



The Use of 3D Printing in Healthcare

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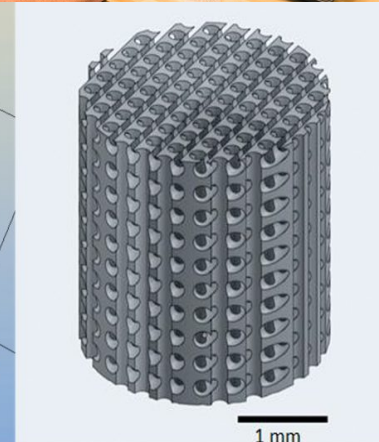
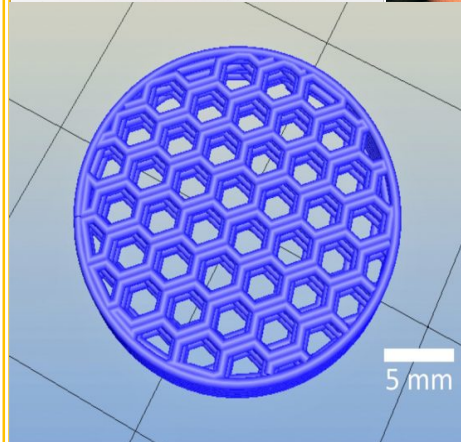
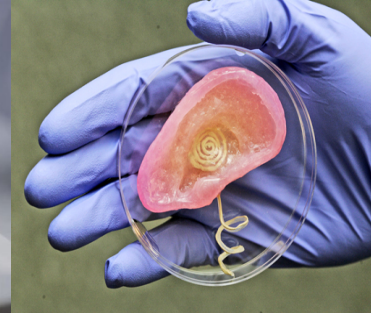
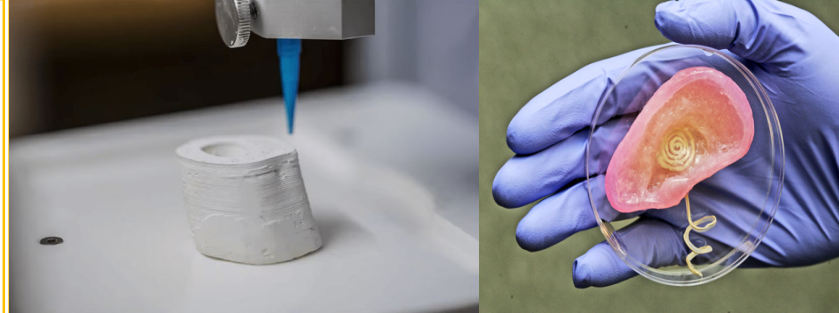


Introduction

Three-dimensional (3D) printing is a relatively new, rapidly expanding method of manufacturing that has found numerous applications in many fields, including healthcare. 3D printing is capable of precisely manufacturing solid objects from a digital file by incrementally adding layers of material until a complete object is created. The first 3D printer was developed by Charles Hull, executive vice president and chief technology officer at *3D systems*, who obtained a patent in 1986 for stereolithography (SLA)-the process of printing layers of material on top of each other to create a three-dimensional object. Hull also developed the standard tessellation language (STL) file format, which is still the gold standard for data transfer between CAD software and 3D printer technology. The purpose of this independent study was to identify various uses of 3D printing in the field of healthcare.

Review of Literature

3D printing in healthcare can be organized into several broad categories, including creation of customized prosthetics, implants, and anatomical models, tissue and organ fabrication using bioprinting scaffolds, and manufacturing of specialty surgical instruments. Benefits provided by 3D printing in medicine include not only the customization and personalization of medical products and equipment, but also cost-effectiveness and increased productivity.



Discussion/Conclusion

3D printing has become a useful and potentially transformative tool in several different fields, including medicine. As 3D printing technology innovates, so does the number of potential use in healthcare. With such advancements, it would not be surprising to see, in the coming years, 3D printing being used widely in clinical settings. Benefits provided by 3D printing in medicine include not only accurate ways of manufacturing customized medical products, but also a more cost effective and faster production rate. Although there are many advantages to 3D printing, there are many changes, on several fronts, that need to be made in order to further advance 3D printing technology. For one, printing speed needs to be improved. Creating realistic models of human bones can sometimes take hours or days to complete, which is problematic in emergency cases. The number of materials used in 3D printing must also be increased to meet demands of complex cases. More materials should also demonstrate biocompatibility to avoid poisonings related to the material entering a patient's blood stream.

References

Bhatia, Sujata K, M.D., P.E., & Sharma, S. (2014). 3D-printed prosthetics roll off the presses. *Chemical Engineering Progress*, 110(5), 28-33. Retrieved from <http://ecsu.idm.oclc.org/login?url=https://www.proquest.com/scholarly-journals/3d-printed-prosthetics-roll-off-presses/docview/1527475045/se-2?accountid=27112>.

Dodziuk, H. (2016, September 30). Applications of 3d printing in healthcare. Retrieved March 14, 2021, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5071603/>

Mikolajewska, Emilia & Macko, Marek & Ziarncki, Łukasz & Stańczyk, Sonia & Kawalec, Patryk & Mikołajewski, Dariusz. (2014). 3D PRINTING TECHNOLOGIES IN REHABILITATION ENGINEERING. *Journal of Health Sciences*. 4. 78-83.