

# Designing a Custom Boot for an Injured Penguin

Despite their tuxedoed appearance, penguins aren't always well mannered. In the aftermath of one particular penguin scuffle among endangered African Penguins at **Mystic Aquarium**, Yellow/Purple (AKA "Purps") was found to have a nonfunctional flexor tendon in her ankle. Much like an injury to a person's Achilles heel, damage to a penguin's flexor tendon leads to pain and difficulty in motion.

Once Purps' injury was identified, the veterinary staff at Mystic Aquarium took action with a handmade boot to immobilize, protect and support the damaged foot. Yet the animal care team knew more modern solutions were available that would not only be more durable and less cumbersome for the small bird, but also require less time than handcrafting the boot. Mystic Aquarium's Chief Clinical Veterinarian, Dr. Jen Flower, proposed 3D printing.

The aquarium took this idea to **Mystic Middle School**, which had recently acquired a 3D printer through **ACT Group**, a local 3D Systems partner, and the rest is history. Working as a team, Mystic Aquarium, ACT Group and the middle school students came together to design and 3D print a new boot for Purps. With anatomical guidance from Mystic Aquarium's veterinary staff and technical training from the professionals at ACT Group, the students led the design and manufacturing process using 3D Systems' end-to-end solutions.

In a workshop facilitated by ACT Group, the students started with 3D Systems' **Geomagic Capture® 3D Scanner** to scan an existing cast of Purps' foot and then imported the data into **Geomagic® Sculpt™** software where they customized the file with details like treads, hinges and closures.

"The students amazed us in how quickly they picked up the software," said Nick Gondek, Director of Additive Manufacturing and Applications Engineer, ACT Group. "It was rewarding to provide them with a technology that could keep up with their ingenuity, and to watch their creative thinking, imagination and intuitiveness lead this process."



Once satisfied with the design, it was 3D printed on 3D Systems' multi-material **ProJet MJP 5600** 3D printer. This printer enables both flexible and rigid materials to be printed and blended simultaneously at the voxel level for custom strength and elasticity. The resulting boot achieved the intended effect in durability, weight and fit, enabling Purps to walk and swim like the rest of her peers.

Watch the video below to learn more about the process and discover how these middle school students used 21st-century technologies to help an endangered penguin:

