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Removal of Varnish Layers verifying with UV-vis Spectroscopy

Vaughn Koch
University of Northern Iowa

Treasure Divis
University of Northern Iowa

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Removal of Varnish Layers verifying with UV-vis Spectroscopy

Vaughn Koch*, Treasure Divis

Introduction

According to the Roy J. Carver grant, one of the goals is to get the mastodon tusk back to its original state. The preservation methods have not been well documented, therefore determining what the best solvents to remove the different layers needs to be known. In order to do this, various solvents will be



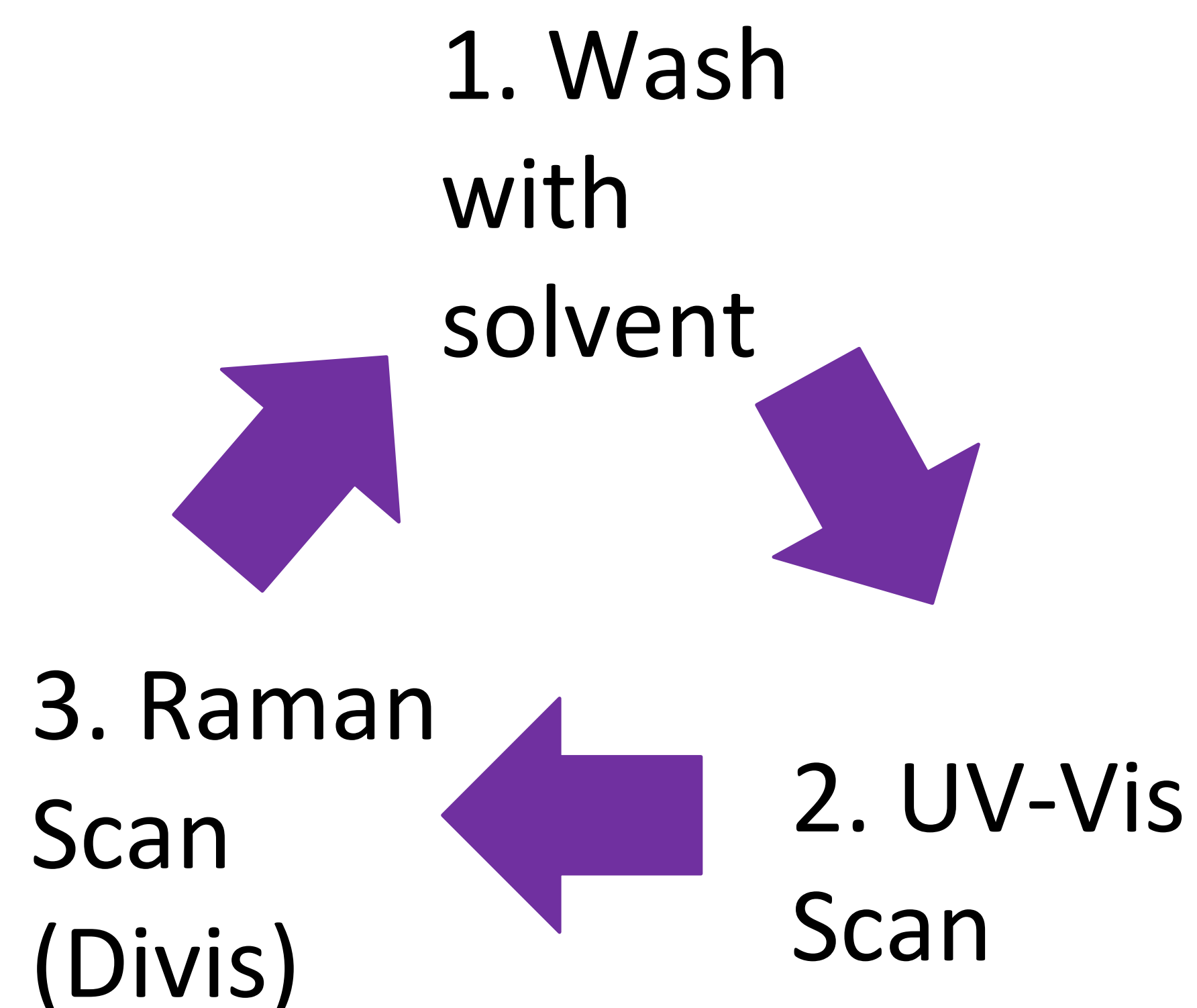
(Optical 45x)

used and confirmed through UV-vis spectroscopy with a Diffuse Reflectance Accessory (DRA) attached. This will measure the percentage of light that gets reflected back towards the detector. The image to the left shows the various layers that have been used in preserving the tusk,

including some organic and inorganic material. As the layers are removed the composition will be checked by T. Divis, which will also confirm when there is only Tusk material remaining on the sample. Due to the size of the Tusk (see below), it is important to know what solvent will remove the most layers, and work the most efficiently.



Methodology



Instrumentation

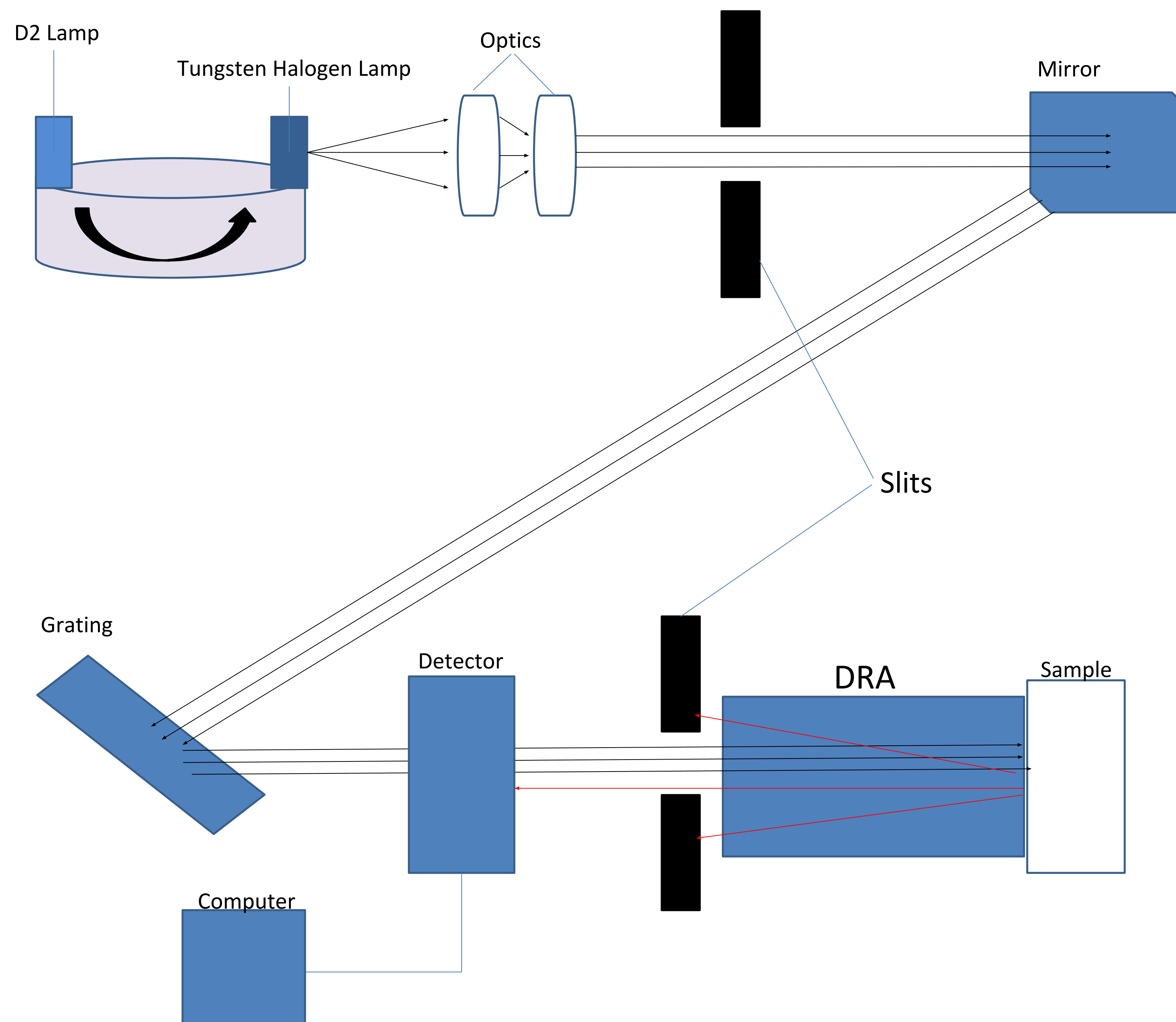
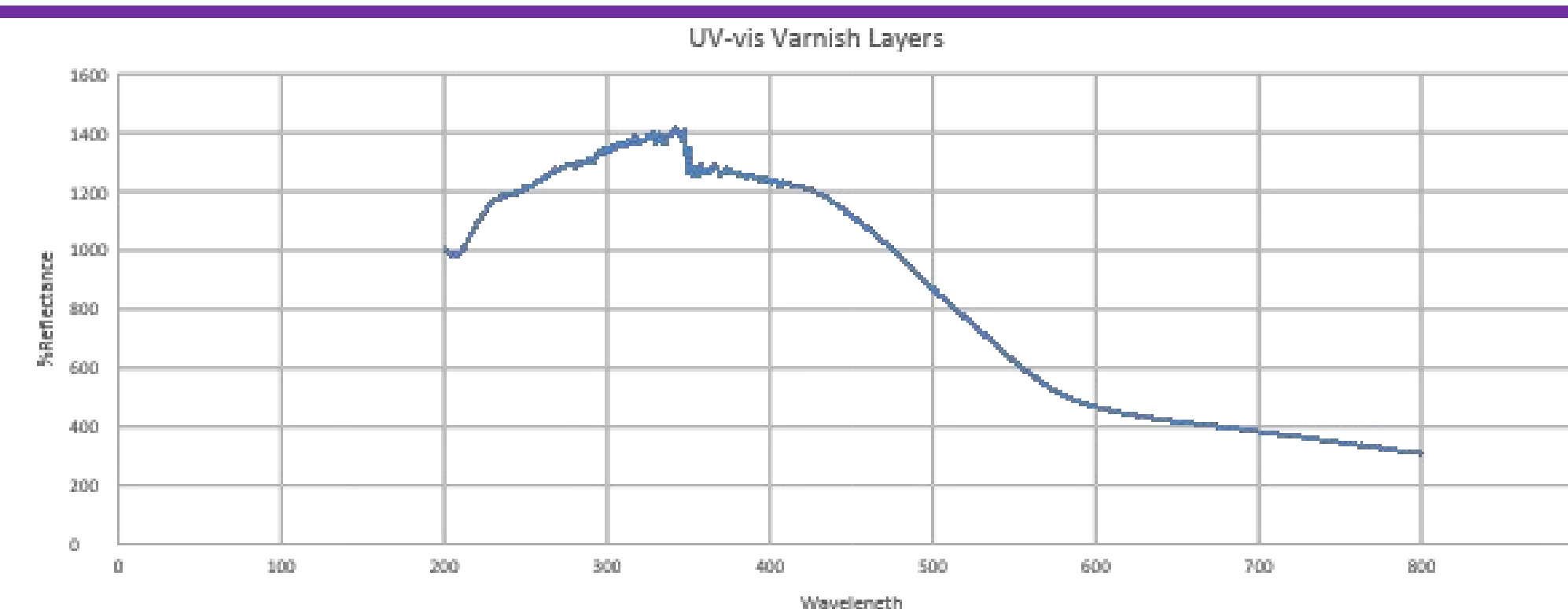
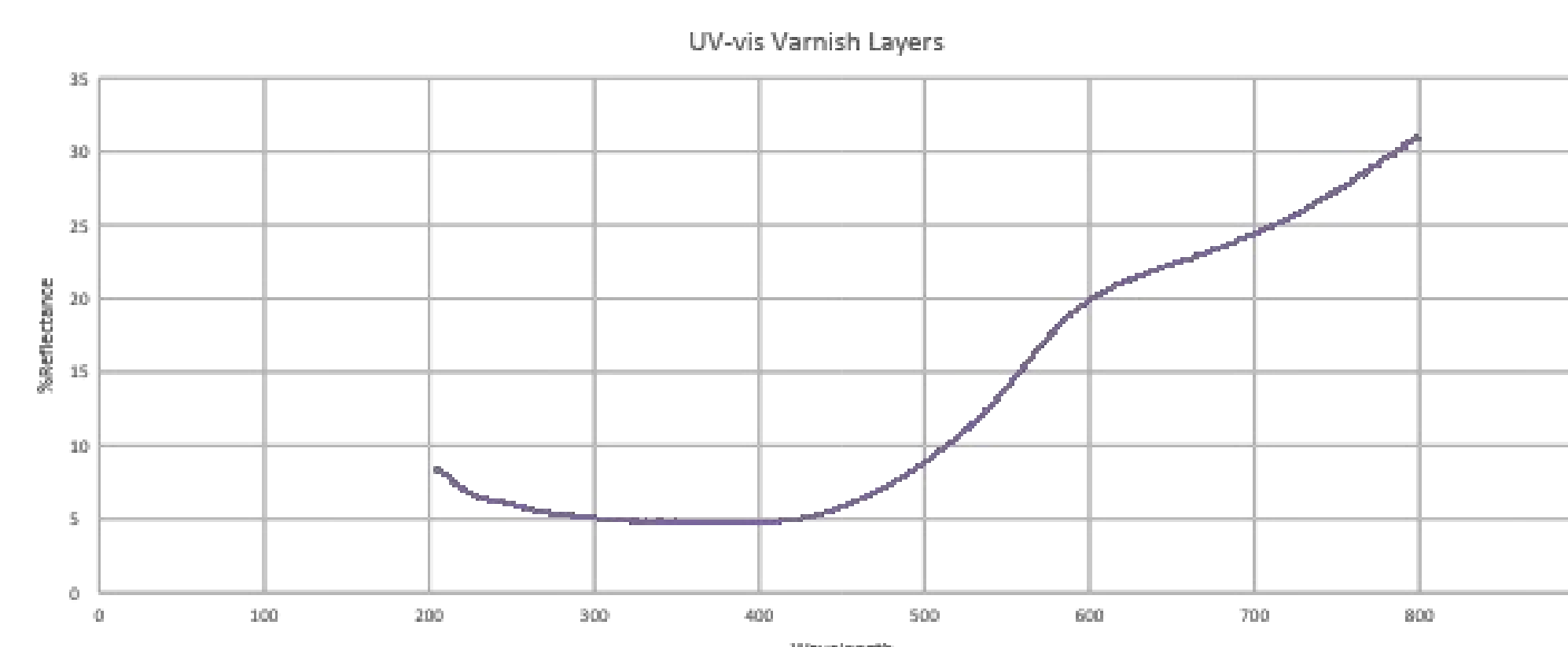


Figure 1: Diagram of a single-beam spectrometer utilizing a DRA set up (Granger)

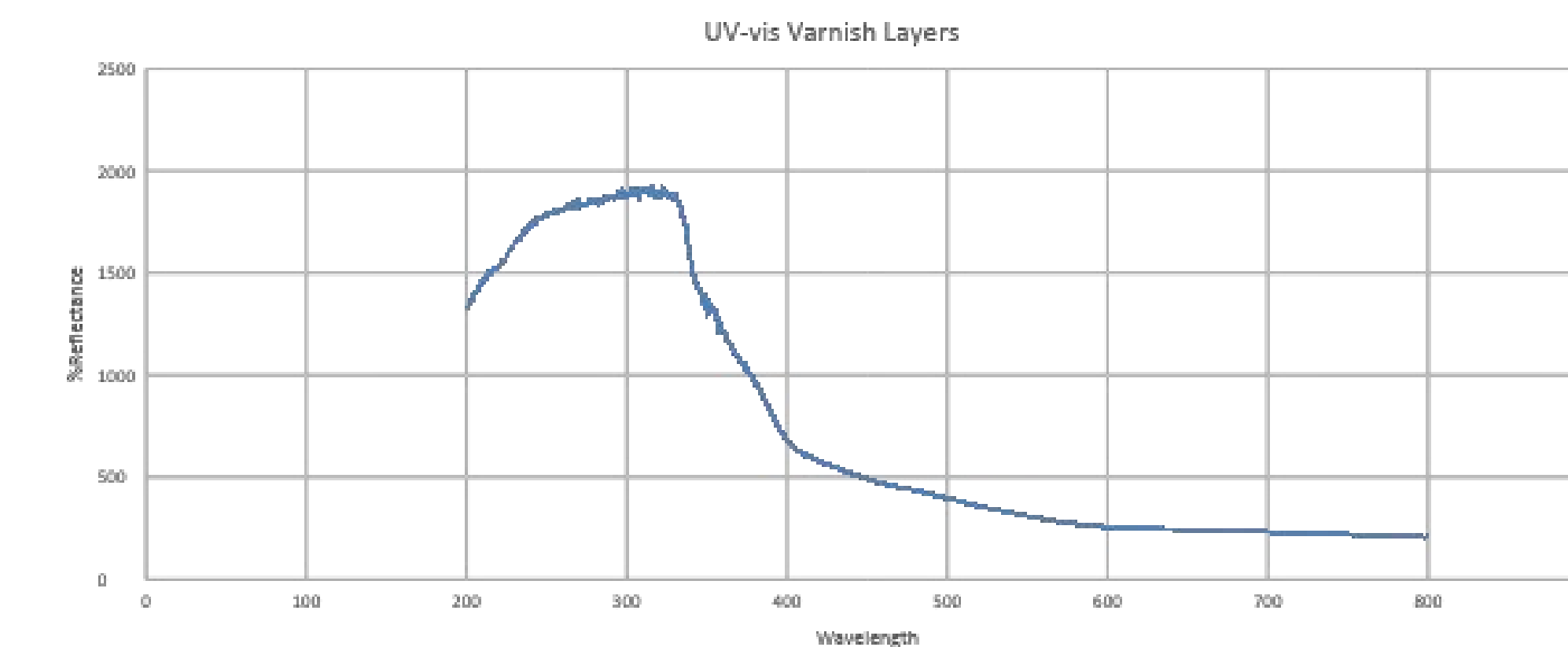
Results



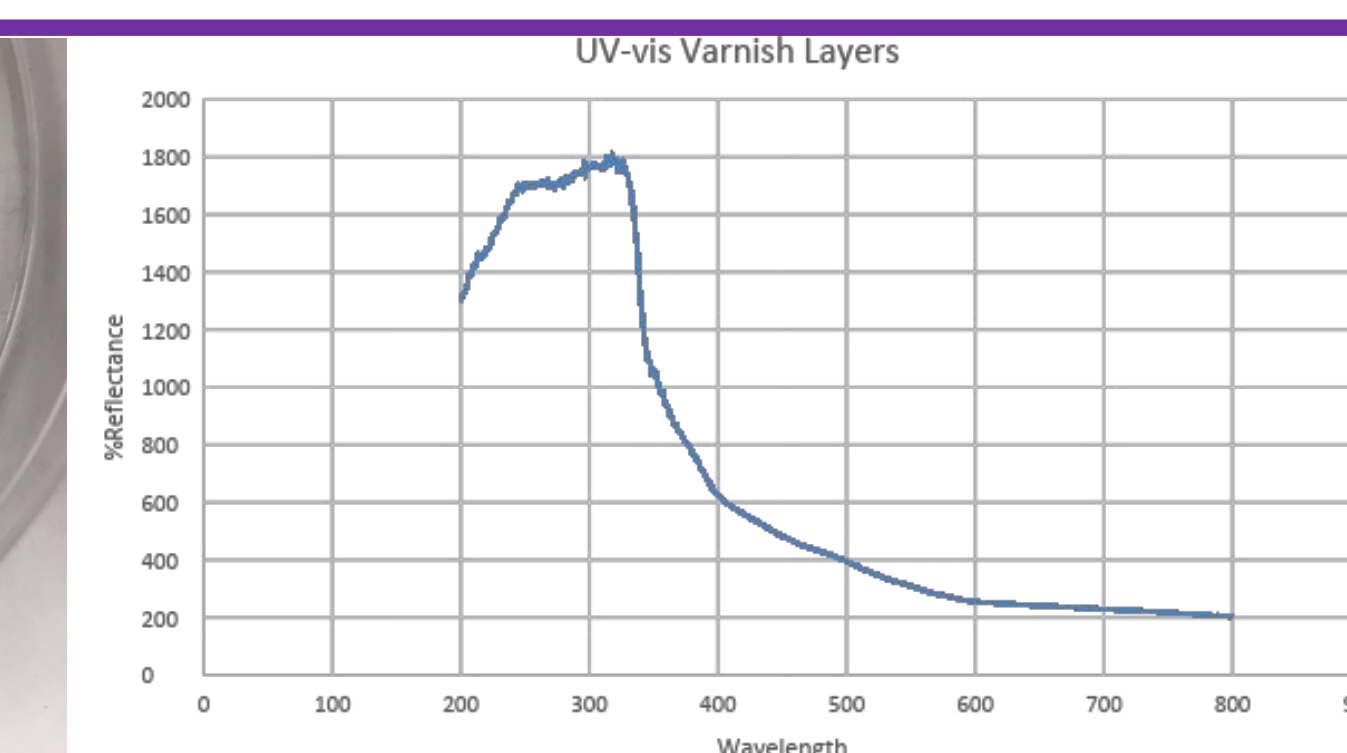
Acetone Wash



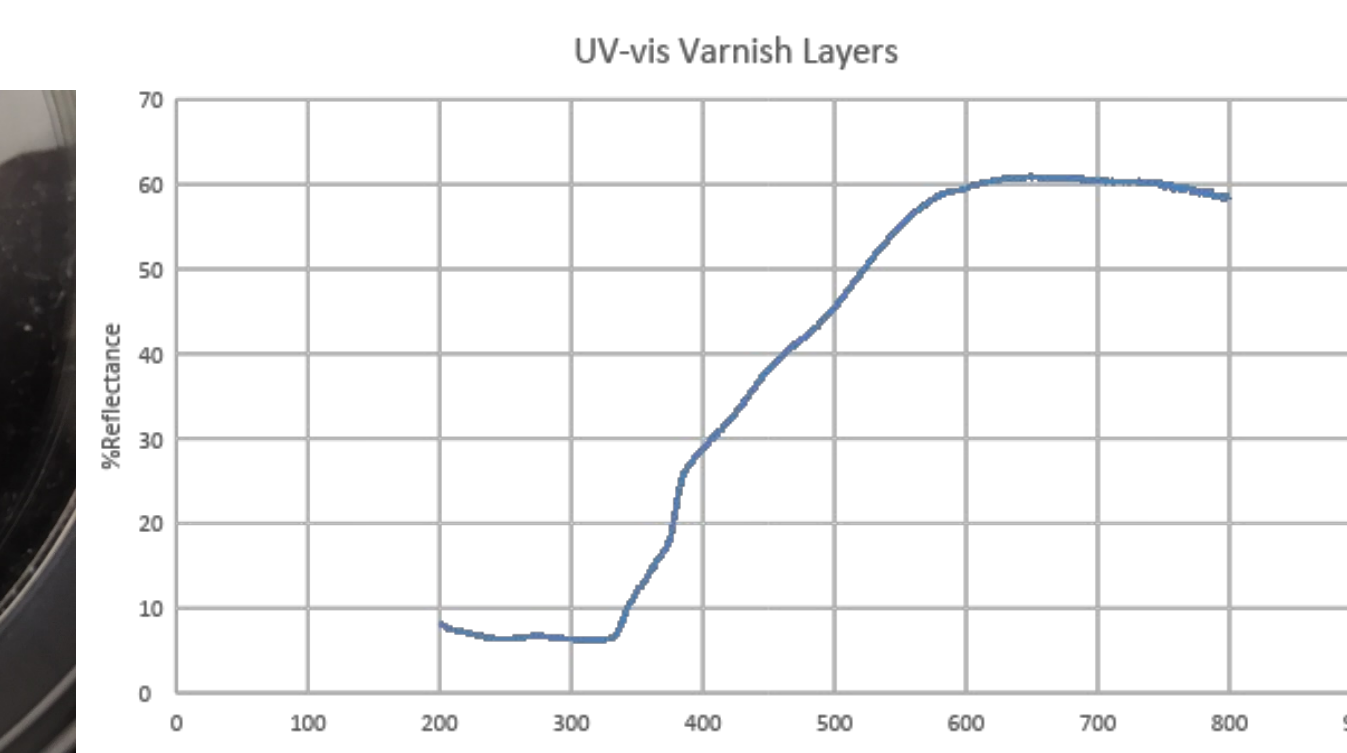
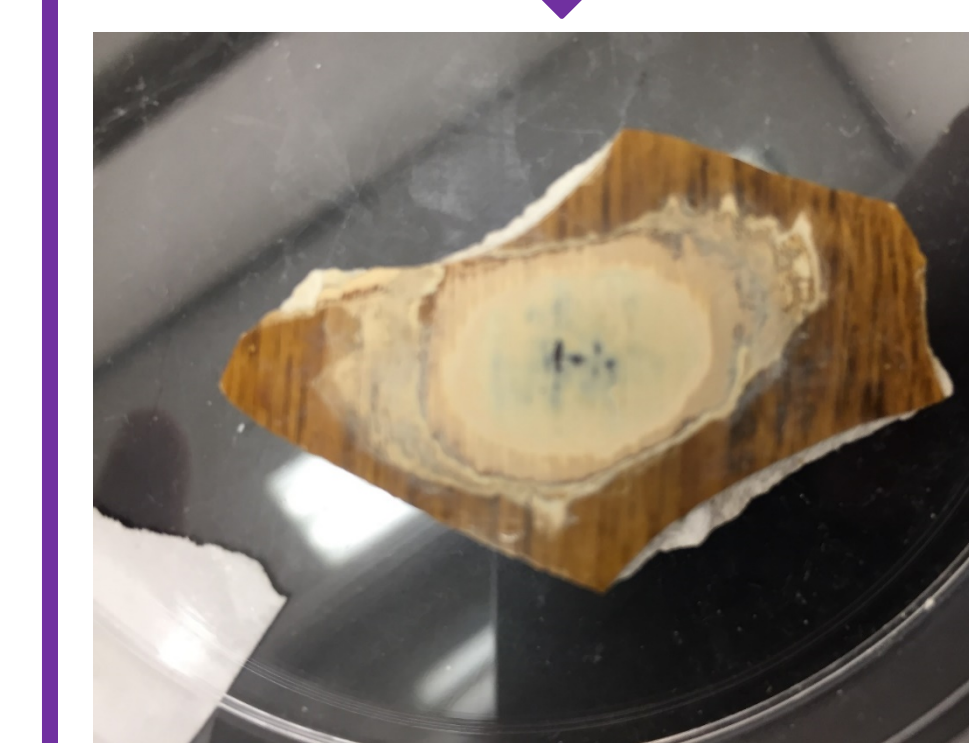
Dichloromethane Wash



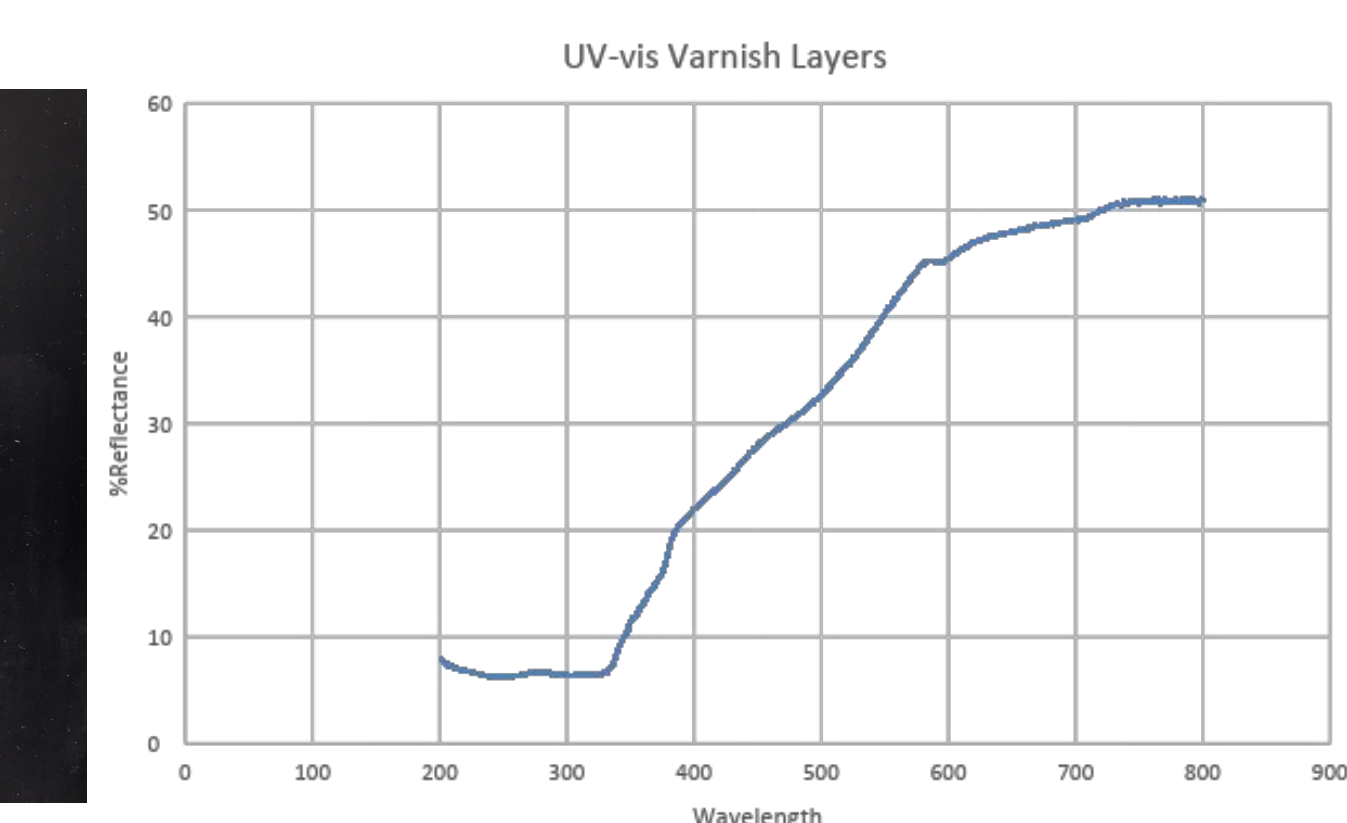
Results Continued



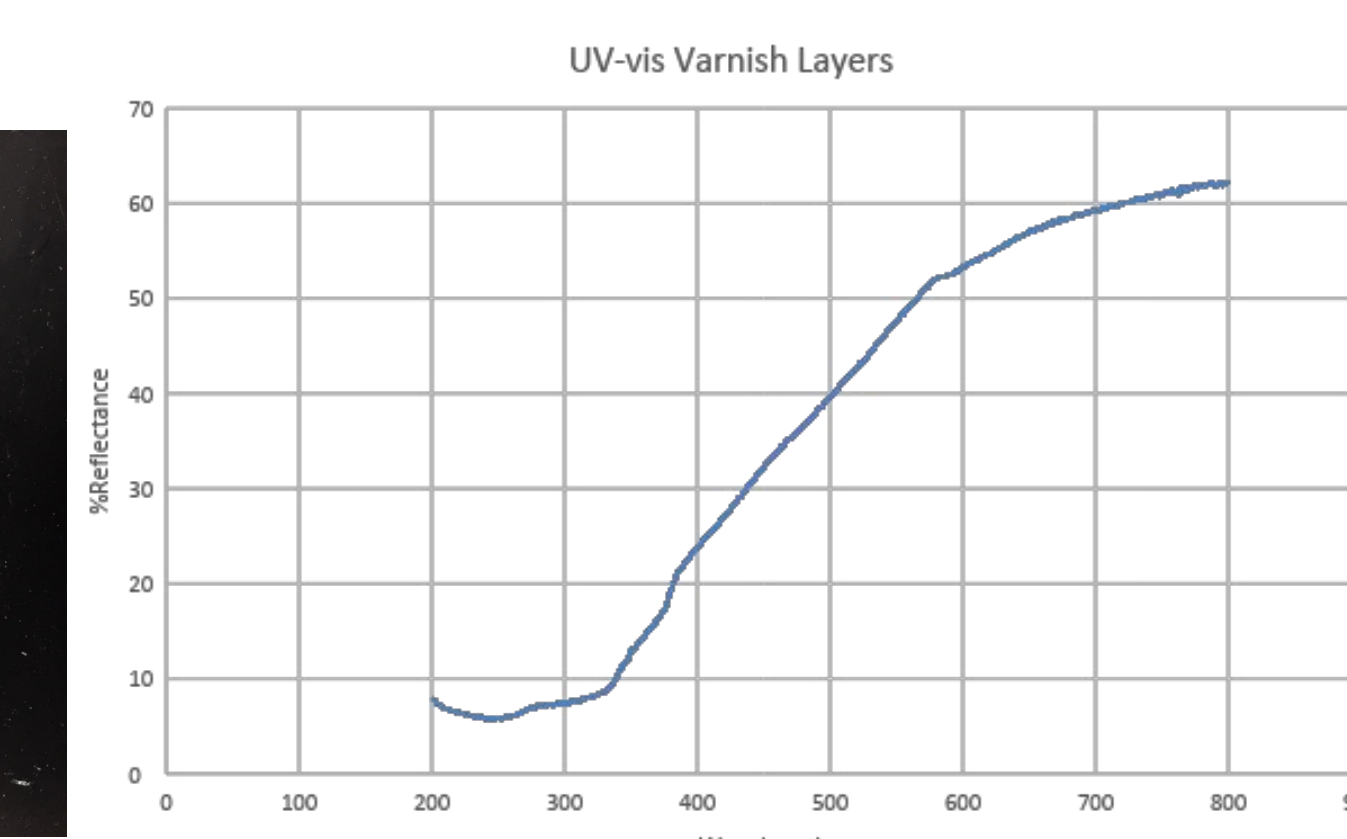
Dichloromethane Wash



Methanol Wash



Dichloromethane Wash



Conclusion

The best solvents to use in order to remove multiple layers at once were Dichloromethane and Methanol. Although the solvents had to be alternated due to the thickness or type of the varnish, they still removed each layer and were initially thought to have gotten down to the plain tusk. After analysis it appeared to have some of the last layer still on top of the tusk that wasn't removed by either solvent.

Acknowledgment

- This project was funded by the Roy J. Carver Grant. This allowed us to purchase a Raman to further our studies.
- Special thanks to the University of Northern Iowa museum for giving access to the tusk and allowing a fun and important research project.

References

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- Granger, R. M.; Yochum, H. M.; Granger, J. N.; Sienerth, K. D. In *Instrumental Analysis*, Revised Ed 1. Oxford University Press: New York, 2017; pp 184-185, 203.