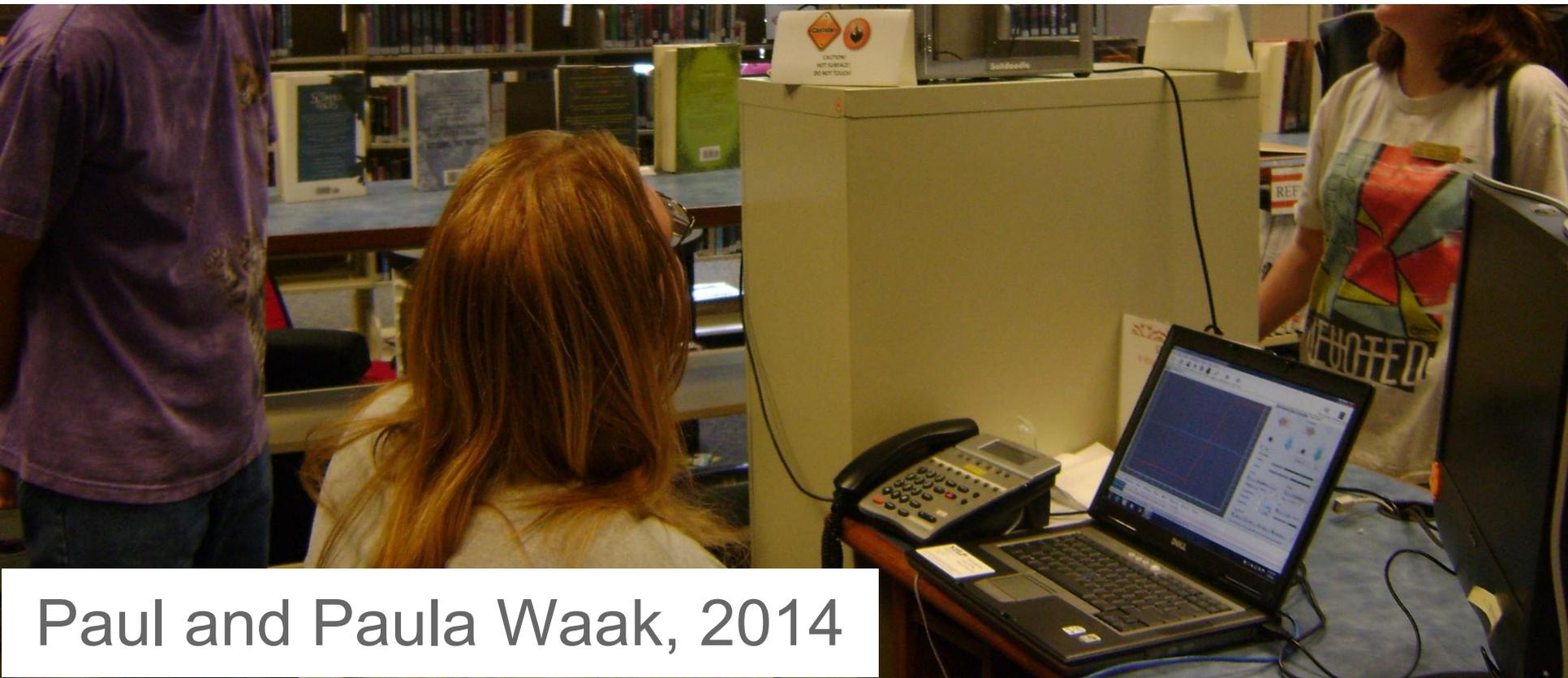


Past, Present, and Future of the 3D Printed World

Understanding What They Are and How They Work



Paul and Paula Waak, 2014

Overview

1. What is 3D Printing?
2. Choosing the Right Printer
3. Setting Up the Printer
4. Getting More Information
5. Questions

What Is 3D Printing?

1. 3D Printing Technology
 - a. Jargon
 - b. Personal manufacturing, aka., 3D printing
 - c. Types of filament
2. Current Uses
3. Social Impact
4. Thinking about the Future

Jargon

Computer Aided Design (CAD)

Computer Aided Manufacturing (CAM)

Computer Numerical Control (CNC)

Material Safety Data Sheet (MSDS)

Personal manufacturing, aka., 3D printing

Additive and subtractive manufacturing

Photopolymer based printing

Powder based printing

Filament based printing

Types of filament

ABS (Acrylonitrile Butadiene Styrene) plastic

- Very stable and safe (Lego™ plastic)
- High melting temperature
- Sturdy

PLA (Polylactic acid) plastic

- Biodegradable
- Safer than ABS for food & body use
- Low melting temperature
- Somewhat fragile

Types of filament

PVA (Polyvinyl alcohol) plastic

- Dissolves in cold water
- Used for support in complex models

Wood plastic

- Darkens with higher extruder temperature

Brick plastic

- Has the texture of sandstone

Types of filament

Taulman 618 Nylon

- Very sturdy, flexible and stable
- Toxic fumes while printing; needs a ventilation hood or equivalent

Taulman T-Glase

- Very sturdy, similar to acrylic
- Translucent
- No fume issues

Types of filament

Urethane (Polyurethanes)

- Flexible rubber
- Toxic fumes while printing; needs a ventilation hood or equivalent

Recreus Filaflex

- Elastic plastic
- Suitable for printing shoes
- May require a special extruder

Types of filament

Conductive ABS

- Blend of ABS and carbon fiber
- Can print both electric circuits and electromagnetic shielding

Flame Retardant ABS

- Self extinguishes
- Suitable for appliance parts (like coffee makers)

Established Uses

- Product prototyping
- Simple home repair
- Toys
- Jewelry
- Hearing aides
- Stop motion animation
- Models for pre-surgery planning
- Architectural models
- Works of art
- Decor

New Uses

- Nike shoe [cleat](#) for the NFL
- [Tissue samples](#) for drug testing
- [Plastic bones](#) for reconstructive surgery
- 2,000 sq ft [house frames](#) in 24 hours for \$5k
- [Prosthetic hands](#) for \$60
- Waterproof [casts](#) with better air circulation
- DIY [cosmetics](#)
- Omnidirectional [speakers](#)
- [Fax](#) 3D objects
- Duplicating [fossil records](#)

Social Impact

- Education
- Do It Yourself and Fix It Yourself
- Home: [Best Buy](#), [Makertronic](#)
- Community: [Fayetteville](#), [Sacramento](#), [Saginaw](#)
- Art: [Captured Dimensions](#), [900lbs of Creative](#)
- Business: [PartSnap](#), [The UPS Store](#)

Thinking About the Future

Remember dot matrix printers and fax machines in 1974? Computers and printers have come a long way in 40 years, personal manufacturing is just beginning.

Plan to upgrade every 2 years to stay current or every 5 years to stay functional.

Choosing the Right Printer

1. Cost
2. Features
3. Software

How Much Do 3D Printers Cost?

- \$400 - \$2,500+
- Makerbot [Replicator 2X](#) = \$2,499
- [Ultimaker 2](#) = €1,895.00 ≈ \$2,598
- Solidoodle [3rd Generation](#) = \$799
- DIY = \$200+



Cost of Filament

Standard Colors

\$25 - \$45 per 1Kg

Fluorescent & Metallic

\$31 - \$55 per 1Kg

Glow in the Dark /
Glittery / Specialty

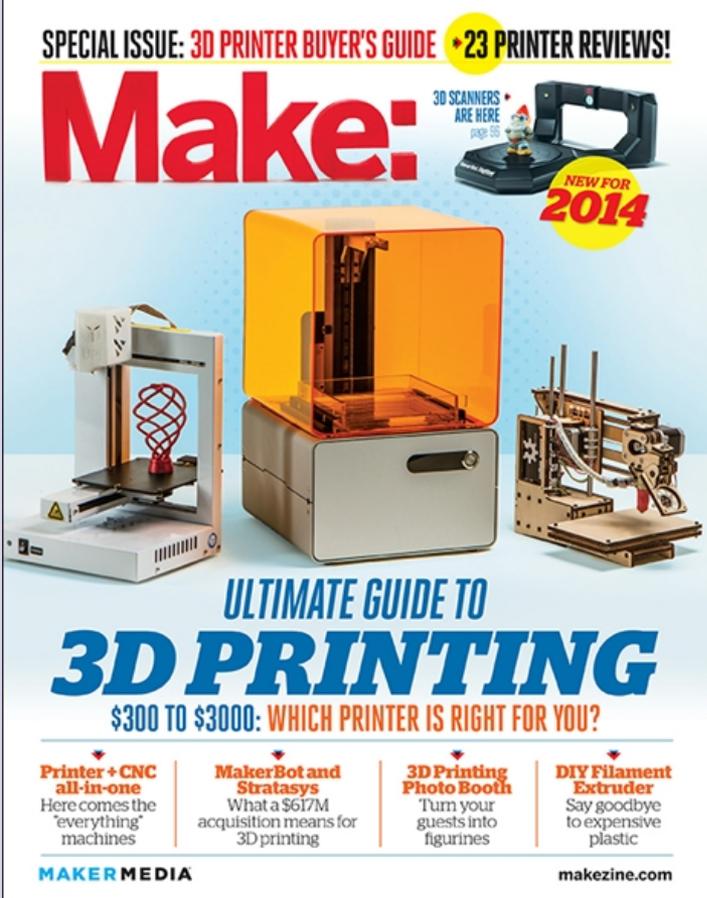
\$35 - \$90 per 1Kg



Getting a 3D Printer for Your Library

1. Price
2. Size
3. Sound
4. Print Speed
5. Detail Quality
6. DIY or Pre-built
7. Software Compatibility
8. Number of Extruders
9. Read Customer Reviews

* Makezine.com & 3ders.org



SPECIAL ISSUE: 3D PRINTER BUYER'S GUIDE +23 PRINTER REVIEWS!

Make: 3D SCANNERS ARE HERE page 56

NEW FOR 2014

ULTIMATE GUIDE TO 3D PRINTING

\$300 TO \$3000: WHICH PRINTER IS RIGHT FOR YOU?

Printer + CNC all-in-one Here comes the "everything" machines	MakerBot and Stratasys What a \$617M acquisition means for 3D printing	3D Printing Photo Booth Turn your guests into figurines	DIY Filament Extruder Say goodbye to expensive plastic
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MAKER MEDIA makezine.com

Types of Software

Free Computer Software

- Trimble [Sketchup](#) (architectural)
- [Blender](#) (visual art / animation)
- [OpenSCAD](#) (programming)
- Autodesk [123D](#) (engineering)

Purchasing Professional Computer Software

- Autodesk [AutoCAD](#) Professional Software
- Adobe [Photoshop CS6 Extended](#)

Setting Up the Printer

1. Additional Equipment
2. Placement

Additional Equipment



Dehumidifier (eg., DampRid)



Foam Sanding Pads



Toothbrush



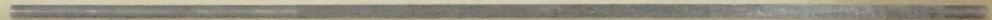
Long Tweezers



Sewing Scissors



Putty Knife



Thin Rounded File (eg., a chainsaw file)

Placement

Well ventilated (most plastics emit fumes)

Shielded from vents

Steady temperature

Room for the printer, computer, recycle bin,
supplies & tools

Getting More Information

General

- 3ders.org
- Makezine.com

Library-specific

- OCLC [WebJunction](#) (2012)
- ALA [ACRL TechConnect](#) (2012)
- [Issues in Science and Technology Librarianship](#) (2013)

Questions

