

## *3D PRINTING & 3D IP ISSUES*

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# What is 3D Printing?

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- n A process for making a physical object from a three-dimensional digital model, typically by laying down many successive thin layers of a material.
- n Known also as “Additive Manufacturing” because primarily *additive processes* are used, in which successive layers of material are laid down until the entire object is created.
  - q Melting or softening material to produce the layers, or
  - q Laying liquid materials that are cured with different technologies etc.

# Traditional Manufacturing

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- n **Subtractive manufacturing:** *Layers of material are removed from a raw material or injected into a mold to create the desired shape.*
  - q Casting, fabrication, stamping, machining etc.



# What is 3D Printing?

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- n Materials other than “ink” are dispensed from printer-type nozzles or syringes onto a moving platform.
- n The amount of material, the rotation of the platform and the design of the object is controlled via graphic design software (aka 3D modeling program) and based on a digital model.
- n The software slices the design into hundreds (at times thousands) of horizontal layers.
- n These layers are printed one atop the other, blending each layer together with no sign of the layering visible, and a three dimensional object is constructed by building upon layers of layers of covered surface.

# 3D Printing Components

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## n Materials

q Early days:

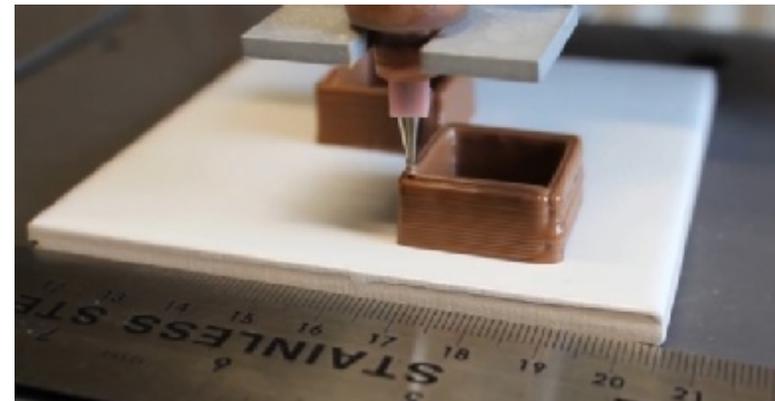
n Metals, plastics, and ceramics

q Modern days:

n Edible food (e.g. sugar, chocolate, dough), living tissue/cell (e.g. replicating organs, blood vessels), wax, glass filled polyamide, polymers, etc.



Titanium jawbone



FOODINI™ printer is printing a desired shape from chocolate

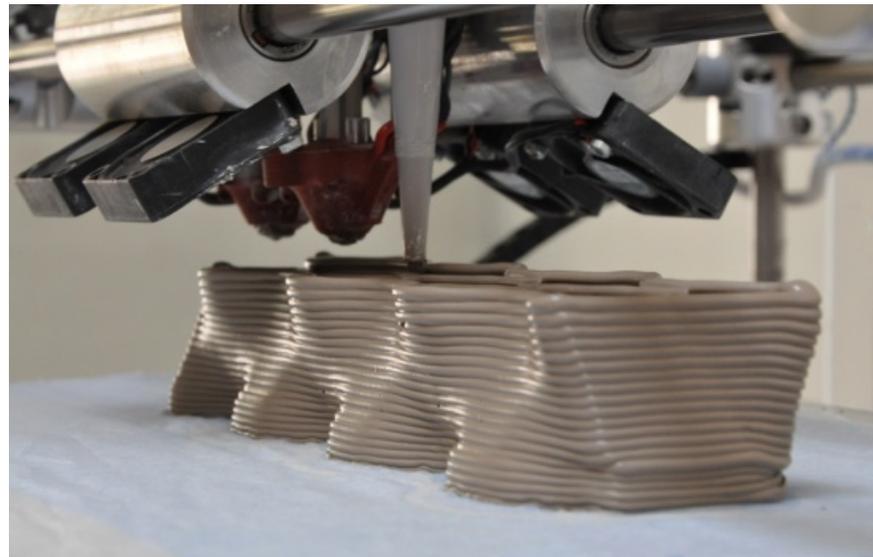
# 3D Printing Components

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## n Materials *(continued)*



Nylon bikini-N12™



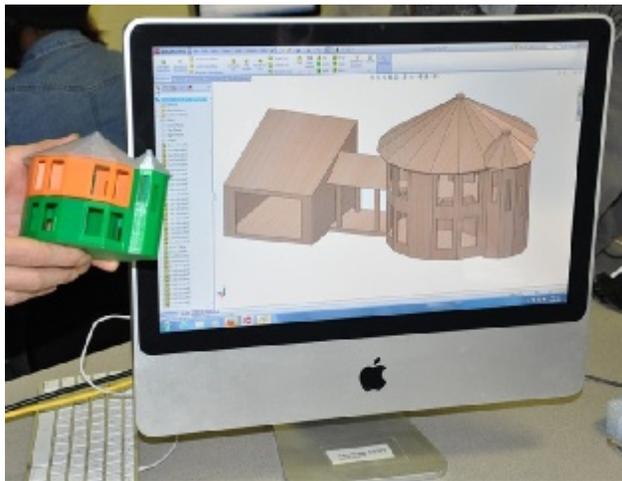
Ceramic brick for construction

# 3D Printing Components

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## n **Digital Model (CAD-Computer Aided Design-File)**

- q A totally new object can digitally be created by using 3D modeling program, or
- q An existing object can be digitally copied via 3D scanner



3-D model of a Zero-Emissions Home designed by students of Penn State Greater Allegheny via CAD software



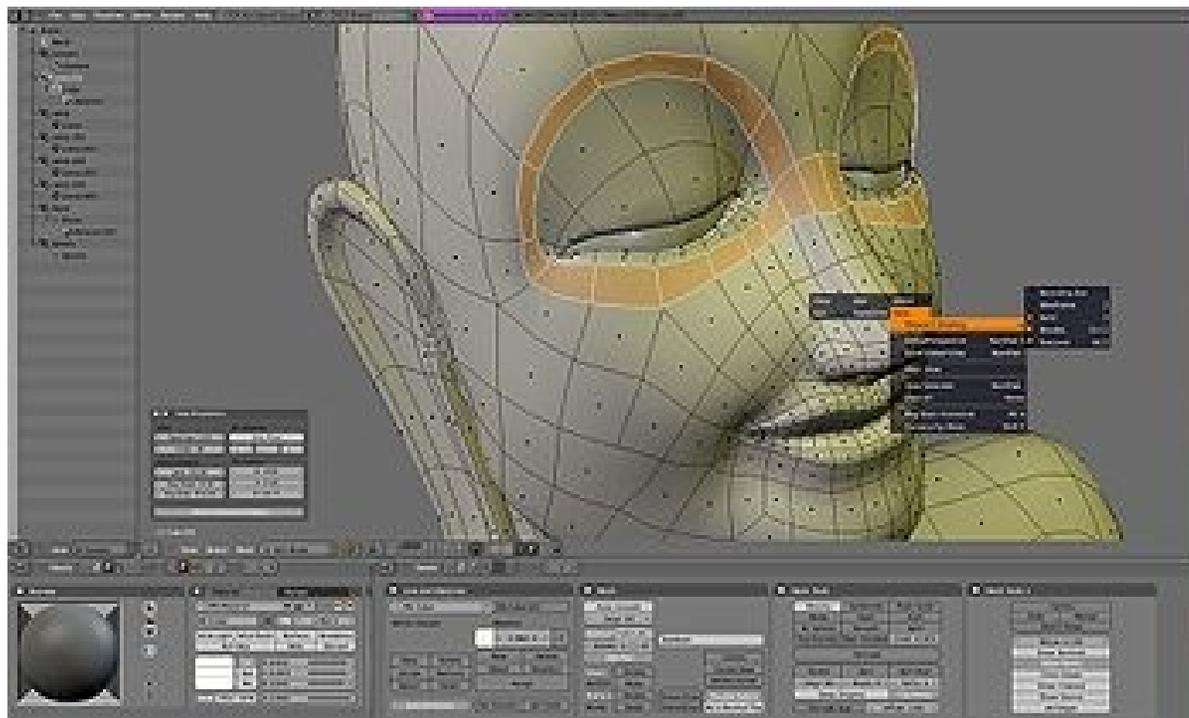
3D Scanner-SENSE™

# 3D Printing Components

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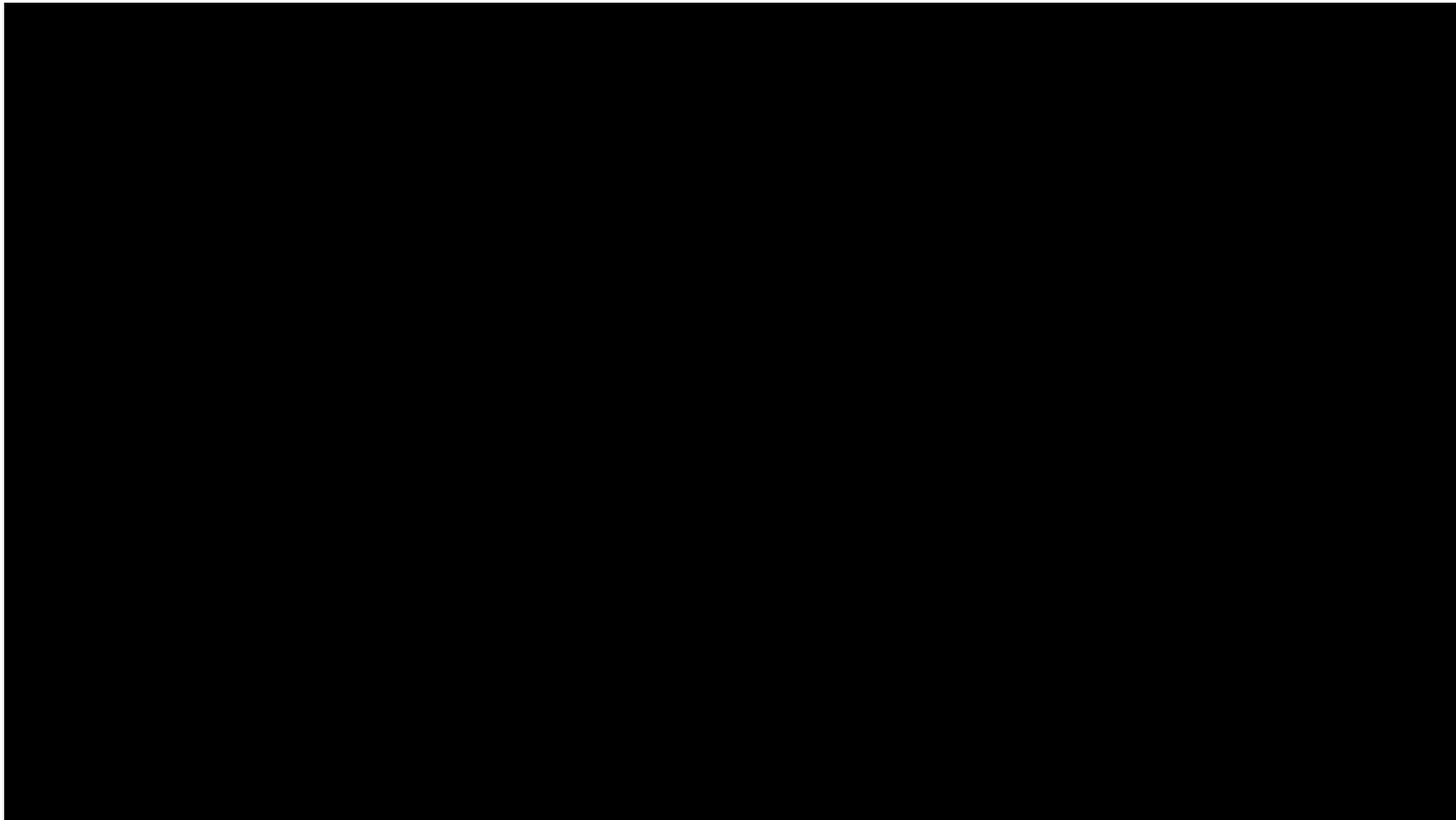
## n 3D Modeling Program

- q 3D computer graphic software that allows users to create and alter models via their 3D mesh.



Can I see one in action?

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# Advantages of 3D Printing

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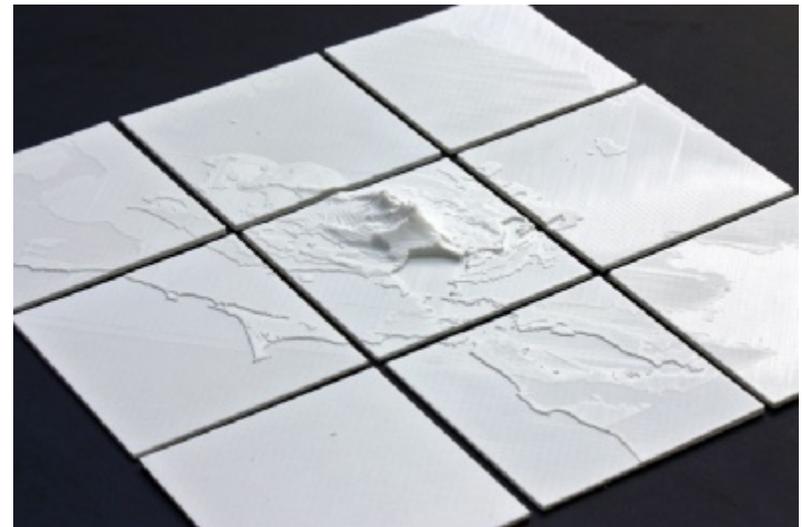
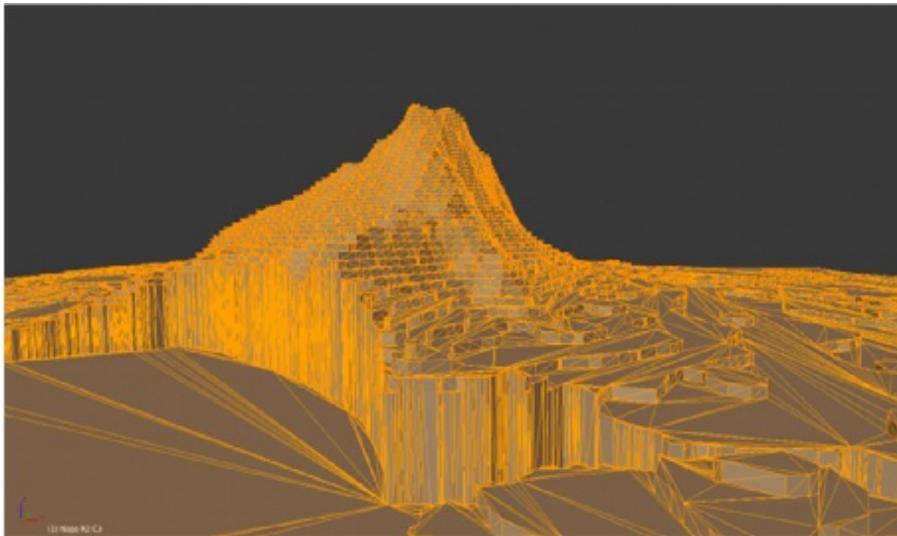
- n Faster and cost efficient product development:
  - q *Rapid prototyping*: Quickly see, touch and test versions of the product design before full blown production.
  - q Reconfiguring tooling machinery v. easily changing digital model mid-production.
  - q GM used 3D printing for 2014 Chevrolet Malibu's front fascia prototyping, enabling aerodynamic and climatic wind tunnel testing without expensive production parts.

# Advantages of 3D Printing

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## n Data visualizing:

- q The visualization of non-visual data.
- q 3D printed visual representation of the Peak Ground Velocity (PVG) information of this year's earthquake struck Napa, California.



# Advantages of 3D Printing

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## n Rapid manufacturing:

- q New method of manufacturing where 3D printers are used for short run manufacturing in the relatively inexpensive production of small numbers of parts within hours.
- q In this way of manufacturing the printed objects are not prototypes but the actual end user product.

# Advantages of 3D Printing

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## n Rapid manufacturing (*examples*)



Nike is using 3D printing to prototype and manufacture the Vapor Laser Talon football shoe cleat.

# Advantages of 3D Printing

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## n Rapid manufacturing (*examples*)



*In January 2013 a top middle-distance runner, Jack Bolas, raced in a New Balance shoe custom-made for his feet using a 3-D printing process.*

New Balance is 3D manufacturing custom-fit shoes for elite athletes.



Technicians use sensors and motion capture cameras to create a digital model of a runner's stride. The 3-D printing technique is used to create highly specialized soles and spike plates on shoes.

# Advantages of 3D Printing

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## n Rapid manufacturing (examples)



Pat Starace, a mechanic, creates 3D printed prosthetic not only looks like but also functions like Iron Man.



5 year-old Texas boy, Keith Harris, who was born with a deformed right hand caused by a rare condition, got an Iron Man inspired 3D printed prosthetic.

# Advantages of 3D Printing

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## n Rapid manufacturing (*examples*)

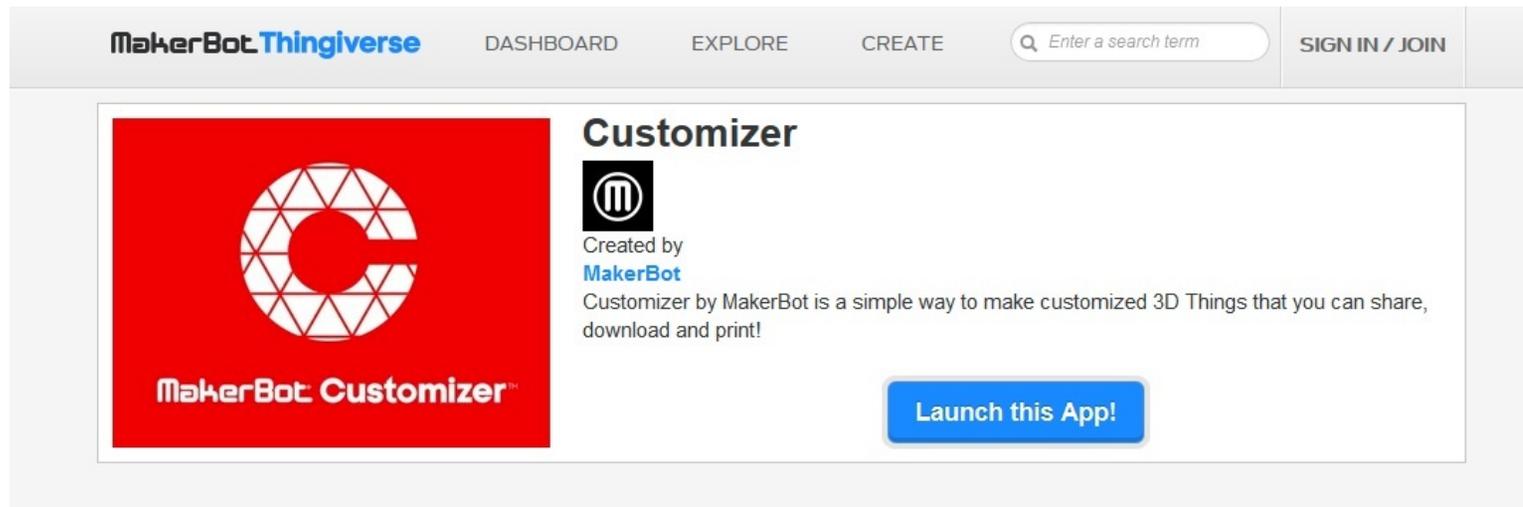
- q 3D printing has been used to print patient specific implant and device for medical use.
  - n A titanium pelvis implanted
  - n A titanium lower jaw transplanted
  - n 3D printed parts to rebuild the face of a person
  
- q NASA granted contractor Systems & Materials Research \$125,000 to develop a pizza printer. The prototype uses shelf-stable powdered food and oils, offering nutrition while minimizing garbage on board of a space vehicle.

# Advantages of 3D Printing

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## n Mass customization:

- q Companies have created services where consumers can customize objects using simplified customization software, and order the resulting items as 3D printed unique objects.



The screenshot displays the MakerBot Thingiverse website interface. At the top, the navigation bar includes the logo "MakerBot Thingiverse", links for "DASHBOARD", "EXPLORE", and "CREATE", a search bar with the placeholder text "Enter a search term", and a "SIGN IN / JOIN" button. The main content area features a card for the "Customizer" app. On the left of the card is a red square with a white circular logo containing a stylized 'C' and the text "MakerBot Customizer™" below it. To the right of the logo, the title "Customizer" is displayed above a small MakerBot logo icon. Below the icon, it states "Created by MakerBot" and provides a description: "Customizer by MakerBot is a simple way to make customized 3D Things that you can share, download and print!". A blue button labeled "Launch this App!" is positioned at the bottom right of the card.

# Advantages of 3D Printing

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## n Mass customization (continued):

 **Customizable hanging spice jar rack**  
by ffs, published Nov 10, 2014



Like	32
Collect	39
Comment	0
I Made One	0
Remix It	0
Share	

 [Open in Customizer](#)

 [Download This Thing!](#)

 Thing Info	 Instructions	 Thing Files	 Comments	 Made	 39 Collections	 Remixes
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**Description**

With this rack you can utilize the space below a shelf for small round containers with herbs and spices (or anything else).  
No drilling or glueing needed!  
All that's needed is a removable board in the shelf.

 1508  129

 Found in Kitchen & Dining

 Report Thing as Inappropriate

# Advantages of 3D Printing

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- n Mass customization (*continued*):
  - q Nokia released the 3D designs for its Lumia phone cases so that owners can customize their own case and have it 3D printed.

The screenshot displays the MakerBot Thingiverse interface for a 'Customizable Nokia Lumia 520 Case'. The page features a central image of the phone with three interchangeable cases in blue, yellow, and green. To the right, a statistics panel shows 32 likes, 46 collections, 5 comments, 4 'I Made One' instances, and 283 remixes. Below the image, a navigation bar includes links for 'Thing info', 'Instructions', 'Thing Files', 'Comments', 'Made', 'Collections', and 'Remixes'. The 'Download This Thing!' button is prominently displayed in blue.

Interaction	Count
Like	32
Collect	46
Comment	5
I Made One	4
Remix It	283
Share	-

Category	Count
Thing info	-
Instructions	-
Thing Files	-
Comments	5
Made	4
Collections	46
Remixes	283

# Advantages of 3D Printing

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- n Distributed manufacturing
  - q 3D printing with cloud computing technologies allows decentralized and geographically independent distributed production.
  - q Design files can be processed digitally in one central location, and then sent to any printer on the network around the world, creating global digital factories.
  - q 3D Printing Marketplaces
    - n To buy, sell, customize and share digital model files.
    - n To 3D print via web-based software.

# Advantages of 3D Printing

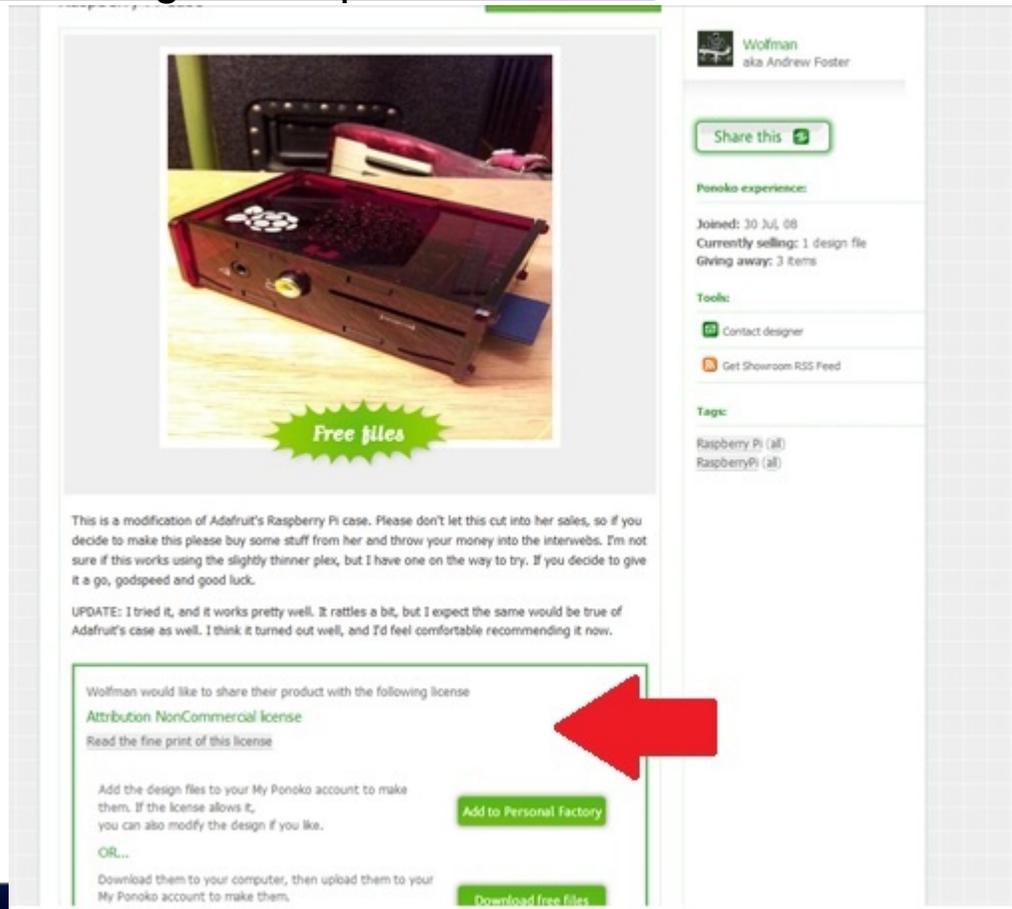
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- n Distributed manufacturing (continued)
  - q 3D Printing Centers
    - n FedEx Kinkos, UPS, Staple etc.
  - q 3D Printing Marketplaces
    - q Model repositories that have digital model files you can download for free.
      - n Thingiverse, 3D Warehouse, 3D Parts Database etc.
    - q On-line 3D printing services to both commercial and private customers, working from 3D designs uploaded to the company website. 3D-printed designs are either shipped to the customer or picked up from the service provider.
      - n Shapeways, Ponoko etc.
    - q Some online sites do not offer 3D printing services but they do integrate network of third party owned 3D printers and connect them with customers/designer.
      - n Threeding, 3DPrintWise

# Advantages of 3D Printing

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- n Distributed manufacturing (*continued*)
  - q 3D Printing Marketplaces-Ponoko



The screenshot shows a product listing on the Ponoko marketplace. On the left, there is a photograph of a dark-colored, rectangular 3D-printed case for a Raspberry Pi, sitting on a wooden surface. A green starburst graphic with the text "Free files" is overlaid on the bottom right of the image. To the right of the image is a user profile for "Wolfman aka Andrew Foster". Below the profile is a "Share this" button with a plus icon. Further down, there are sections for "Ponoko experience:" (Joined: 30 Jul, 08; Currently selling: 1 design file; Giving away: 3 items), "Tools:" (Contact designer, Get Showroom RSS Feed), and "Tags:" (Raspberry Pi (all), RaspberryPi (all)). At the bottom of the listing, there is a license section: "Wolfman would like to share their product with the following license Attribution NonCommercial license. Read the fine print of this license." Below this, there are two options: "Add to Personal Factory" and "Download free files". A large red arrow points from the right towards the "Download free files" button.

# Advantages of 3D Printing

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- n Distributed manufacturing (*continued*)
- q 3D Printing Marketplaces-Shapeway



## 1. Design a Product



### Use a 3D Printing App

Tweak and tailor your product to perfection using an easy 3D printing app.



### Use Your Favorite Software

We support a wide range of parametric, sculpting and modeling software.



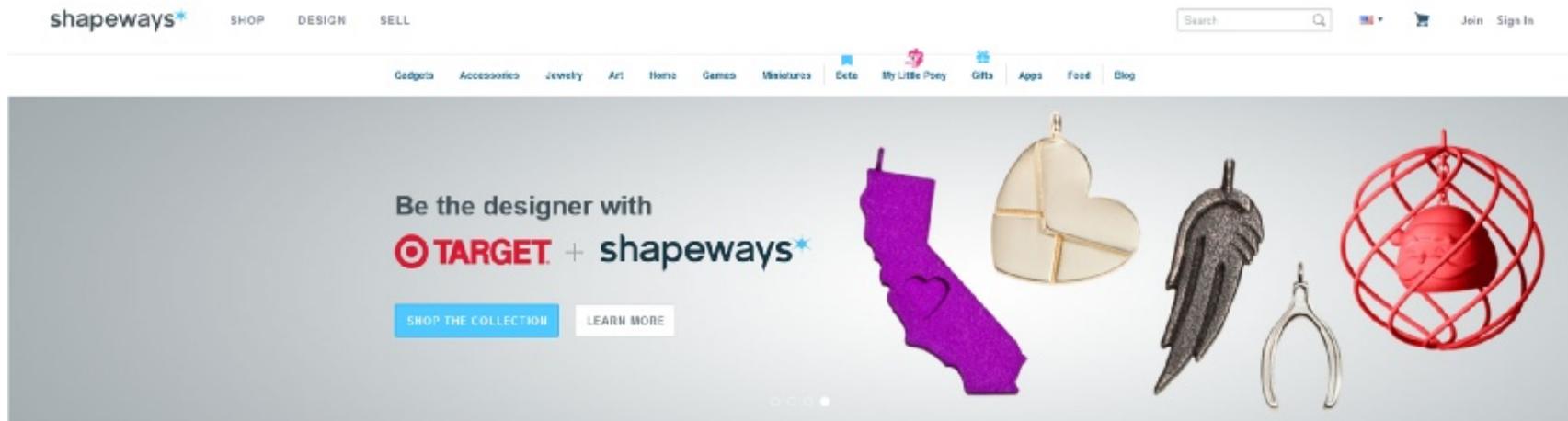
### Hire a Designer

Work with the best 3D modelers in the world to bring your idea to life.

# Advantages of 3D Printing

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- n Distributed manufacturing (*continued*)
  - q 3D Printing Marketplaces-Shapeway



## Shapeways 3D Printing Service and Marketplace



# 3D Printing Opportunities

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- n 3D Printing is not new (e.g. 1980s) but the technology has become more accessible, sophisticated and cost efficient.
- n One of the major patents protecting a specific type of 3D printer expired in January 2014.
  - q The cost of high quality 3D printers has decreased steadily due to the expiration of such patents.
  - q Some are under \$1,000.
- n 3D printing is being used almost in every industry.
  - q architecture, construction, automotive, aerospace, medical, biotech, clothing, jewelry, eyewear, food, etc.

# Threats to IP Rights

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- n The potential for widespread personal manufacturing of objects and designs may facilitate large scale infringement that cannot be easily detected, prevented, or controlled.
  - q Anyone can easily copy based on a scan or file.
  - q The digital design can be widely distributed just like any other computer file.
  - q The objects can be printed in a living room and stored in a garage.
  - q It is easy to move the printer/operation to another location or open another account in the same 3D printing online market or switch to another platform when discovered.
  - q The infringing products may not need to cross borders eliminating IP enforcement mechanisms at the customs.

# Threats to IP Rights

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- n The level of legal and intellectual property issues that arose for music and movie industry in the digital age may arise potentially for all industries.
  - q Peer-to-peer digital model file sharing.
  - q Counterfeiting.
  - q Consumers may print their own Tiffany's rings, Oakley eyewear, Barbie babies, Picasso's 'She-Goat' sculpture, or figurines of Brad Pitt and Spider-Man.
  - q Famous trademarks, well-known cartoon characters or celebrities' likeness may be printed on or as unflattering objects.

# Which Rights Might be Affected?

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## n Trademark/Trade Dress

- n E.g. Printing a purse bearing the word “PRADA” or Burberry's tartan pattern.

## n Copyright

- n E.g. Creating a digital model of Darth Vader, printing a figurine of Darth Vader etc.

## n Patent (design and utility patent)

- n E.g. Printing a patented prosthetic, fastener etc.

## n Publicity/Privacy

- n E.g. Printing a pillowcase bearing Brad Pitt's face, or printing a sculpture of Angelina Jolie.

- n Trademark and Trade Dress Basics:
  - n Trademark: Source identifier by distinguishing the goods and services of one person or company from those of another (*e.g. traditionally words, logos or combination of both*).
    - q Must be distinctive.
  - n Trade Dress: Non-traditional trademark (e.g. product design, product packaging design, color, texture etc.).
    - q Must be non-functional and distinctive.

## n Trademark and Trade Dress Basics:

- n Trademark Infringement: **Unauthorized use** of a trademark **on or in connection with goods** and/or services in a **manner that is likely to cause confusion**, deception, or mistake about the source of the goods and/or services.
  - q Counterfeit: Post-purchase confusion and unfair competition.
    - § The direct purchaser's confusion is not needed.
    - § Post-purchase confusion by observers is sufficient.
- n Dilution: Use of a **famous** mark diminishing the strength or value of the mark by “**blurring**” the mark's distinctiveness or “**tarnishing**” the mark's image by connecting it to something distasteful or objectionable
  - q Even if there is no likelihood of confusion.
  - q Even if the goods are not competing or related

## n Trademark example:

E.g. printing a purse *bearing* the word “PRADA”



## n Trade dress example (product design):

E.g. printing shoes with three parallel stripes on the upper area between the laces and the sole.

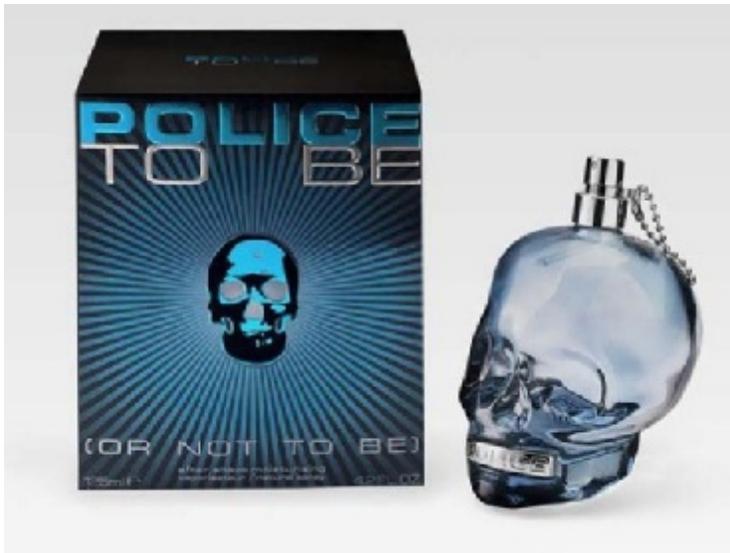


*Adidas AG's trade dress for "footwear": "three parallel stripes applied to footwear, the stripes are positioned on the footwear upper in the area between the laces and the sole".*

## n Trade dress example (product container design):

E.g. printing human skull shaped perfume bottle.

*Mavive S.P.A.’s trade dress for “perfumes”: “**Configuration of a glass bottle container for the goods in the shape of a human skull.**”*



## n Copyright Basics:

- n Original works of authorship fixed in any tangible medium of expression.
- n Immediately protected upon creation without the need of a registration.
- n Copyright does not protect utilitarian objects excepts to the extent there is some conceptually separable artistic/creative element.



While the decorations on this vase is likely protected by copyright, the shape itself is primarily utilitarian and therefore not protected under copyright.

The dragon shape lamp base is likely protected under copyright.



# Liability Theories

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- n 3D Printing For Personal Use.
- n 3D Printing Services Upon Order (*e.g. FedEx Kinkos in-store services, online marketplace platforms allowing users to upload files and print their files or others' files*).
- n 3D digital peer-to-peer sharing sites without any printing services.
- n 3D digital file hosting sites without any printing services.

## n 3D Printing For Personal Use

### § Trademark/Trade Dress

#### § “Use in Commerce”

§ In connection with the sale, offering for sale, distribution, or advertising of any goods...

§ No infringement or dilution if the printed product that copies a trademark or trade dress used for personal use,

§ Printing a pair of shoes with three parallel stripes and wearing them yourself --*no infringement*.

§ Printing a pair of shoes with three stripes and sell it to your friend---*infringement (post-purchase confusion)*

## n 3D Printing for Personal Use

### § Copyright

- § Copyright can protect the 3D design files in the same manner as blueprints are protected.
- § Copying a copyrighted object digitally alone can be infringement (via scanner or software).
- § Sharing and printing the digital file alone also can be infringement.
  - § Infringement of the designer's copyrighted work.
  - § Infringement of the original copyrighted work.
    - § Ex: Sharing digital files and printing Barbie looking babies from scanned Barbie baby infringes Mattel's rights in the Barbie design. It also infringes the derivative work (digital model of the Barbie design) of the designer who bought the rights from Mattel to make digital models.

## n 3D Printing Upon Order

### n Trademark/Trade Dress

- q Direct statutory liability---analogue to “printers and labelers”
  - § Reproduce or imitate a registered mark and apply such reproduction . . . to labels, signs, prints, packages, wrappers, receptacles, or advertisements.
  - § intended to be used in the sale or advertising of goods such that likelihood of confusion result.
  - § No likelihood of confusion if merely reproduce clipart of a logo in a computer software.
    - § Printing the PRADA word on the 3D purse?
    - § Printing shoes with three parallel stripes?
- q Secondary liability under case law.
  - § Contributory and vicarious infringement.

- n 3D Printing Upon Order and/or File Hosting/Sharing
- n **Trademark/Trade Dress**
  - q Contributory infringement
    - (1) intentionally induced another to infringe a trademark; or
    - (2) continued to supply a product or service to a party with knowledge that the buyer is engaging in trademark infringement.
  - q Key notes:
    - § General knowledge is not enough, must know or have reason to know the specific infringement and continue supply goods or services to that infringer.
    - § No legal duty to act until notice is given.
    - § No contributory liability for merely failing to anticipate that other would use the services to infringe.
      - § *Sony v. Universal City Studios; Tiffany v. eBay; Rout v. Amazon etc.*

- n 3D Printing Upon Order and/or File Hosting/Sharing
- n **Trademark/Trade Dress**
  - q Vicarious infringement
    - (1) have an apparent or actual partnership,
    - (2) have authority to bind one another in transactions with third parties or
    - (3) exercise joint ownership of control over the infringing product
  - q The relationship between the direct infringer and the printers/service provider matters.
    - § Rosetta Stone v. Google (*on the matter of keyword triggering advertisement, there is no evidence that Google acted jointly with any of the advertisers to control advertising or sale of counterfeit Rosetta Stone products*)

## n 3D Printing Upon Order and/or File Hosting/Sharing

### n Copyright

#### q Contributory infringement:

§ one who induces, causes or materially contributes to copyright infringement, by another but who has not committed or participated in the infringing acts him or herself, and

§ he or she had knowledge, or reason to know, of the infringement

#### q Vicarious infringement

§ Possessing the right and ability to supervise the infringing conduct, and

§ Having a direct financial interest in the use of the copyrighted materials.

#### q Cases:

§ Metro-Goldwyn-Mayer v. Grokster; A&M Record v. Napster

- n** Safe Harbor Under DMCA (copyright only)
  - q** Online service providers (e.g. web site hosting services, Internet service providers, search engines) are protected from liability for direct infringement of their users if they quickly remove or disable access to infringing material identified in a copyright holder's complaint.
  
  - q** In order to qualify for safe harbor:
    - n** Must have no knowledge of, or financial benefit from infringing activity on its network,
    - n** Must act expeditiously to remove or disable access to the complained material,
    - n** Must have a copyright policy and provide proper notification of that policy to the subscribers, and
    - n** List an agent to deal with copyright complaints.

- n In-Store Printer/3D Marketplace Printers:
  - n In-store printer services as well as the 3D marketplace platform printing services may likely be liable for copyright and trademark infringement since it may be difficult to claim no specific knowledge of infringement or lack of control over the infringing product while their staff prints, stores and ships the infringing objects.
  - n The risk of trademark and copyright liability for 3D marketplace platform is higher since they manufacture the infringing articles that are sold to public.

## n Designer and Digital File Hosting Site:

- n Designer and digital file hosting site may be liable under trademark law even if they merely reproduce or host a digital reproduction of the trademark in CAD software alone?
  - q No likelihood of confusion as to source or dilution until it is printed and used in commerce?
  - q *In Medic Alert, no infringement was found when defendant merely reproduce the trademark as a “clip art” logo embedded in a computer program for reproduction by end users.*
  - q *But in 3D cases, the trademark is already on a product or the trademark is the product that is digitally created or hosted. Seeing a digital model of Adidas shoe on the site would likely lead the consumers think that the design originates from Adidas.*
- n They may have liability under copyright.
- n If the design itself is infringing copyright, a take down notice may be sent under Safe Harbor.

## n Peer-to-Peer File Sharing Sites:

- n Peer-to-peer sharing site may be liable under trademark law even if the file is in users' computers in CAD software?
  - q Same as hosting sites, the digital model features a product (either bearing the trademark or the trademark is the product) and therefore confusion may arise.
  - q If the site is good for nothing but infringement, liability is highly likely.
- n They may have liability under copyright.
- n If the design itself is infringing copyright, a Safe Harbor notice may not work because the P2P site is not one of the online service providers listed under DMCA. The content is in the user's server.

# In Conclusion...

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KEEP  
CALM  
AND  
SMILE

The 3D printing does not exactly create new IP issues but rather potentially expands the magnitude of existing issues

There is not any case law specifically on the 3D printing IP matters but we may apply case law for other technologies and industries (e.g. peer-to-peer file sharing, online service providers' liability, manufacturer's and supplier's liability etc.)