

15-294 Rapid Prototyping Technologies:

Varieties of 3D Printing

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Five Types of 3D Printers

1) Squirters

2) Flashers

3) Gluers

4) Melters

5) Laminators

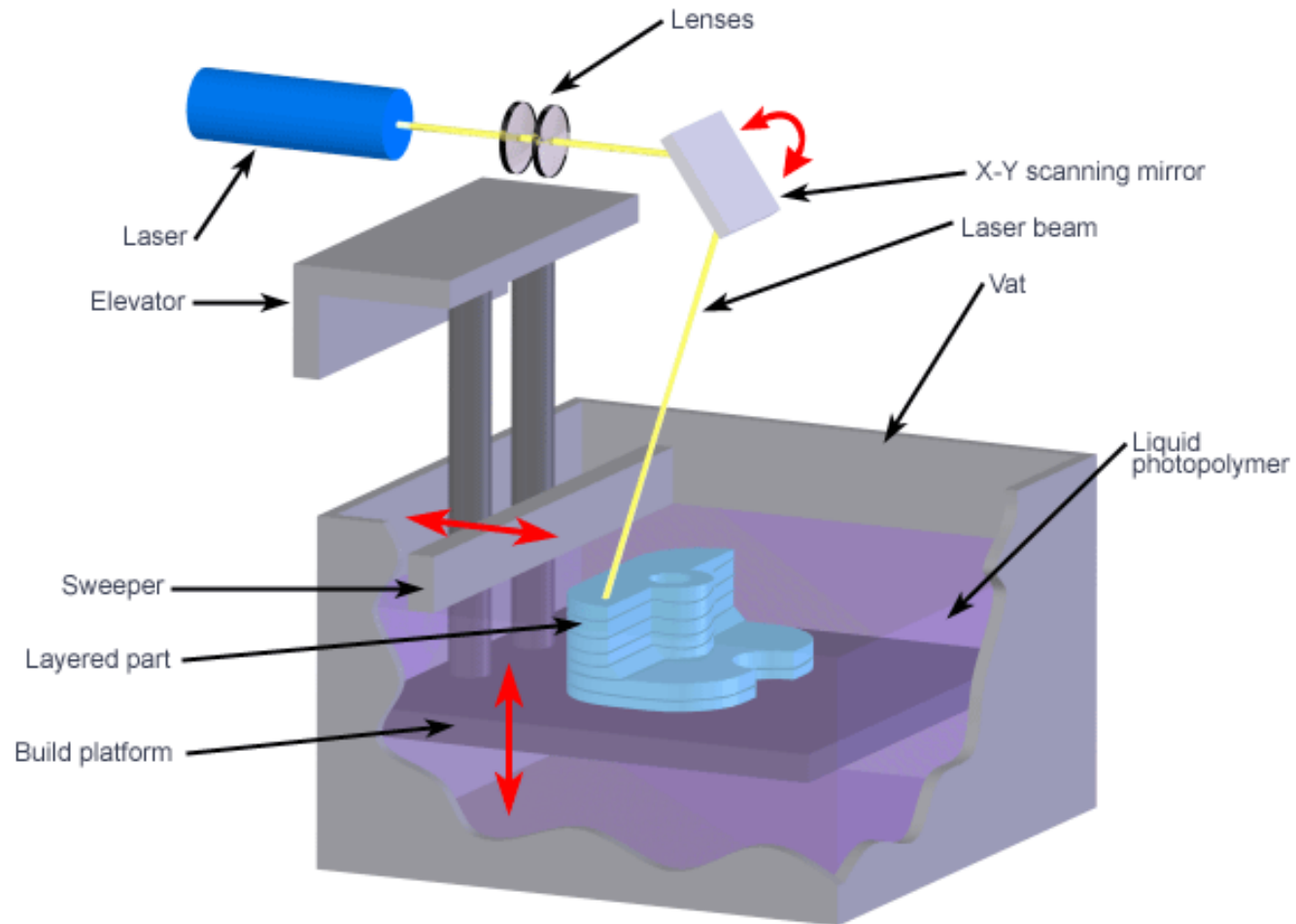
1) Squirters

- Extrude soft material through a nozzle.
- Also called FDM: Fused Deposition Modeling, or PJP (Plastic Jet Printing)
- Nozzle moves, print bed moves, or both move.
- Common materials: plastic (ABS, PLA, PVA)
 - (acrylonitrile butadiene styrene; polylactic acid; polyvinyl alcohol)
- Other materials:
 - concrete, wood fiber, chocolate, dough, ground meat
- Examples: Cube 3, Makerbot

2) Flashers

- Stereolithography: use a UV laser to polymerize a liquid resin.
- Mirrors steer the laser; print bed rises from or lowers into the resin tank.
- Materials: proprietary plastic resin.
- Cure in a UV oven, or with sunlight.
- Finer precision than FDM, but more expensive.
- Examples: Form Labs Form 1+

Stereolithography

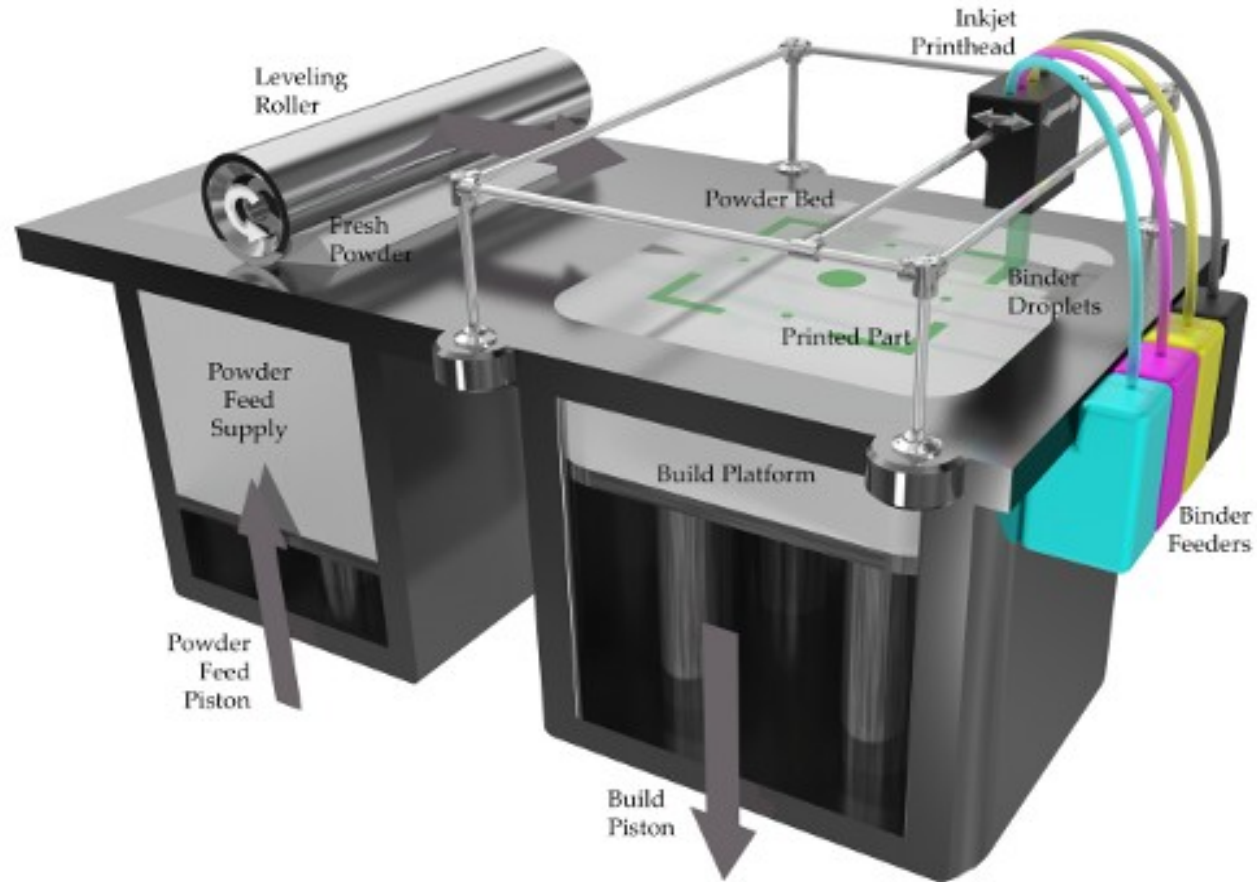


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3) Gluers

- Binder jet printing.
- Layer of plastic, metal, or ceramic powder on which binder is sprayed as with an inkjet printer.
- The powder acts as its own support material.
- At the end, unbound powder is vacuumed away. Binder is cured with heat.
- Can use colored binders to produce colored 3D prints.

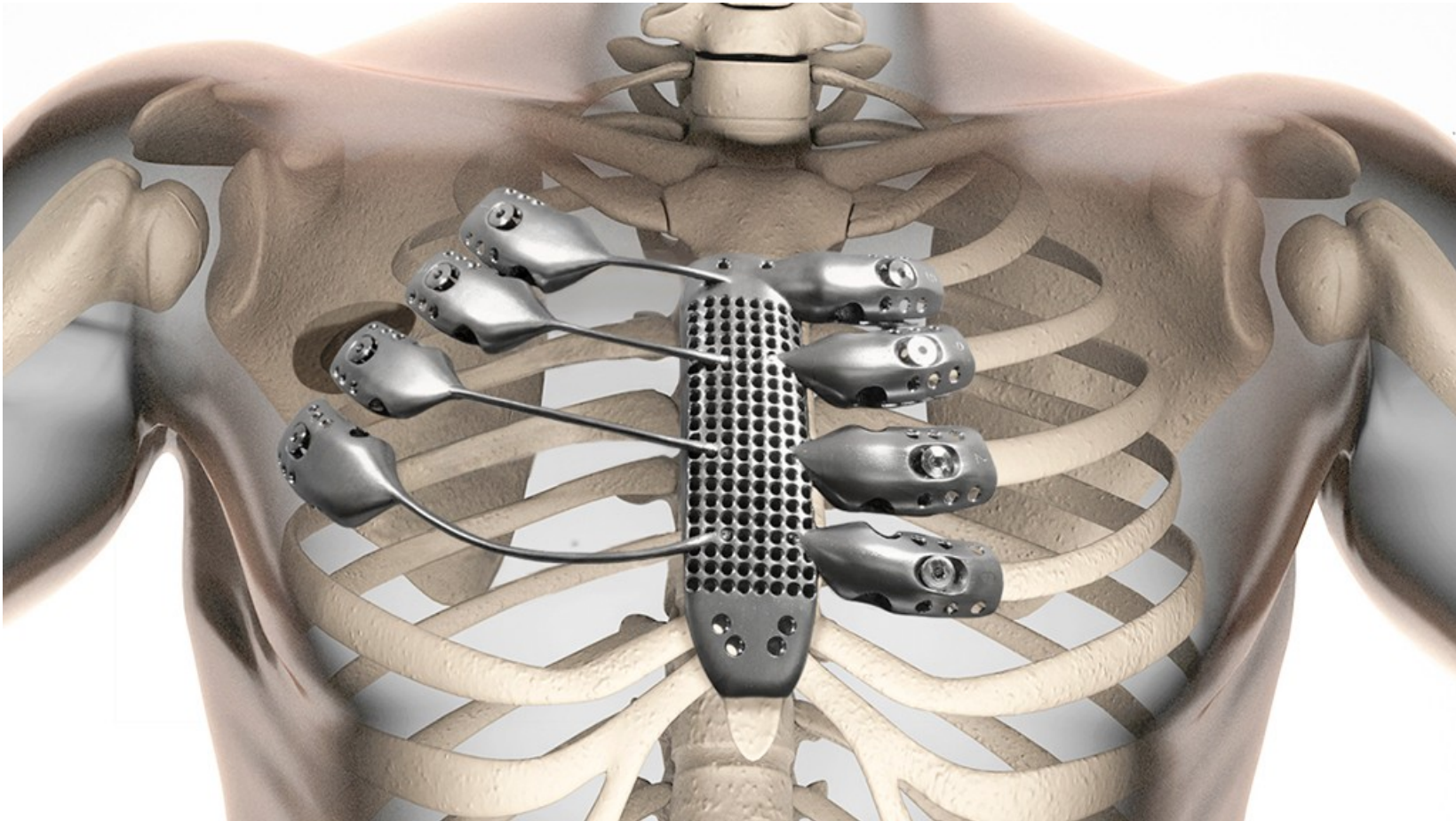
Color Binder Jet Printing



4) Melters

- Selective laser sintering (SLS).
- Uses a powder bed, similar to binder jet printing, but no binder.
- Metal powder is melted by either a laser or a beam of electrons.
- Can be used to print in titanium (for surgical implants) or other metals.
- Used to make aircraft parts.

3D Printed Rib Cage



Electron beam sintering done at CSIRO (Australia).

5) Laminators

- Print one sheet of paper at a time.
- Cut part outline with a digitally controlled knife.
- Glue in place (lamination).
- Can produce full color 3D prints.

Laminated Object Manufacturing (LOM)

- **Paper material is the base material** used in this technology
- In this method, layers of **adhesive-coated** plastic, paper or metal laminates are **fused together** and **cut into shape** with the aid of a **knife or a laser cutter**

