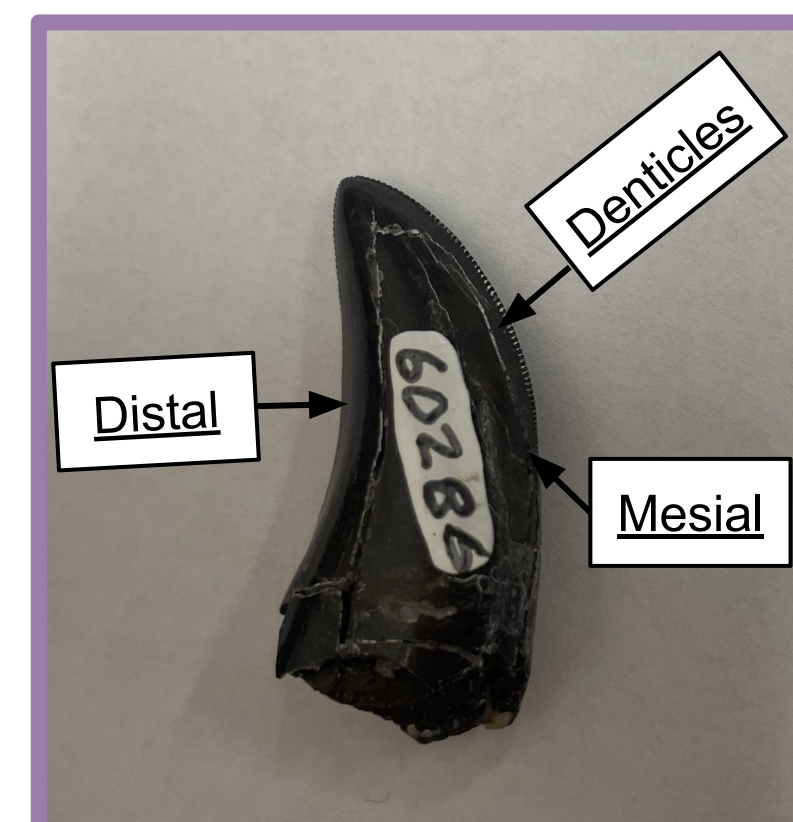


3D Models of *Tyrannosaurid* Teeth for Analysis of Denticles

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Introduction

- *Tyrannosaurid* teeth have a serrated edge called denticles.
- These denticles are found on both the mesial and distal surface of the tooth.
- *Tyrannosaurus* would lose their teeth around every 200 days after the denticles had been worn down.
- These denticles are seen on every *tyrannosaurid* tooth regardless of position.
- From this it can be hypothesized that the denticles assisted with the usage of the *Tyrannosaurids* teeth.



Purpose

- The purpose of this project is to better understand the denticles of the *Tyrannosaurus* by creating 3D models of the teeth to analyze how they would have been positioned within the mouth of a *tyrannosaurid*.

Methods

- Photogrammetry is the process of taking a series of pictures at different angles and heights of one specific specimen to create one composite image.
- Once the photogrammetry was completed the photos were saved into a computer program called Metashape.
- The 3D images from Metashape were exported into a separate program called Meshlab.



Figure 1.0 Photogrammetry Process.

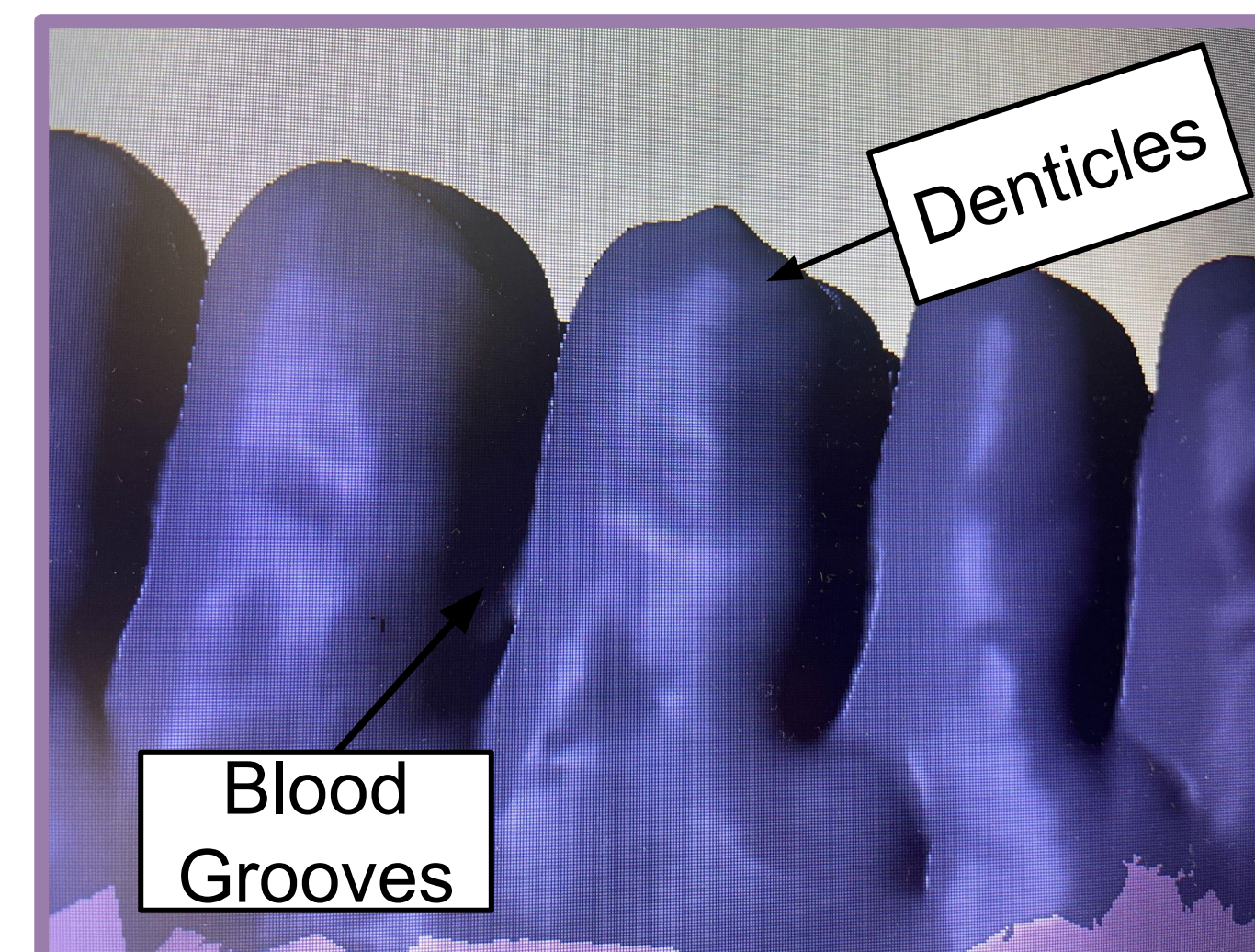


Figure 2.0 Tooth Specimen displayed in Metashape.



Figure 3.0 Tooth Specimen used for Photogrammetry.

Methods Continued



- The Meshlab Program was used to smooth out the specimen to allow for more exact texture on the denticles when printed.

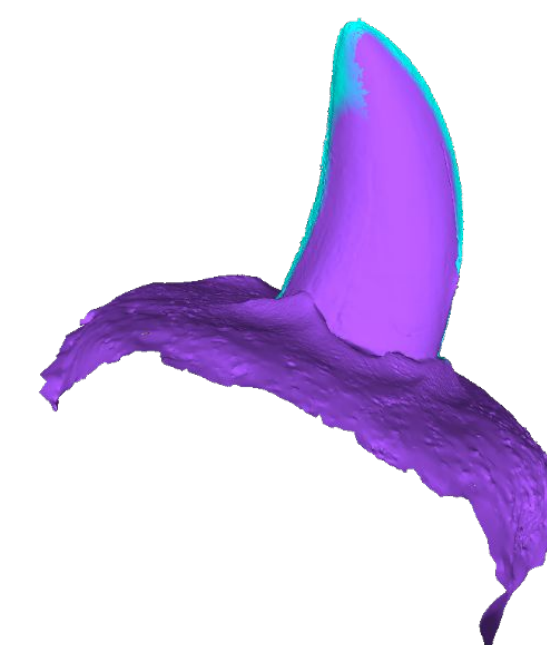


Figure 4.0 Specimen UALVP 60286 in Meshlab Program.

- After this was completed the specimen were then exported into another program called Meshmixer.
- This program was used to add greater detail to the denticles.
- This also allowed for the blood grooves or dents in between the denticles to be better represented.
- The teeth specimen were then moved into a flashdrive to be prepped for 3D printing.
- Both the plastic and resin 3D printers took eight hours to print all four specimens.

Figure 5.0 Specimen UALVP 54771 denticles before Meshmixer.

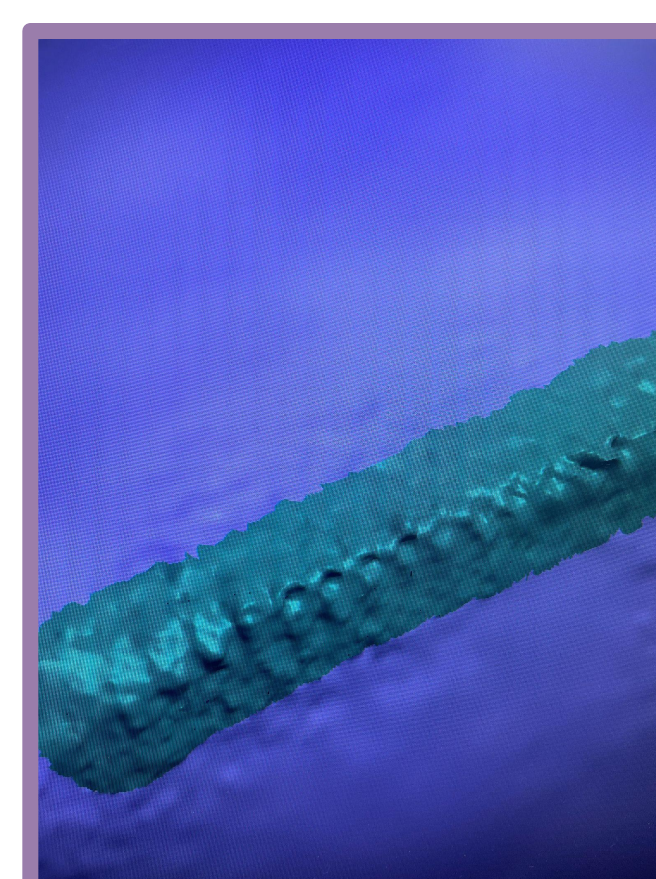


Figure 6.0 specimen UALVP 54771 tooth before Meshmixer.

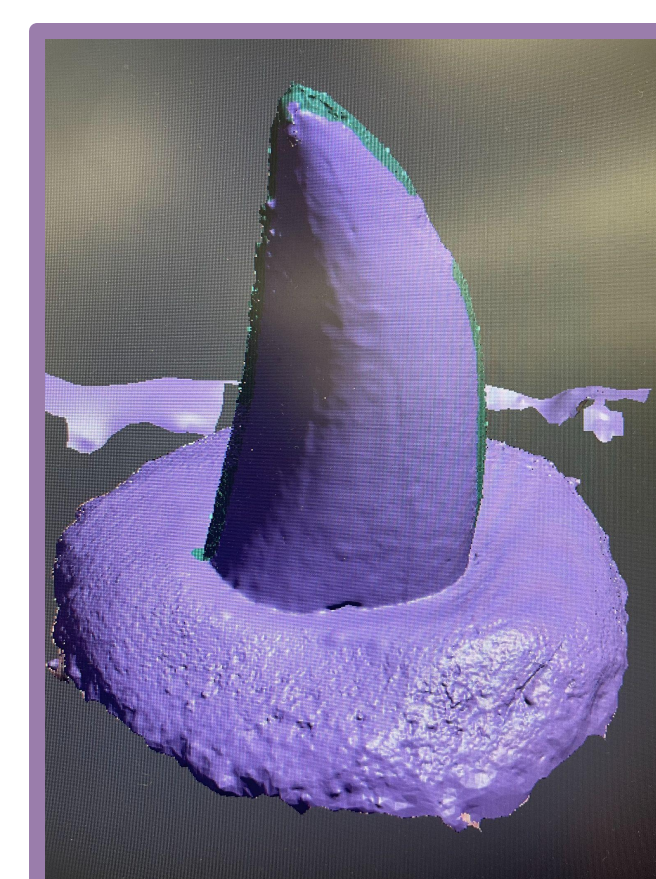


Figure 7.0 Specimen UALVP 60286 tooth after Meshmixer.

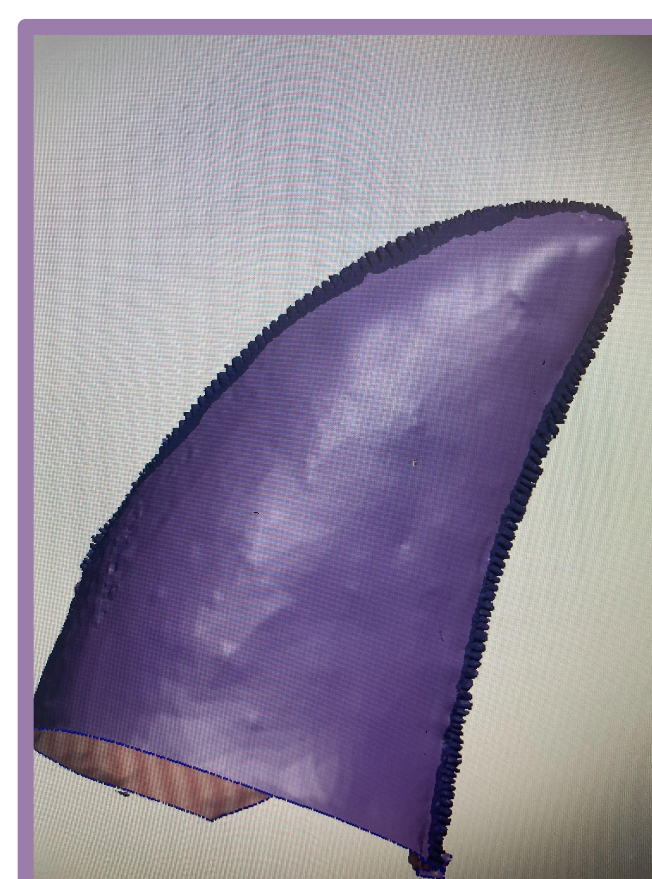
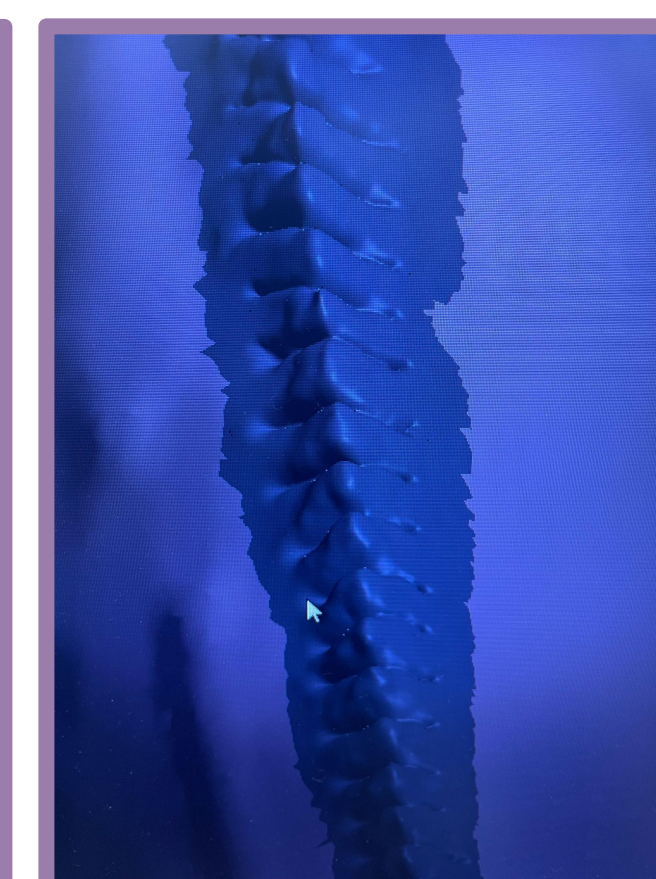
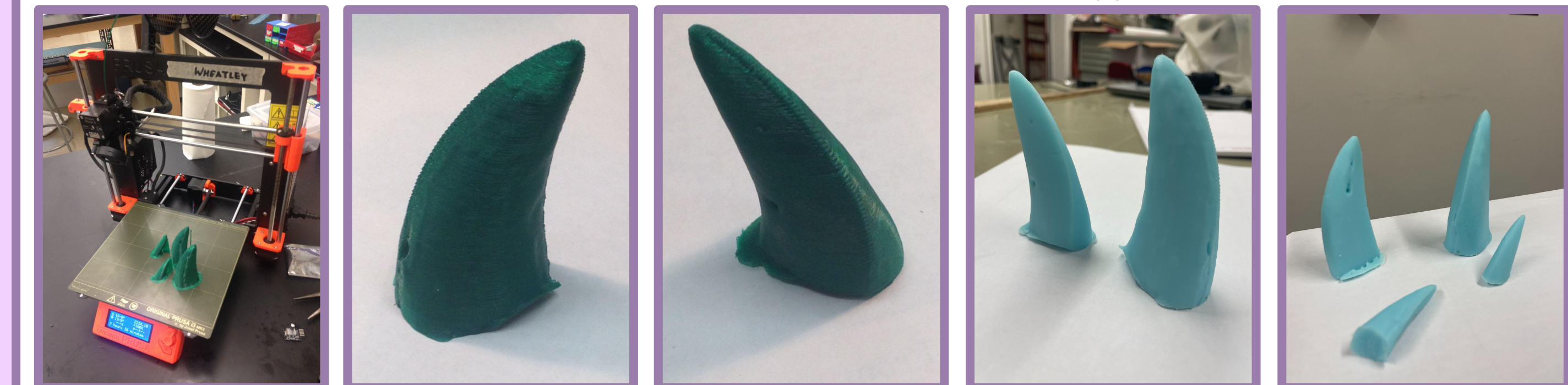


Figure 8.0 Specimen UALVP 60286 Denticles after Meshmixer.



Results

Figure 9.0 Teeth Specimens after Plastic 3D printing. Figure 10. Specimen UALVP 60286 3D printed in plastic. Figure 11. Specimen UALVP 54770 3D printed in plastic. Figure 12.0 Specimens UALVP 60286 and 54770 printed in resin. Figure 13. Teeth Specimens after Resin 3D printing.



Conclusion

- The next step in this project would be to print more teeth that would be placed in a mechanism that would be used to create bite marks on cow bones.
- Being able to reproduce these bite marks will allow us to understand how they would have been made.
- Being able to analyze these denticles and later analyze how they would have affected other dinosaurs bones will allow us to better understand these prehistoric animals.

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