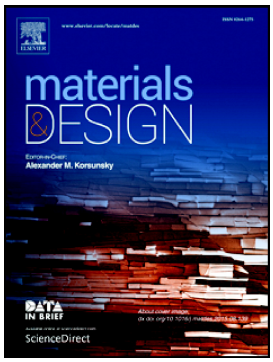

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The Design and Manufacturing of a Titanium Alloy Beak for *Grus Japonensis* using Additive Manufacturing

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ABSTRACT

In this paper, we report the design and fabrication of a titanium alloy beak for an individual *Grus japonensis* bird, the second rarest crane species in the world. The bird could not feed itself due to a broken beak. We employed a detailed geometric and structural analysis of the upper beak and used a computational design and additive manufacturing to fabricate a suitable replacement. The combination of fused deposition modeling (FDM) with selective laser melting (SLM) allowed a quick response to the design requirements, fabrication and installation of the customized titanium alloy beak. Half an hour after the operation, the bird was able to feed itself. We present an analysis that shows the complementarity of FDM and SLM and their relevance to customized medicine. Our work provides insights into the delivery of personalized veterinary care to animals using computational design and additive manufacturing.

Keywords: additive manufacturing, selective laser melting, titanium alloy, design and fabrication, beak