (Fig. 4.3)

Frustrated with photogrammetry experiments and their seeming failure, I examined the possibilities of filtered photography for archaeological imaging. I created these images because I was curious about what visible-range filters might reveal in glass beads. Applying these filters led to all of the research contributions made in Chapter 4. While they do show the stark contrast in bubbles within the text, the effect is emphasised here in a manner akin to applying the filter within Photoshop, with the effects displayed immediately on-screen. Click the slide to experience the effect or use the left and right arrows to toggle between them.



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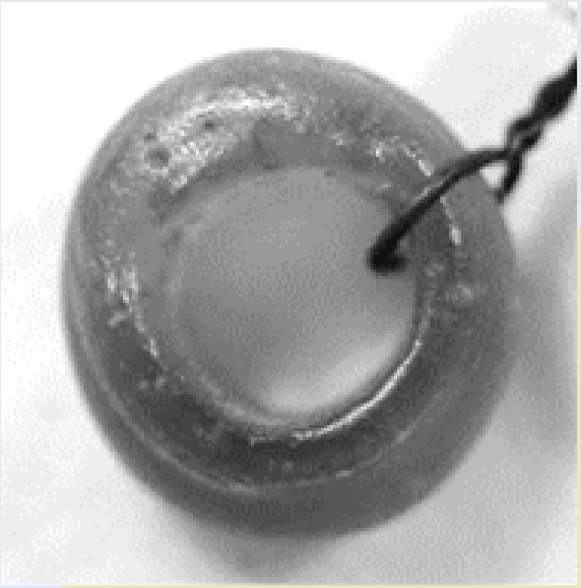

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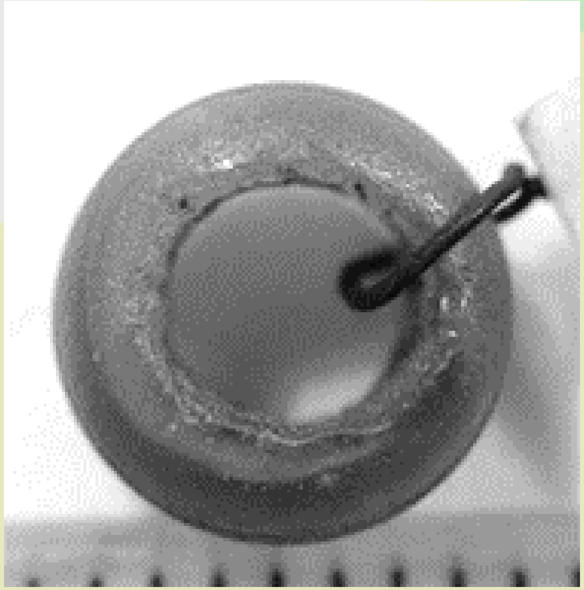

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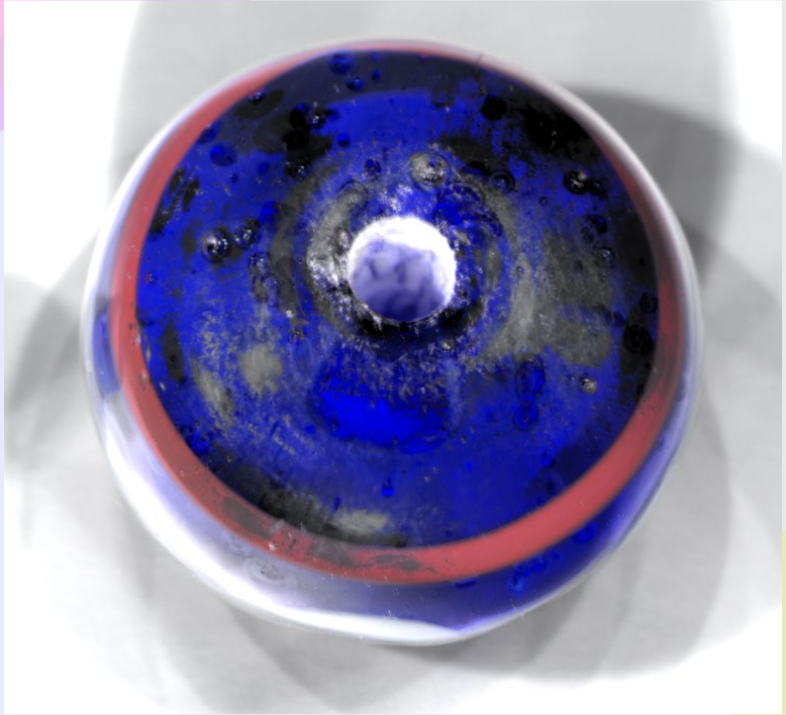
Spectral RTI (Figs. 6.9 and 6.10)

RTI of glass objects is difficult largely due to the reflective nature of it. The original RTI of this object resulted in grey patches on the bead. Once the premise for using filters to examine bubbles was discovered, I applied blue filters to this object to see if RTI of bubbles was possible, even in a model with grey patches. To my surprise, not only was it possible, it also eliminated the grey patches plaguing my results. Reproduced as images for the PDF version.



RO 002

Fouhlin, Loch Eriboll (Fig. 6.28)

This spiral bead from Fouhlin, Loch Eriboll was the first bead to successfully generate a photogrammetric 3D model, but using macro photography and no masking, targets or markers. There are some problems with the texture and there is a hole on one side, but this model has captured and rendered the entire three-dimensional surface of the object. After months of failure only enhanced by continually troubleshooting with conventional 'fixes,' this model demonstrated that looking elsewhere for solutions would be worthwhile.

UG F128

Photomicrogrammetry (Fig. 6.25)

The final major development for photogrammetry came with the purchase of a digital handheld microscope. Having worked with one before, I suspected they would be capable of creating viable 3D models of glass beads, particularly those that were too small for a macro lens to capture enough detail. This microscope was the tool that finally created a successful photogrammetric model of this bead from Glenshee, after dozens of failed attempts.

NH Unknown #

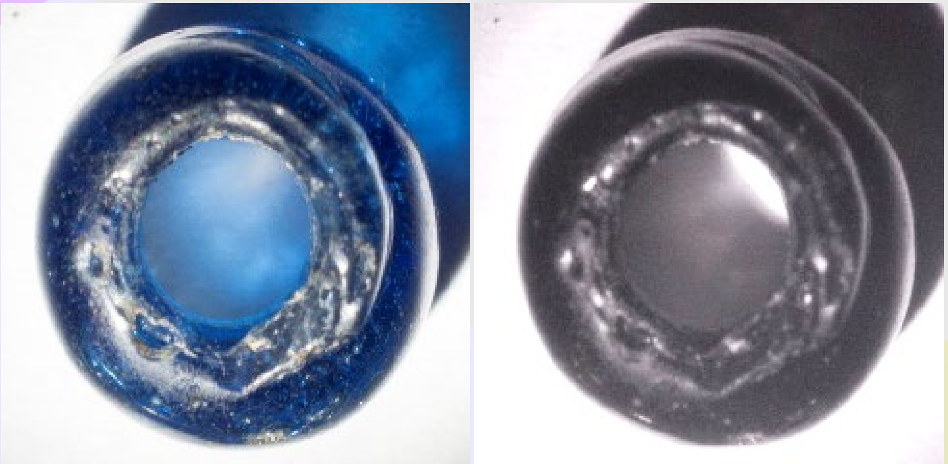
Photomicrographic RTI (Fig. 6.8)

Given the success of photomicrogrammetry, photomicrographic RTI was the next logical step for research. This is not a perfect RTI output, as elements are out of focus. The bead in the image is 3 x 10mm, however, which is significantly smaller than the image displayed here. In fact, when viewed on a computer screen, the size of this video in this slideshow is such that some of the corrosion holes seen in the dark green segment would occupy more space on screen than the entire object occupies in reality. Thus, these digital representations using somewhat unconventional methods allow us to see the object in a way that is not otherwise possible. With objects this size, the visual representation of this object in this way emphasises the skill and ingenuity required for its creation and encourages similar skill and ingenuity in our visual treatment and representation of the object.

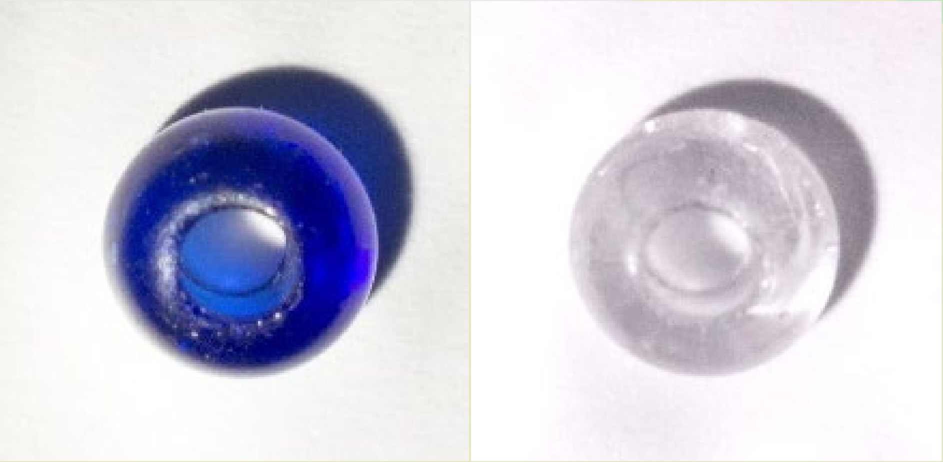
NH Unknown #

Spectral Difference and Chemistry (Fig. 5.1)

Similar to the images dealing with bubbles, these images were created largely out of curiosity as to what glass beads looked like when photographed using an infrared filter. These results were so stark that they spurred all of the non-visible-range spectral photography contained in this thesis. While the images show this contrast within the text, the effect is reproduced more effectively through the aesthetic of their presentation here, as if seeing the images through the camera's playback screen when the images were taken. Reproduced as images for the PDF version.



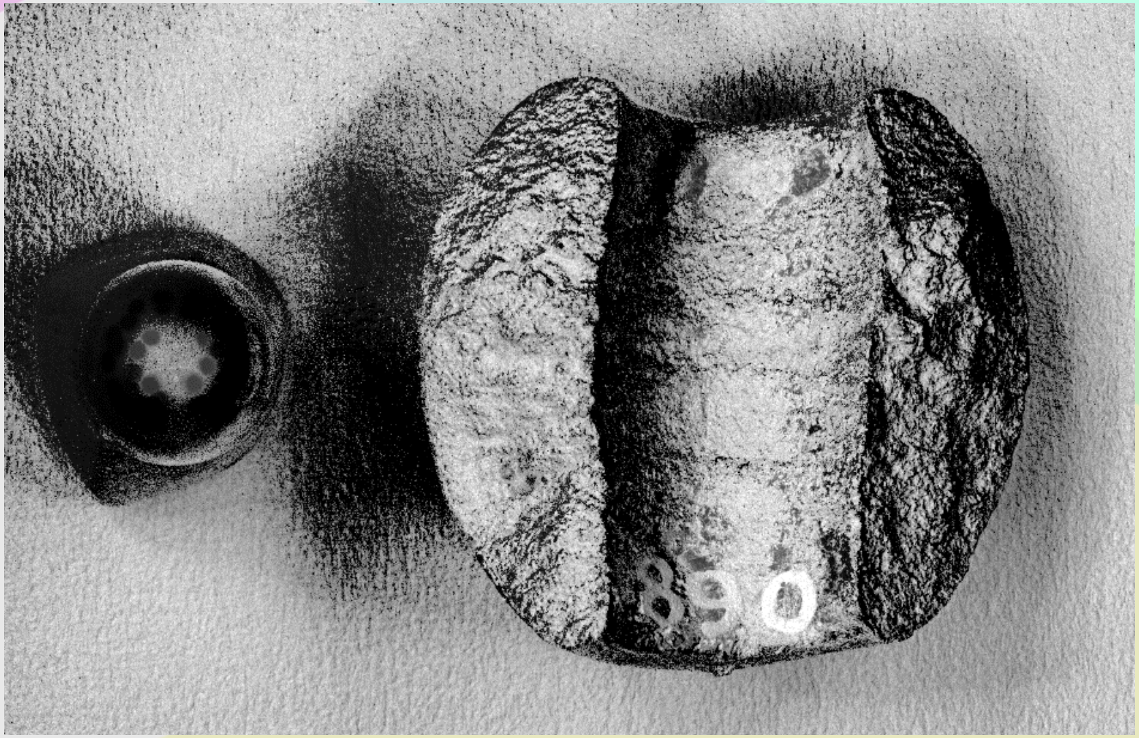
UG SF 15021



UG CLB 1

Ultraviolet RTI (Fig. 6.11)

Ultraviolet RTI was pivotal in that it was one of the first instances of merging spectral imaging and 2.5- or 3-dimensional imaging in this thesis. It was borne out of needing to capture RTI data in rooms without the ability to control ambient light, since most study spaces in museums are open areas with multiple people working. Ultraviolet RTI allowed for image capture without disturbing others, and resulted in highly informative images, particularly in relation to the bead perforations.



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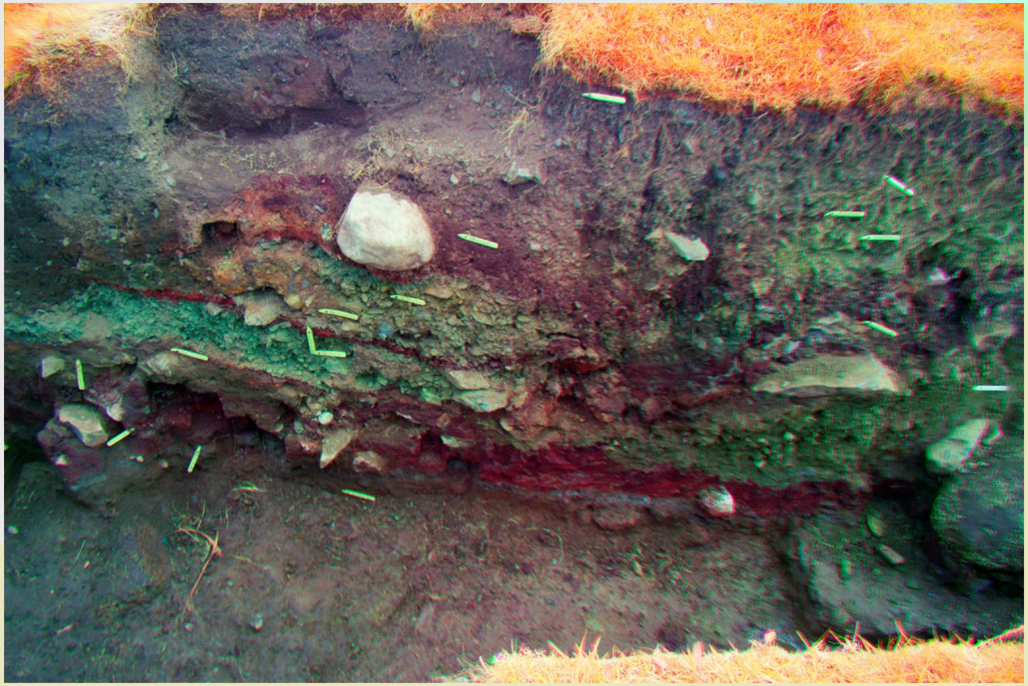
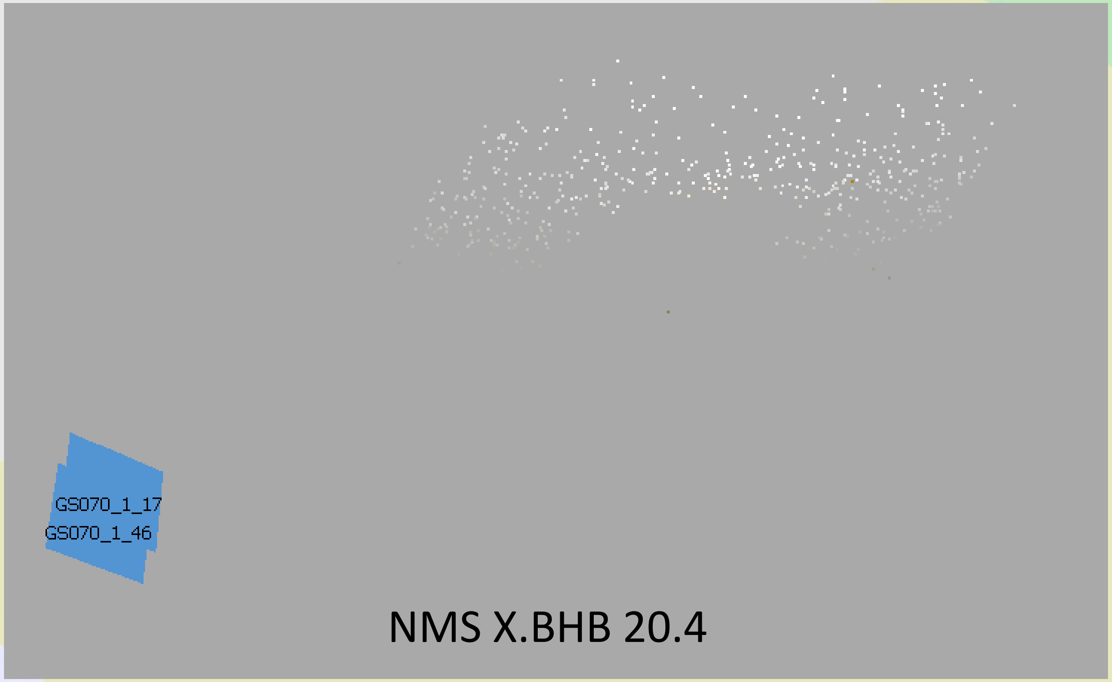
Iona Stratigraphy (Figs. 7.2 and 7.3)

This was the first instance in which multispectral imaging was clearly valuable for a wider variety of archaeological materials and subjects. It also suggested it could be adopted by other disciplines, such as ecology or geology. The images were taken largely to document the stratigraphic layers in the trenches, which demonstrates the potential of merging standard conventions and new techniques in to produce informative results. Click the slide to experience the effect or use the left and right arrow to toggle between them.



Work in Progress (Fig. 6.33)

While the unconventional fixes for photogrammetry discussed previously have worked for many glass beads, some models still fail to produce results even with handheld microscopes, etc. Despite being a failure, this model is significant (even pivotal) to this research in that it demonstrates there is still work to be done and still much that we do not know about this process. The benefit to this work is that it has significantly narrowed the gap in success rates between SRT objects and those that lend themselves well to conventional techniques. Given this, it is understandable that there is still work to be done.



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