NANOVEA
A Better Measure

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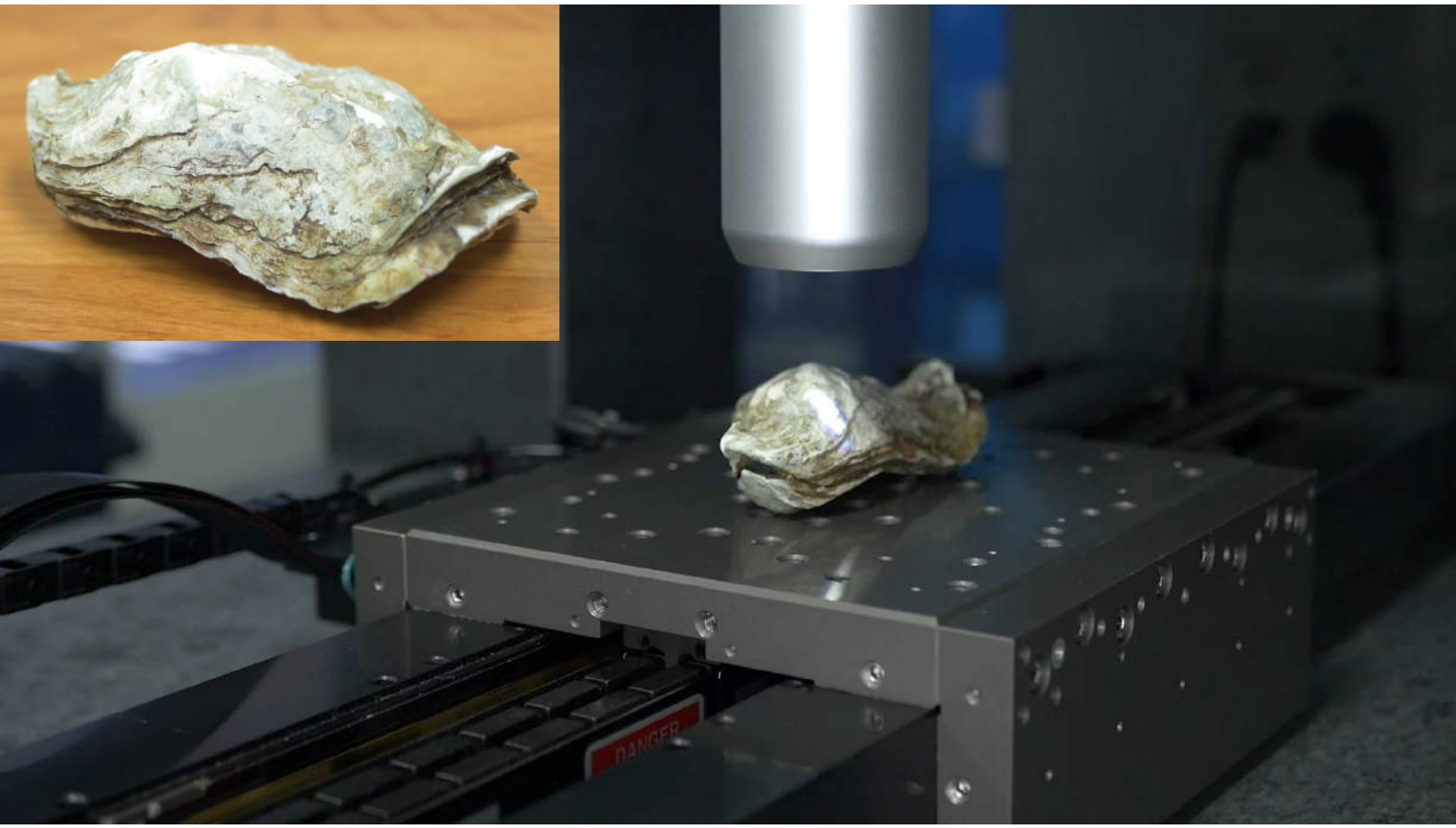
HIGH SPEED SURFACE CHARACTERIZATION of an OYSTER SHELL



Prepared by

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INTRODUCTION

Large samples with complex geometries can prove difficult to work with due to sample preparation, size, sharp angles, and curvature. In this study an oyster shell will be scanned to demonstrate the Nanovea HS2000 Line Sensor's capability to scan a large, biological sample with complex geometry. While a biological sample was used in this study, the same concepts can be applied to other samples.

IMPORTANCE OF 3D NON CONTACT PROFILOMETRY ON AN OYSTER SHELL

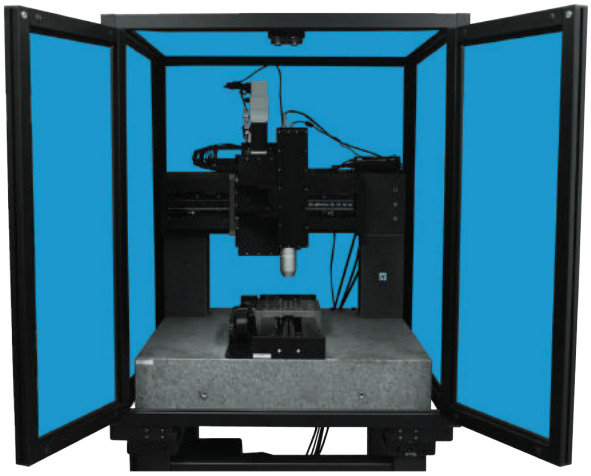
By scanning the whole surface of an oyster shell, the Nanovea HS2000 Line Sensor will display its ability to work with large samples with unique geometries. Typically, samples need to be securely mounted to the stage to mitigate their displacement as the stage moves. This usually requires additional sample preparation or a fixture to be used. But with the smooth air bearing stages on the Nanovea HS2000, little to no sample preparation is needed to begin your tests.

Patching, shown in this study, allows the Nanovea HS2000 Line Sensor to capture a surface that has features taller than the optical sensors height range or the instruments lateral range. This is accomplished by taking multiple scans at varying heights and overlaying them at their relative offsets. And with the stages' 3 axis motion control, you can index in specified steps in the z direction to quicken the process.

Measurement Objectives

Equipment Featured

NANOVEA HS2000L



High Speed Inspection & Precision Flatness Measurement

Advanced Automation with customizable options

High-speed data collection, up to 384k points per second

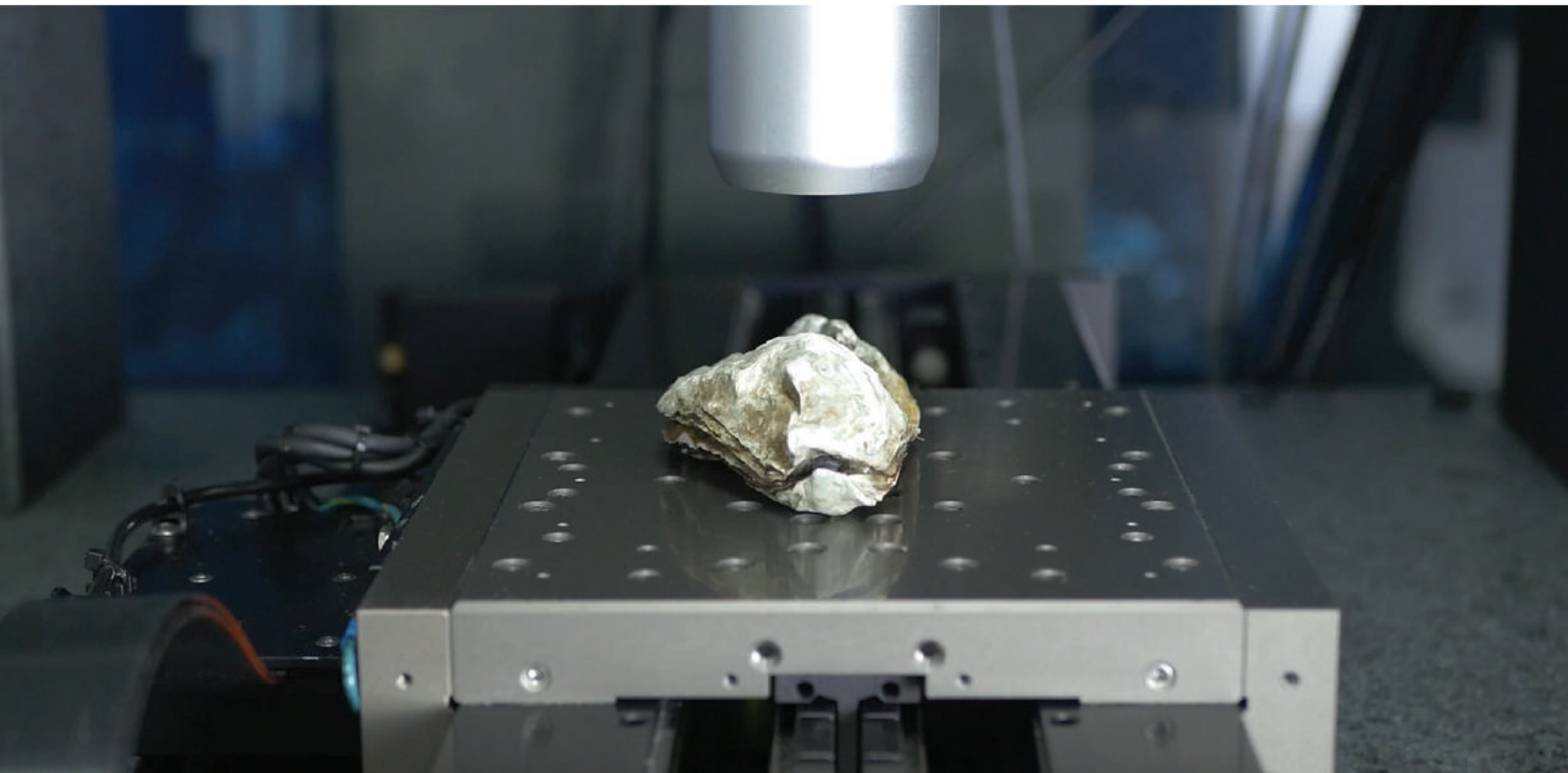
Designed for large area flatness measurement

Full granite base with integrated anti-vibration table

Learn More about the HS2000

Measurement Objectives

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.



Profilometry Results

Measurement Parameters

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

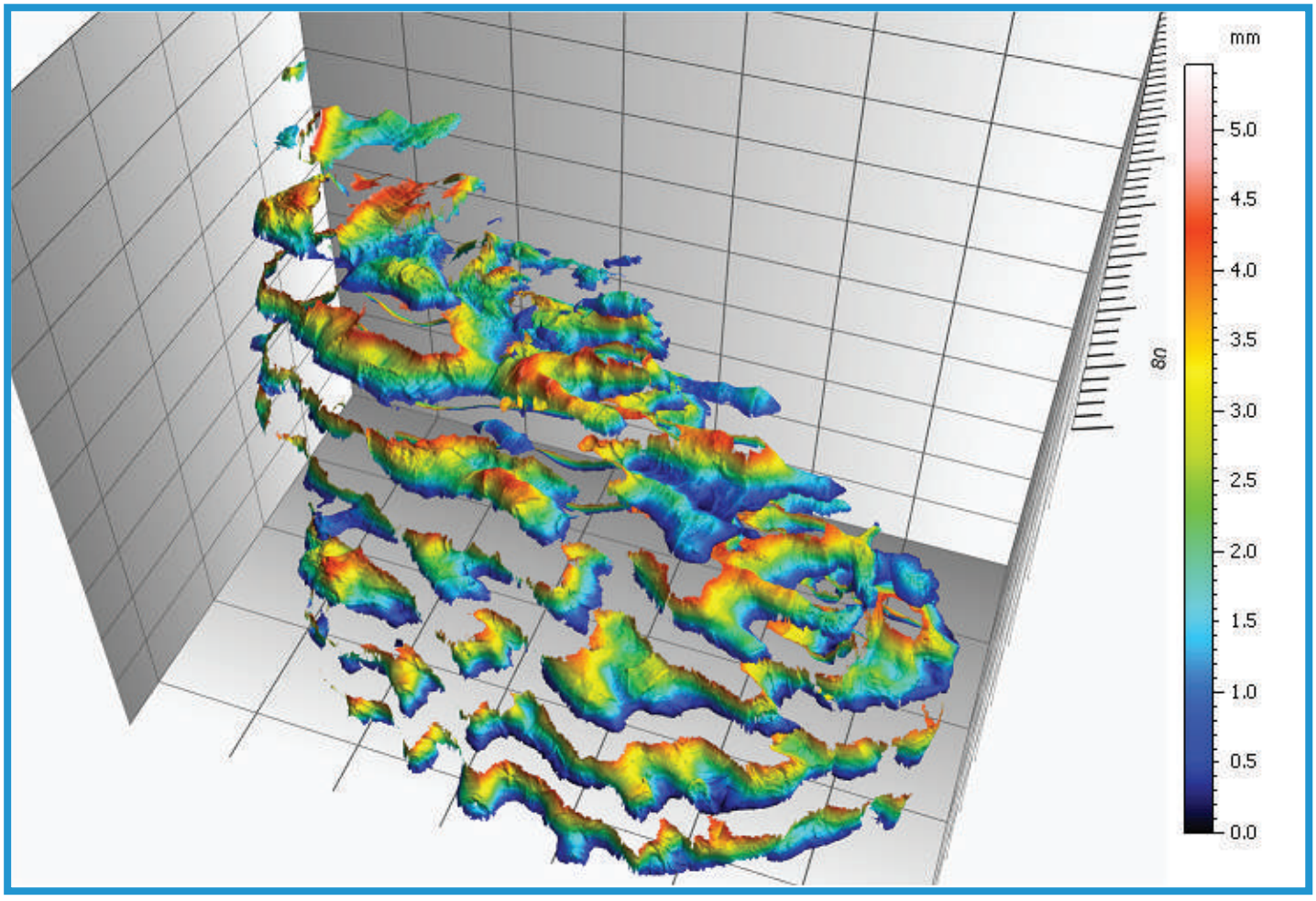
Table 1: The following test parameters were used for each of the 9 scans performed for this study.

Sample Tested

Sample of Oyster Shell Tested

Results: Series of Surfaces

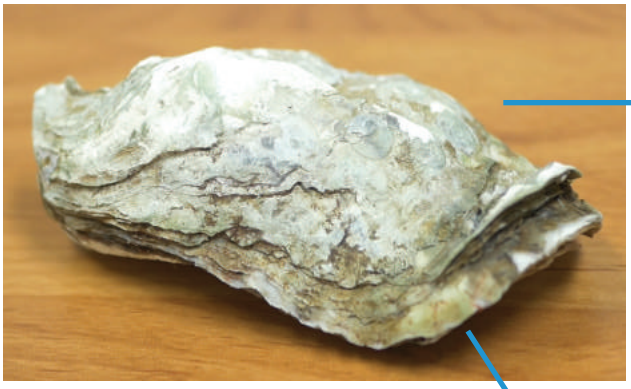
For this study, a total of 9 scans were conducted on the oyster shell to obtain height data over the whole surface. The individual scans are shown in a 3D view below.



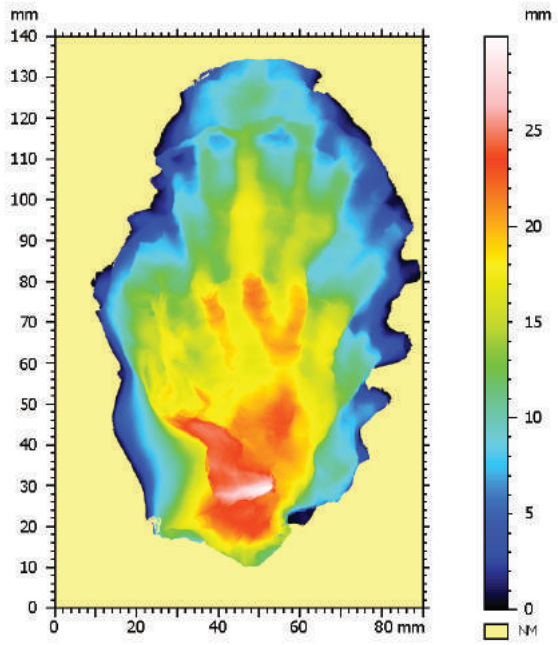
Profilometry Results

Results: 3D Surface

The patched 2D and 3D surface can be observed below. We were able to obtain the whole surface of the oyster shell with the Nanovea HS2000 Line Sensor without compromising on the resolution. Small features on the shell's surface can still be seen in the 3D view.



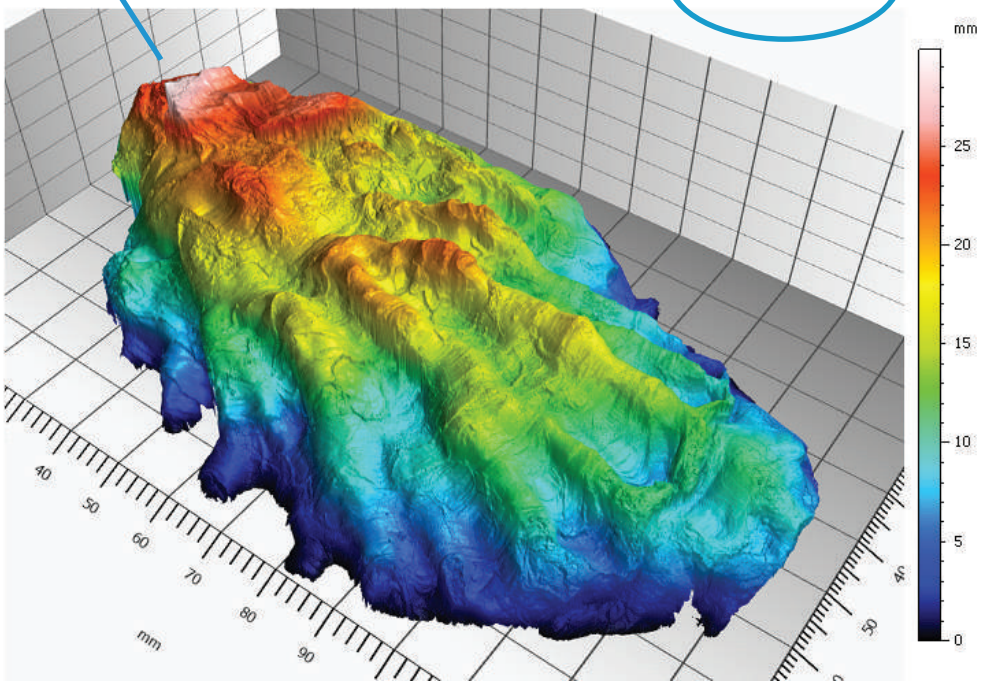
Sample of Oyster Shell



2D 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	

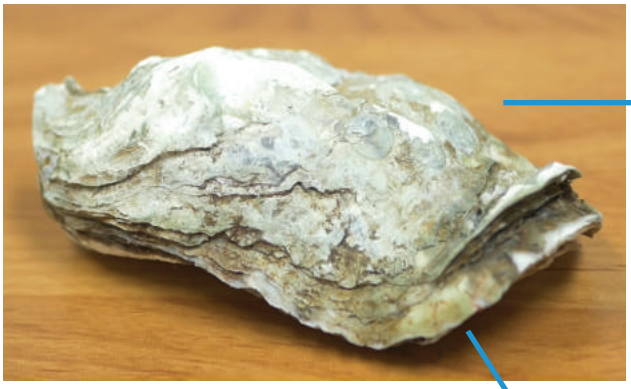
3D View



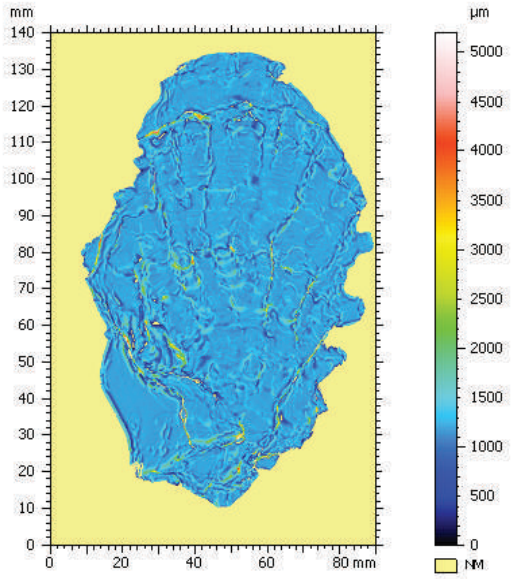
Profilometry Results

Results: Surface Roughness Analysis

Below is the surface roughness of the oyster shell, this was obtained by applying a gaussian filter of 1.5mm. This excludes form (or waviness) larger than the cut-off index, leaving behind features that represent the oyster shells roughness. Despite the lack of a fixture, stage noise was not observed in the surface roughness analysis.



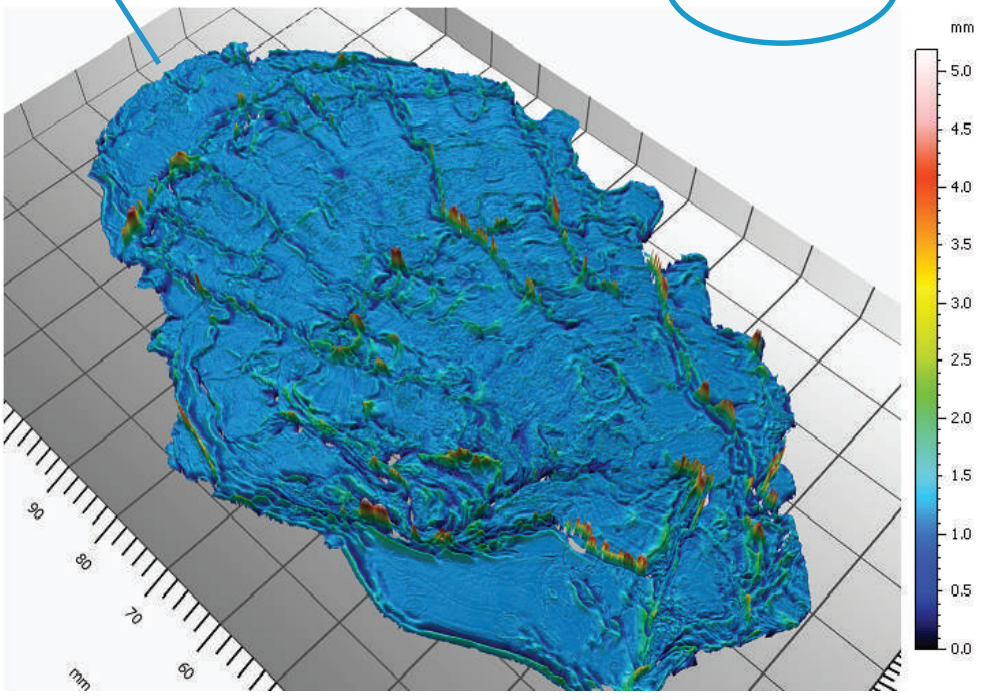
Sample of Oyster Shell



2D View

ISO 25178		
Height Parameters		
Sa	0.1255	mm
Sz	5.198	mm
Sv	1.211	mm
Sp	3.987	mm
Sq	0.2614	mm
Ssk	3.737	
Sku	41.93	

3D View



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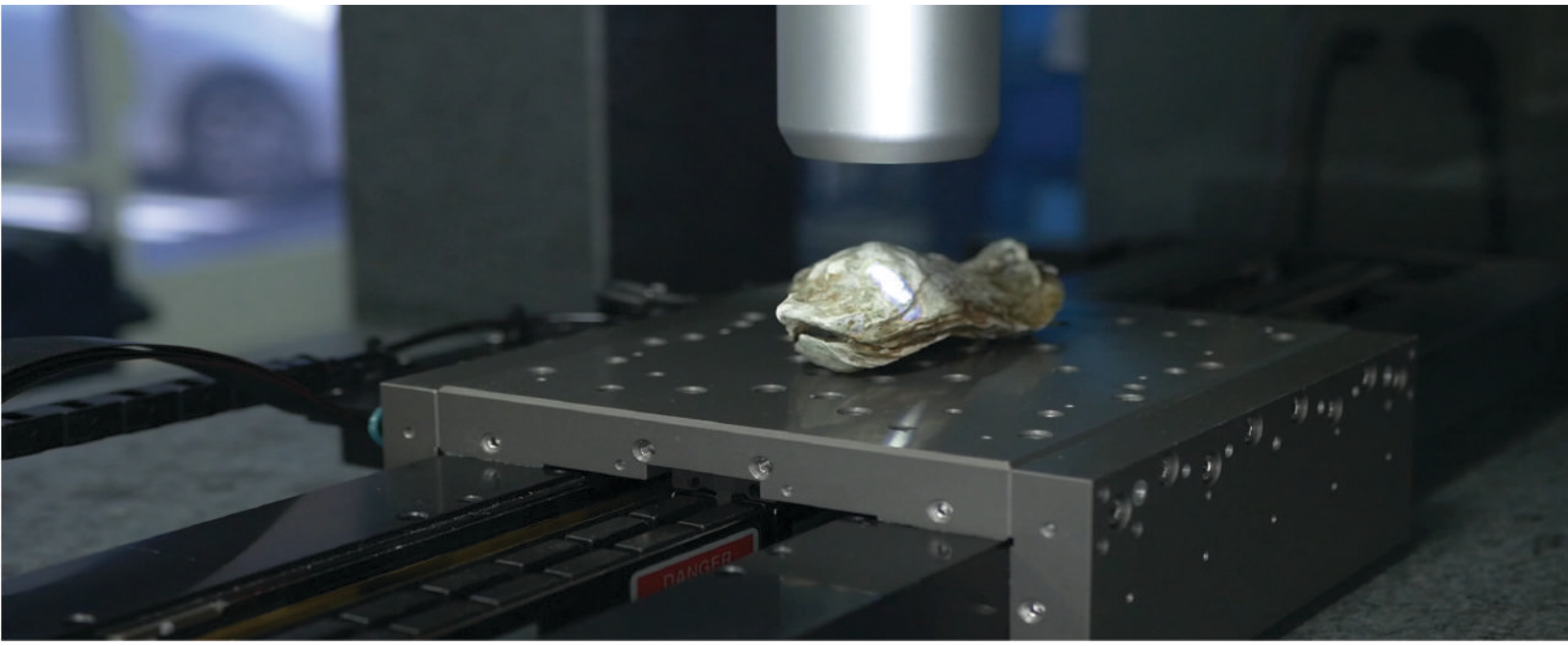

Conclusion

A total of 9 scans were used in this study to recreate the surface of the oyster shell using the Nanovea HS2000 Line Sensor. From the patched surface, the roughness of the oyster shell was measured by removing the form (or waviness) of the sample. Patching can also be used to measure much finer roughnesses on a large sample that would normally be beyond the optical sensors height range. Large conical lenses, for example, require a very fine step size in order to quantify microscopic features that can be present. 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.

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