

3D Printing in Medical Libraries

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Librarians are becoming integrated into the research process more than ever before. The shift from a focus on print collections to being the source of knowledge has provided new opportunities for librarian development, and complementary to this development is the rapid advancement of technology. Additive manufacturing, or the automated and successive synthesis of a three-dimensional (3D) object through print layering, has become increasingly accessible through the proliferation of affordable consumer-grade 3D printers [1].

The ability to purchase inexpensive models and supplies, especially through technology-focused awards and grants, has provided promising avenues for medical libraries to expand services and encourage innovation. There are also numerous opportunities for collaboration and assistance to the medical and science communities. This article highlights a few of those opportunities.

Medical Devices

Prosthetics were once difficult to afford, particularly for families of children who continually outgrow their devices. Now, because of 3D printing and a group called e-NABLE, manufacturing custom upper limb prosthetics is quick and less costly. The National Institutes of Health 3D Print Exchange (3dprint.nih.gov) provides biomedical 3D print files, including e-NABLE prosthetics, as well as modeling tutorials and educational material. Libraries are using these models to offer users meaningful learning experiences by providing the infrastructure and teaching to assist users in being able to print and assemble prosthetics on campus. Furthermore, researchers are partnering with libraries to study the use of these prosthetics in various applications and to further develop these models.

Researchers have also partnered with libraries in using 3D printing to develop tools that are customized to their research objectives and may not be affordable or available elsewhere. For instance, these tools include mechanisms developed to measure joint reflexes and to test grip and wrist dexterity. The latter mechanism involves a patient lifting a ball from its resting place over a small divider and into a cup on the other side. When developing this test, the researchers adjusted the height of the divider and the size of the cup in the design until it was suitable for their purposes.

Surgical Applications

There are many new and innovative ways in which 3D printing is improving patient care and outcomes for surgeons. This technology is a paradigm switch, and implementation varies greatly depending on the equipment and materials available as well as doctors' awareness of and experience with the technology.

As an example, the ability to take a patient's MRI scans and transfer them into a 3D file compatible for printing has transformed surgery planning for high-risk, previously inoperable conditions. Surgeons can now print any organ for surgery planning and practice procedures by utilizing flexible filaments. As a result, surgeries are more efficient and less time consuming, minimizing surgeons' doubt and patients' pain and recovery time. The technology can also be instrumental as a surgical guide and tool for operations like jaw reconstruction that previously relied a lot on "eyeballing" rather than precise fit; now, reconstruction can be achieved through custom-printed surgical guides for screw placement [2]. This has minimized the number of surgeries and given patients better outcomes.

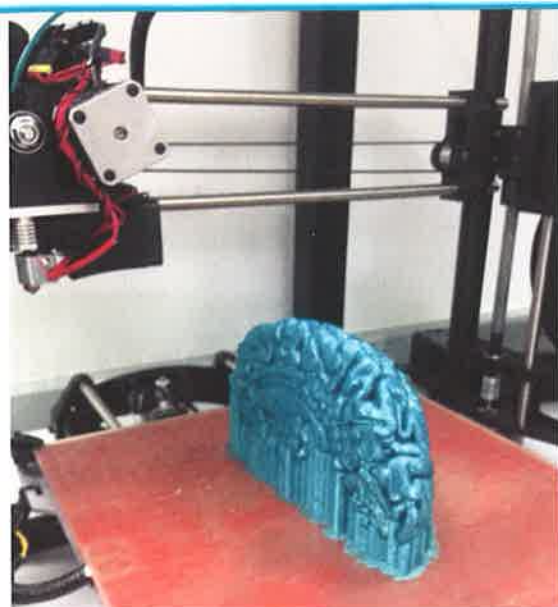


Figure 1
3D print from an MRI scan of the right hemisphere of a brain UT Southwestern Health Sciences Digital Library and Learning Center

Researchers around the world are currently experimenting with organs printed from living cells, focusing primarily on research testing improvements to drug therapies with human tissue versus animal. Although custom-printed surgical organ transplantation for patients still appears to be at least a decade away, recently the Food and Drug Administration approved the 3D printing of pills and vertebrae. This is important, as some materials go through a process that renders them non-sterile, which impacts widespread usability or adoption of the technology.

For libraries, the use and application of 3D printing is unlimited. Whether through creating joints to aid with grabbing, practicing to aid in a surgery, or furthering the research of organ development, libraries benefit from the collaboration with researchers and gain extremely valuable skills.

References

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