3D Printing for Scientists

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What is 3D Printing?

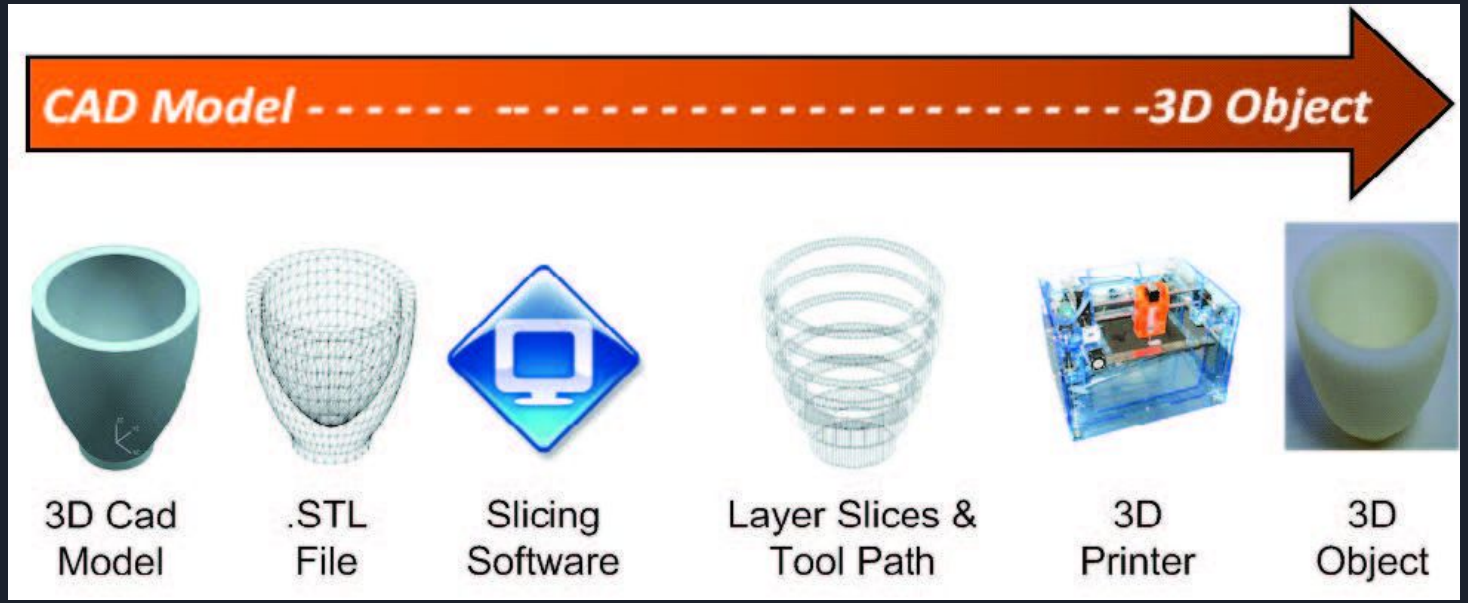
The process of joining material together to create 3D objects

Allows for complex internal structures

Useful for creating custom parts, display pieces, rapid prototyping, additive manufacturing

http://www.georgehart.com/rp/polyhedra-clusters/hand2.jpg

How it works



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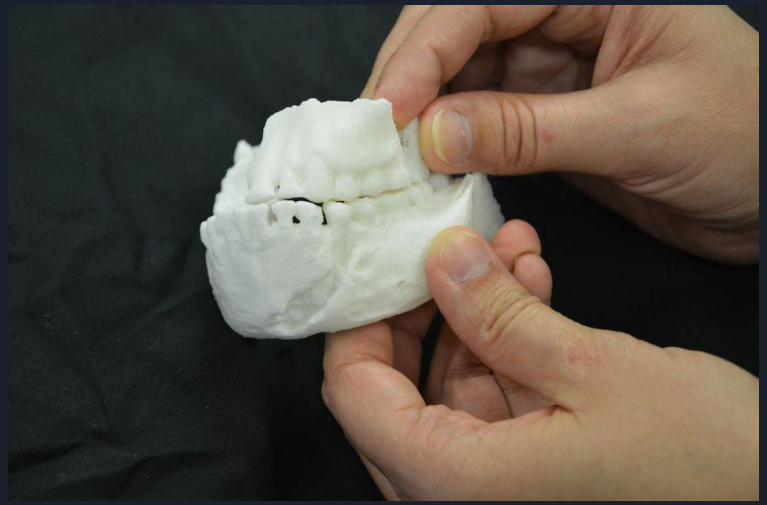
Applications

3D Technology Helps Democratize Science as CMU Studies 3D Printed *Homo Nadeli* Fossils

How To Print Your Own 3D Replicas Of *Homo Naledi* And Other Hominin Fossils



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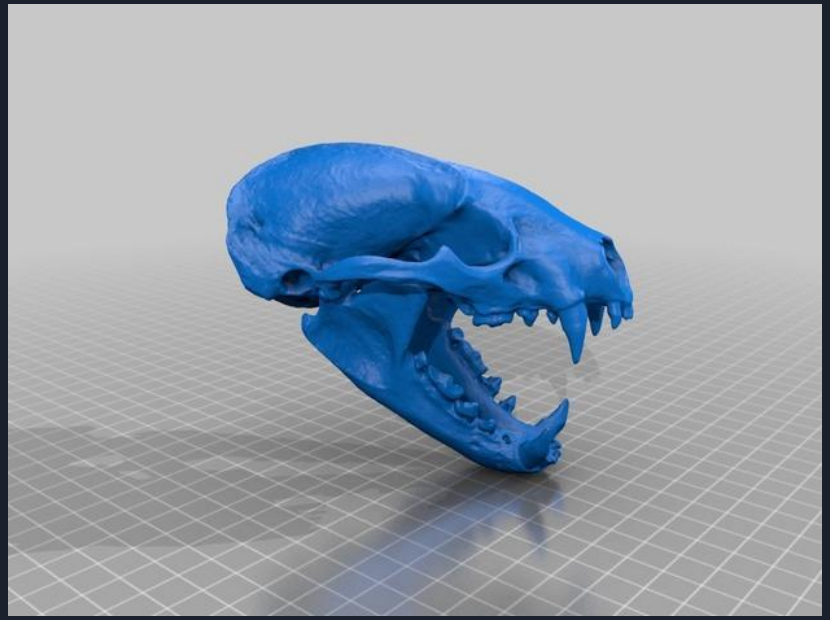
Applications

American Badger Skull



https://cdn.thingiverse.com/renders/68/90/35/2a/78/32b41350fb08f5363f18501fc778b504_preview_featured.jpg

Applications

Bird Macaw Skeleton

https://cdn.thingiverse.com/renders/86/1e/c5/a6/2b/88f62d936d656912703e6ddbfd463e72_preview_featured.JPG

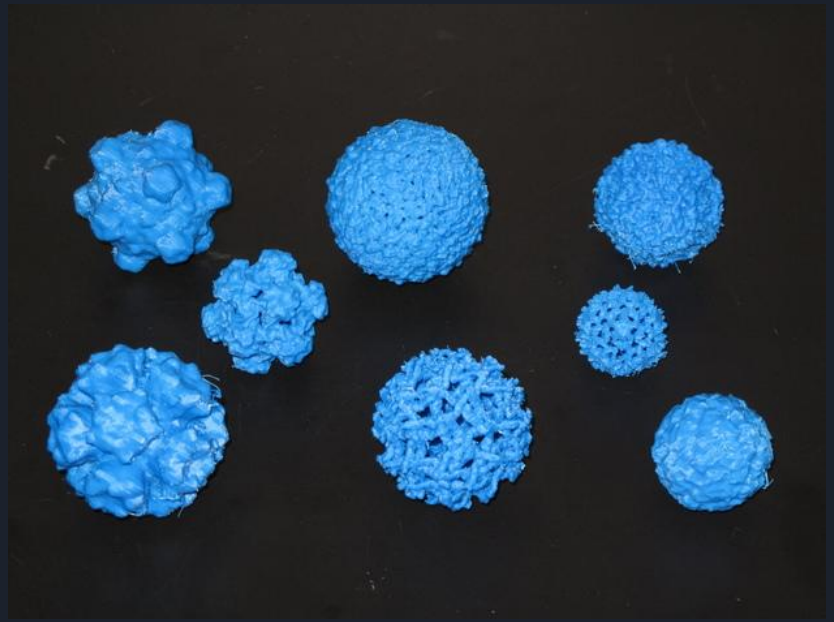
Applications

Trilobite articulatum

https://cdn.thingiverse.com/renders/51/9b/75/97/b3/Trilobite_stripes_preview_featured.jpg

Applications

Infectious Pathogens



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Applications

Owl Pellet Discovery Kit

https://cdn.thingiverse.com/renders/92/f8/f1/5e/33/522c80ae390e09a6fa7a48ff272c4282_preview_featured.JPG

Applications

Grand Canyon South Corridor

https://cdn.thingiverse.com/renders/93/c6/79/dd/f8/DSC_0023_preview_featured.jpg

Applications

Automatic Transmission Model

https://cdn.thingiverse.com/renders/26/14/39/6f/c3/transmission4_preview_featured.jpg

Applications

Bionic Wildlife: 3D Printing Technology Gives Animals Second Chance

http://cdn.roaring.earth/wp-content/uploads/2016/11/beauty-eagle.jpg

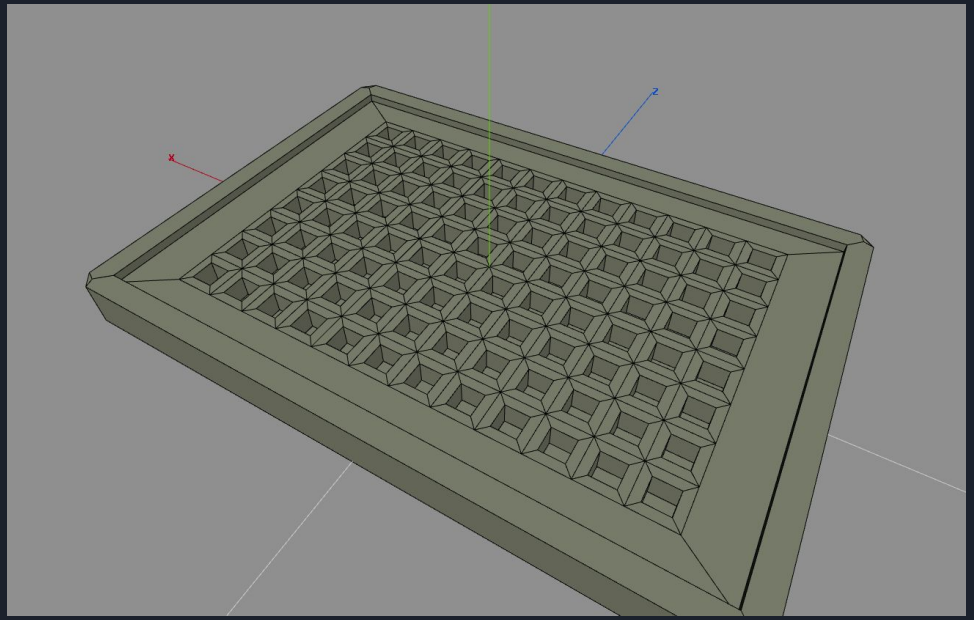
Applications

Enclosure design for 3D Printing: A step-by-step guide

https://s3-eu-west-1.amazonaws.com/3dhubs-knowledgebase/enclosure-design-for-3d-printing/photo4.jpg

Applications

Lab Equipment



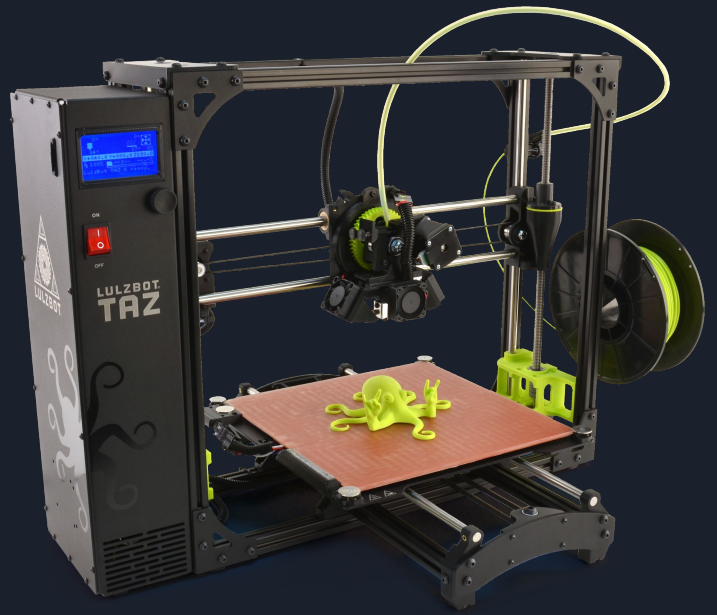
Types of 3D Printing

Stereolithography (SLA)

Selective Laser Sintering (SLS)

Fused Deposition Modeling (FDM)

Many others:
[3D Printing Processes (Wikipedia)]



https://www.lulzbot.com/sites/default/files/TAZ_6_Angle_Main_Product_Page.png

Stereolithography (SLA)

Builds by curing resin with laser

High accuracy, smooth details

More expensive

Selective Laser Sintering (SLS)

Builds by fusing powder with laser

Good detail, rough surface finish, doesn't need support structures

Expensive

Fused Deposition Modeling (FDM)

Build by melting and extruding thermoplastic filament

Low-cost, fast

Low accuracy and details

FDM - Materials

3D Printing Materials: The Pros and Cons of Each Type

- ABS
- PLA
- PVA
- Nylon
- HDPE
- T-Glase/PETT
- Wood Filament
- Metal Filament
- Carbon Fiber Filament
- Conductive

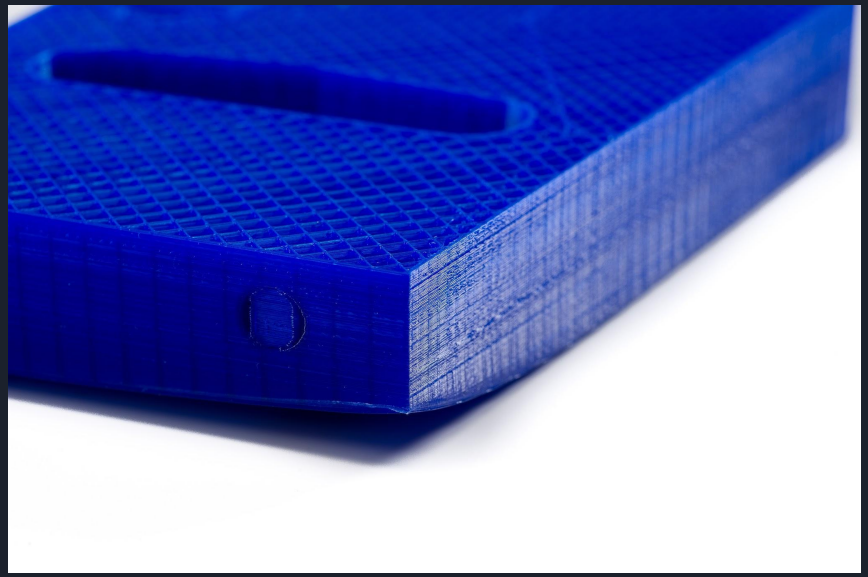
https://blog-assets.pinshape.com/blog/wp-content/uploads/2016/10/23095600/image00.png

Shrinkage & Warping

Shrinkage: A Problem of 3D Printing

How To Fix Warping

Adhesives, heated plates, draft guards, rafts



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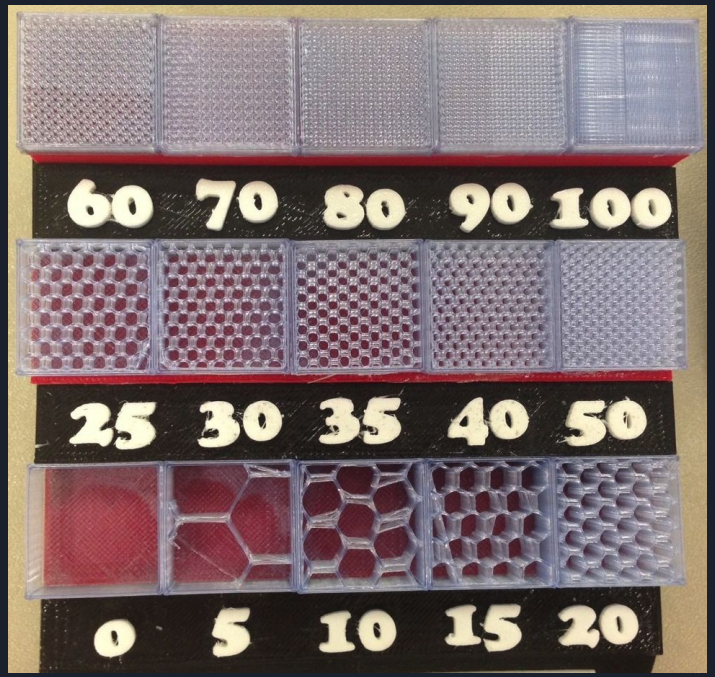
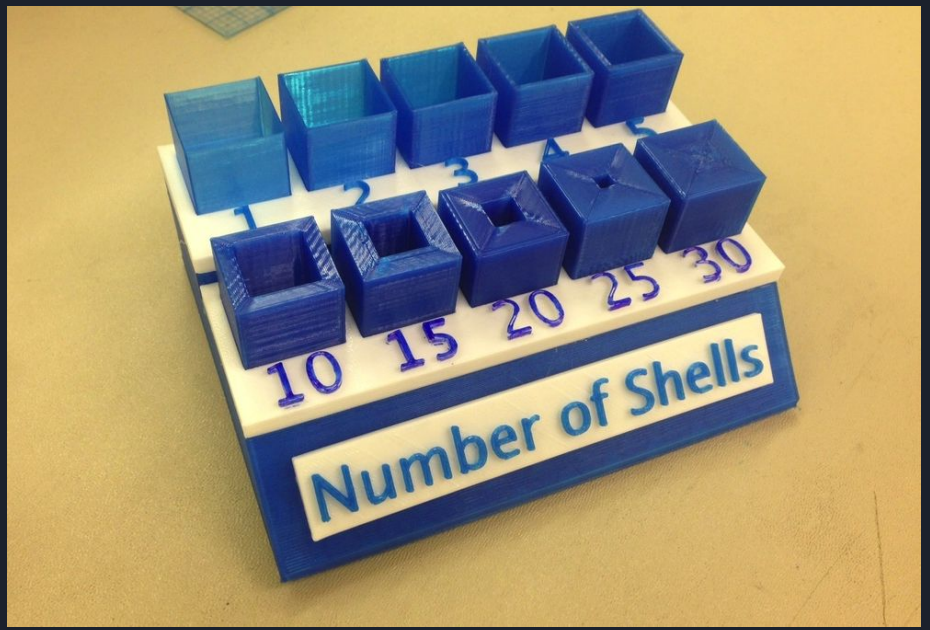
Important Terms - Infill

https://3dprint.com/82668/infill-shells-3d-printing/



Important Terms - Shells

https://3dprint.com/82668/infill-shells-3d-printing/



Important Terms - Rafts & Supports

https://3dprint.com/82668/infill-shells-3d-printing/

Printing Models

Home printers

Libraries

Universities

Online services

https://innovationacademy.ufl.edu/media/innovationacademyufledu/images/resources-tab/prototype-and-build/Lib-3d-printer.jpg

Creating Models

Online sources

3D scanning

Direct modelling

CAD

Software

Ultimaker Cura: Visualizing and preparing models for printing

Wings3D: Direct modeling

FreeCAD: Computer aided design

Go here: www.thingiverse.com

Search: low poly

FreeCAD Tutorial

https://www.freecadweb.org/wiki/Basic_Part_Design_Tutorial