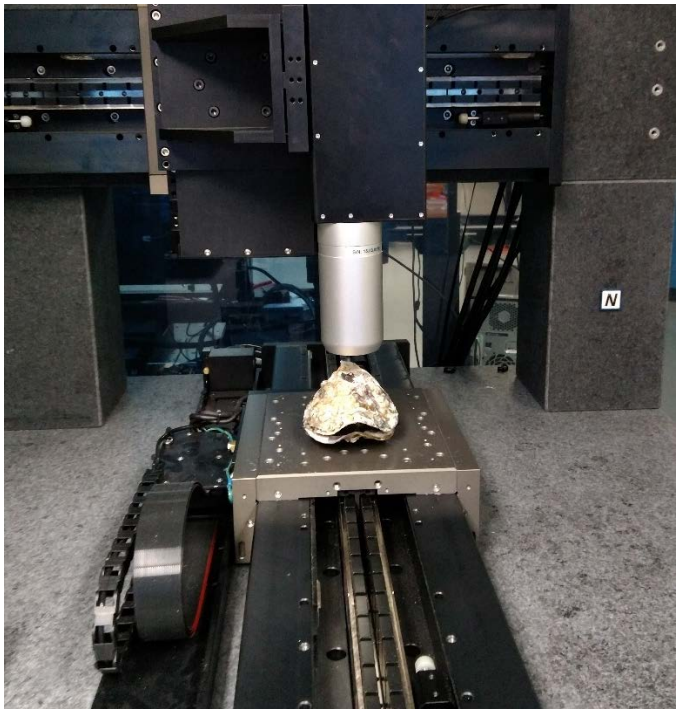
NANOVEA®
A Better Measure.

Conchology Topography Measurement Using 3D Profilometry



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INTRODUCTION:

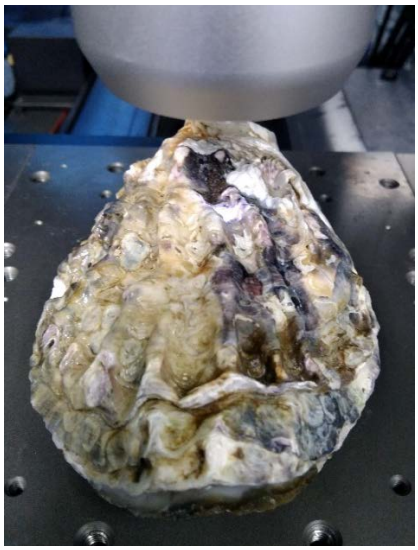
Topographic data can be used for many applications but is not always easy to attain. Large samples with abnormal geometries can prove difficult to work with due to sample preparation, angles, and simply being too large. The Nanovea HS2000 Line Sensor aims to combat commonly faced problems with profilometers by attempting to scan a biological sample with large dimensions and abnormal geometries: an oyster shell. While a biological material was used in this study, the same concepts can still be applied to other materials and industries.

IMPORTANCE OF USING 3D PROFILOMETRY FOR CONCHOLOGY STUDIES

By scanning the whole surface of an oyster shell, the Nanovea HS2000 Line Sensor will display its ability to work with large samples with abnormal geometries. Reflectivity, transparency, and angles do not affect the data collected with our technology, making 3D Non-Contact Profilometry ideal for all types of samples. Another difficulty that lies with profiling an oyster shell lies in its lack of flat base. Samples typically needs to be securely mounted to the stage to minimize wobbling as the stage move. This usually requires additional sample preparation or fixtures to be used. The smooth air bearing stages on the Nanovea HS2000 Line Sensor, however, drastically minimizes stage noise. Its motorized control of the x, y, and z stages also allows for ease in extending varying height measurement. The extended measurement shown in this study, allows our instrument to capture a full surface that is beyond its pen height range limits (approximately 4mm).

MEASUREMENT OBJECTIVE

In this application, an oyster shell was scanned using the Nanovea HS2000 Line Sensor. Multiple scans were conducted at various heights and reconstructed via patching to represent the whole shell. The oyster shell was placed directly onto the stage with zero fixtures to showcase the ease of using the instrument.



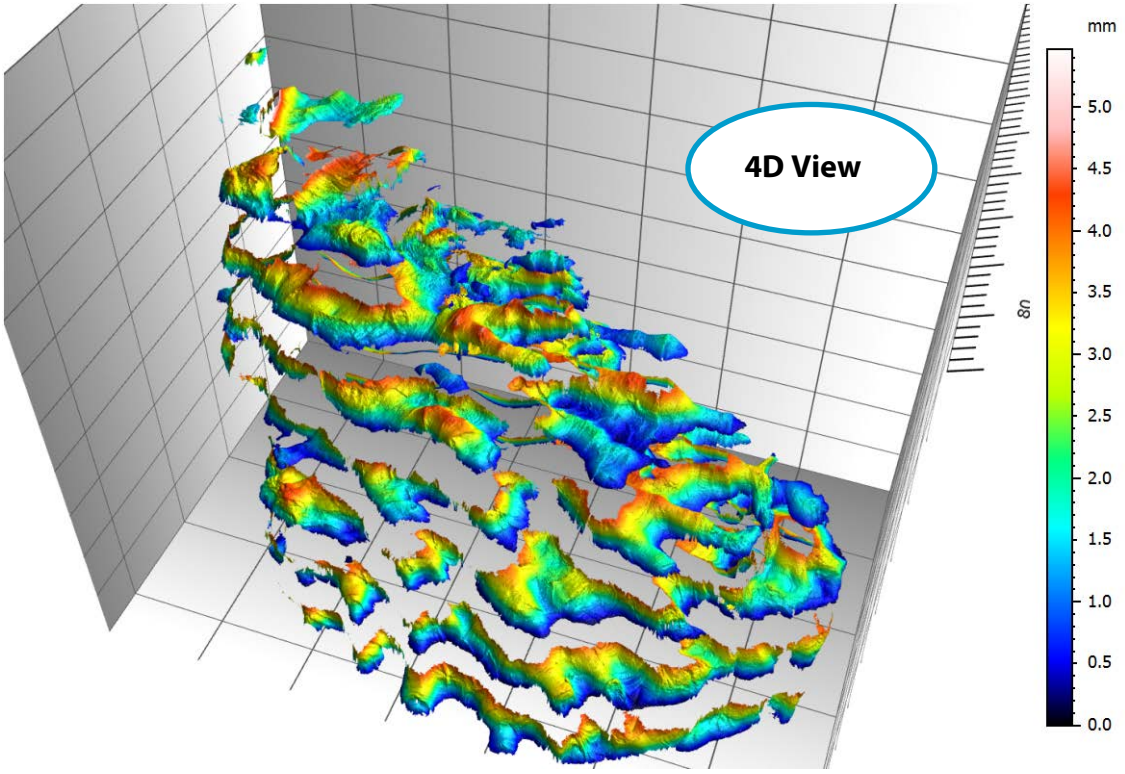
TEST CONDITIONS AND PROCEDURE

The following indentation parameters were used:

	Oyster Shell
Optical Pen	L3
Acquisition rate	400
Averaging	1
Measured surface	140mm x 90mm
Step size	25µm x 25µm
Measurement Time (h:m:s)	00:05:31

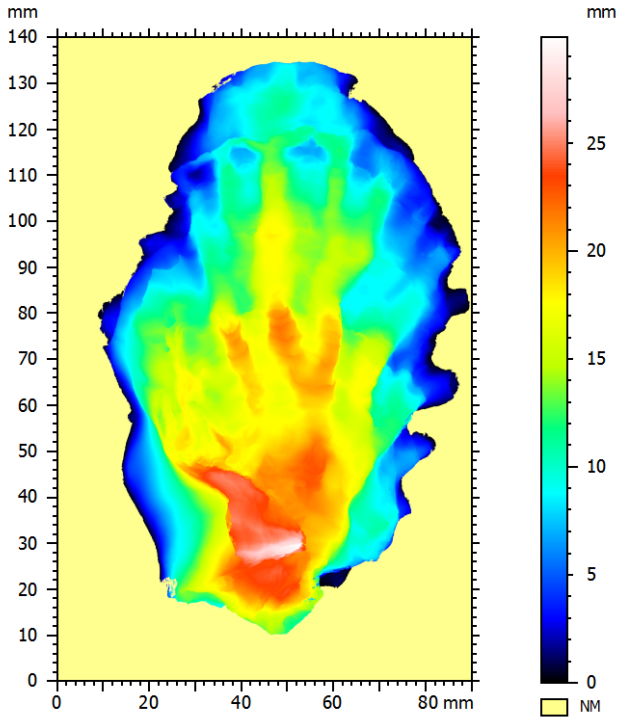
RESULTS: Extended Height Measurements

For this study, a total of 9 scans were conducted on the oyster shell to obtain height data over the whole surface. The individual scans are shown in a 4D view below.



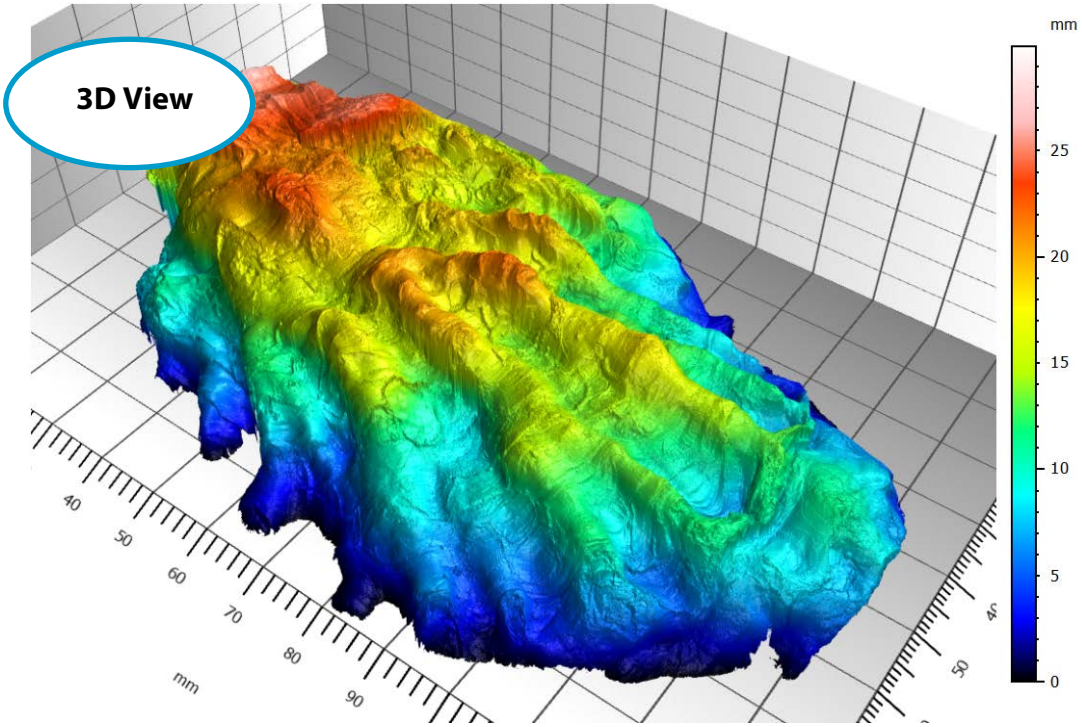
RESULTS: 3D Surface

The reconstructed 3D surface can be observed below. The scans conducted was able to obtain the majority of the oyster shell surface. Even with a large area scan, the resolution was not compromised. Small features on the oyster surface can still be seen in the 3D view.



False Color View

ISO 25178		
Height Parameters		
Sa	5.054	mm
Sz	29.90	mm
Sv	12.38	mm
Sp	17.52	mm
Sq	6.058	mm
Ssk	0.02877	
Sku	2.281	



RESULTS: Surface Roughness Analysis

The surface roughness of the oyster shell was obtained by applying a gaussian filter of 1.5mm. This excludes form (or waviness) larger than the cut-off index above, leaving the surface with only features that represents roughness. Despite the lack of fixture on the sample, stage noise was not observed in the surface roughness analysis.

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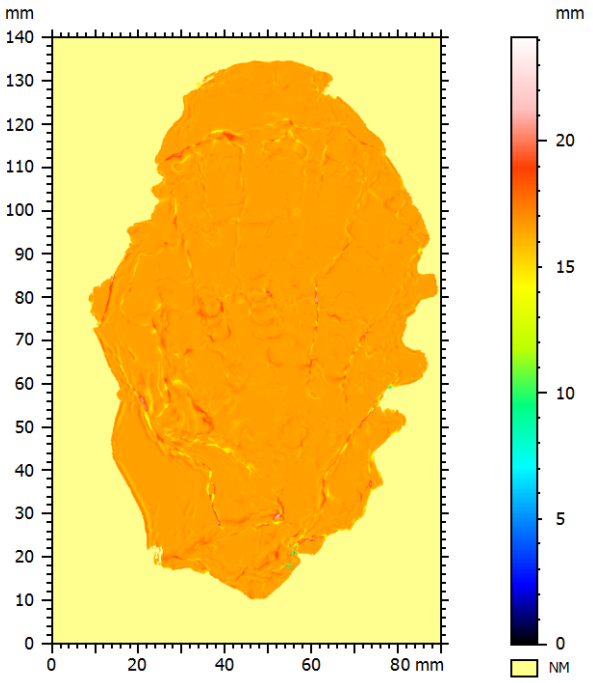
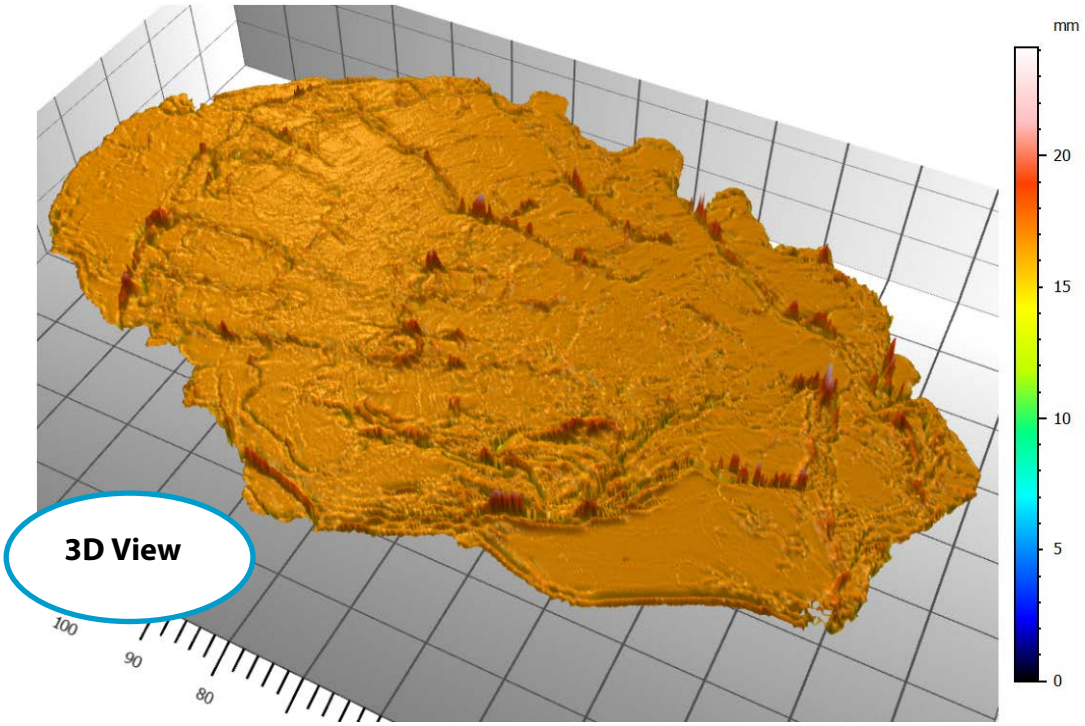


False Color View

ISO 25178		
Height Parameters		
Sa	0.1385	mm
Sz	24.12	mm
Sv	16.63	mm
Sp	7.486	mm
Sq	0.3518	mm
Ssk	-3.454	
Sku	140.6	



3D View

CONCLUSION:

The full surface of an oyster shell was profiled with Nanovea HS2000 Line Sensor. The shell was scanned a total of 9 times at different heights to reconstruct the whole oyster shell in our analysis software. The 9 scans conducted constructed about 30mm of height. From the patched surface, the roughness of the oyster shell was also obtained by removing the waviness or form of the sample. No apparent stage noise can be observed from the roughness analysis. A value of 0.1385mm was obtained for the Sa. The Nanovea HS2000 Line Sensor has shown it is able to conduct profilometry measurements on large samples with abnormal geometries while retaining high resolution with minimal sample preparation. Patching of the individual scans, makes it possible to obtain surface data beyond our pen height range limits.

Learn more about the Nanovea Profilometer or Lab Services