

*3D*  
*The Transformation of Manufacturing*  
*&*  
*The Creative Application of STEM*

*C. Mike Newton*



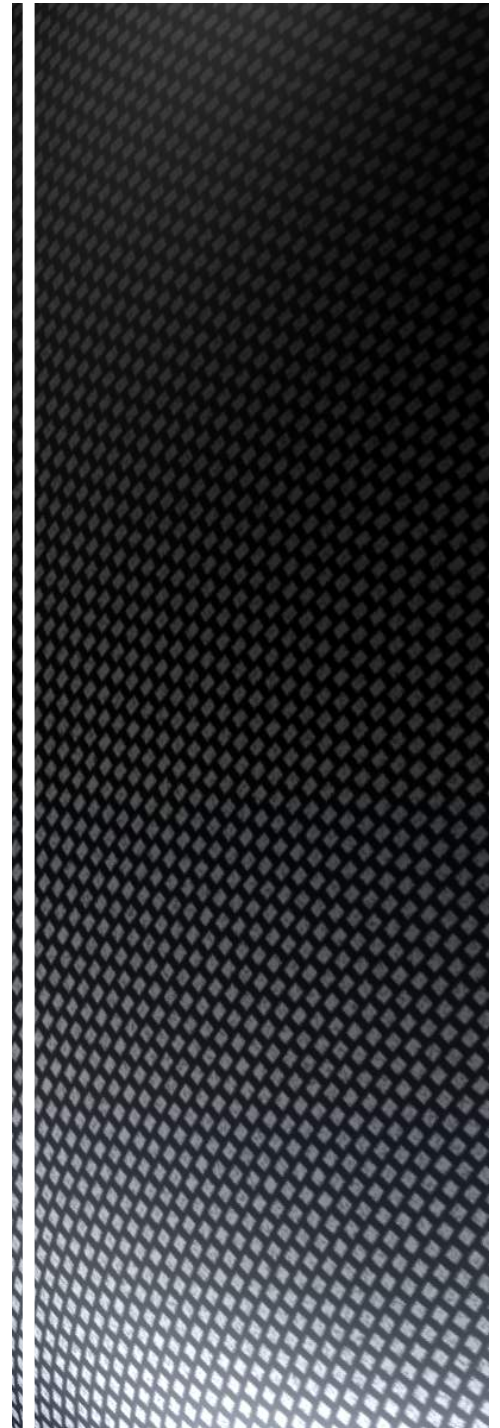
Newton **Cyber**facturing, LLC

Come build a bridge with us....the future is waiting

12151 Research Parkway, Suite 150

Orlando, FL 32826

Phone: (407)275-4720



# Cyberfacturing – The future of making

## \* Manufacturing

C16 from obsolete *manufact* hand-made, from Late Latin *manūfactus*, from Latin *manus* hand + *facere* to make

## \* Cyber

C20: back formation from cybernetics....  
indicating computers

**Cybernetics** (noun) functioning as singular the branch of science concerned with control systems in electronic and mechanical devices and the extent to which useful comparisons can be made between man-made and biological systems

\* Collins English Dictionary



# Strategic Partners

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# *Printing*

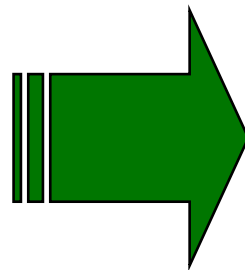


# Printing History

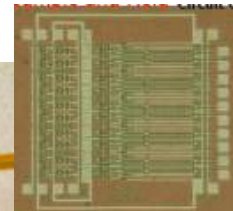
<u>Phaistos Disc</u>	1850–1400 BCE
<u>Woodblock printing</u>	200 CE
<u>Movable type</u>	1050
<u>Intaglio</u>	1430s
<u>Printing press</u>	1439
<u>Lithography</u>	1796
<u>Offset press</u>	by 1800s
<u>Chromolithography</u>	1837
<u>Rotary press</u>	1843
<u>Flexography</u>	1890s



**Phaistos Disc**  
soft clay Hieroglyphic "seals"



<u>Screen-printing</u>	1907
<u>Dye-sublimation</u>	1957
<u>Photocopier</u>	1960s
<u>pad printing</u>	1960s
<u>Laser printer</u>	1969
<u>Dot matrix printer</u>	1970
<u>Thermal printer</u>	1970
<u>Inkjet printer</u>	1976
<u>Digital press</u>	
<u>3D printing</u>	

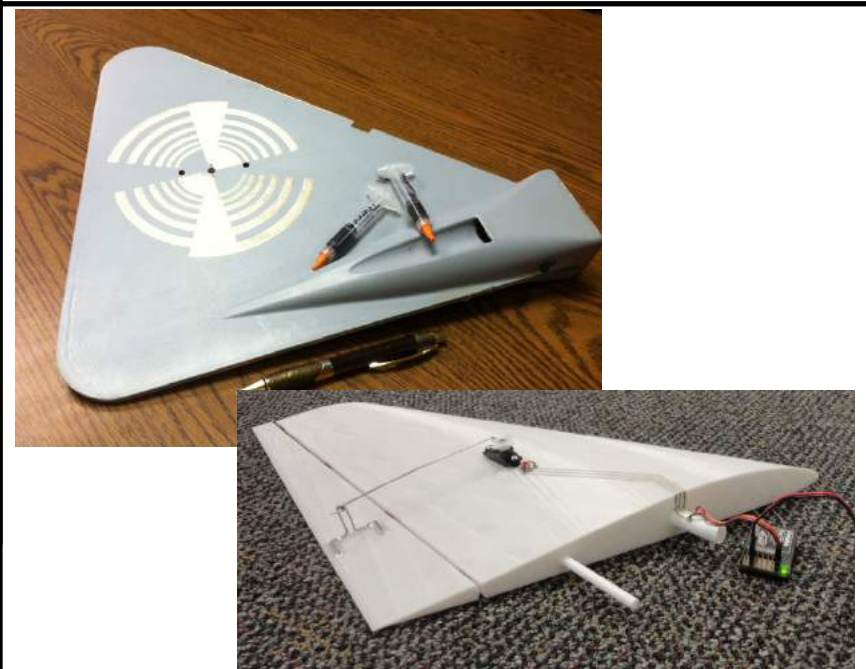


**Printed I.C.**

**A prototype electronic paper display**

[http://en.wikipedia.org/wiki/History\\_of\\_printing](http://en.wikipedia.org/wiki/History_of_printing)

# Printing: 2D and 3D



# Digital Fabrication Technology

- Printed Electronics
- 3D Additive manufacturing

## Convergent Technologies

### *Direct Print Additive Manufacturing*

**The  
Economist**

\* The third industrial revolution

The digitization of manufacturing will transform the way goods are made—and change the politics of jobs too

## The New York Times

### Disruptions: On the Fast Track to Routine 3-D Printing

By [NICK BILTON](#)

..... the prediction that 3-D printers will become a part of our daily lives is happening much sooner than anyone anticipated. These printers can produce objects, even rather intricate ones, by printing thin layer after layer of plastic, metal, ceramics or other materials. And the products they make can be highly customized.

In his State of the Union Address, President Obama echoed a sentiment that has been gaining traction in the industrial and tech sectors: 3D printing is going to reinvigorate American-based manufacturing.

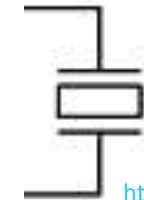
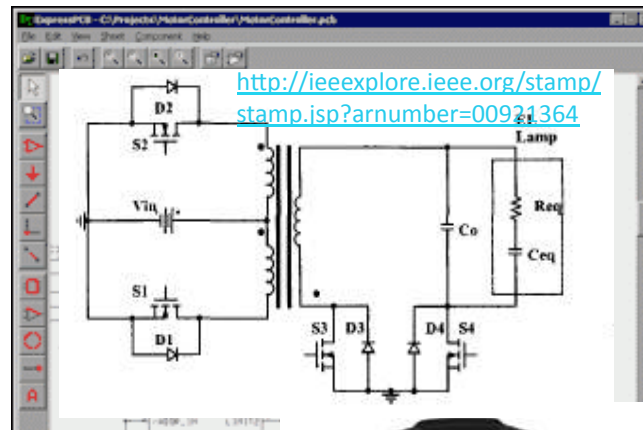


DISCOVER

# Printed Electronic – Conformable ~ Flexible



1966 [Dodge Charger](#) instrument panel with electroluminescent lighting.  
[Chrysler](#) began building cars with EL panel lighting for the 1960 model year



EL Lamp Schematic diagram

[http://www.maxim-ic.com/quick\\_view2.cfm/qv\\_pk/5488](http://www.maxim-ic.com/quick_view2.cfm/qv_pk/5488)



Basic EL Lamp



EL Lamps and animation



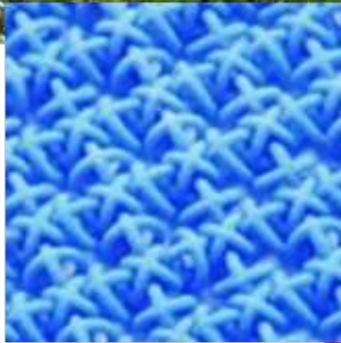
Printed EL



Traditional

**Graphical**  
Elsbuicgl

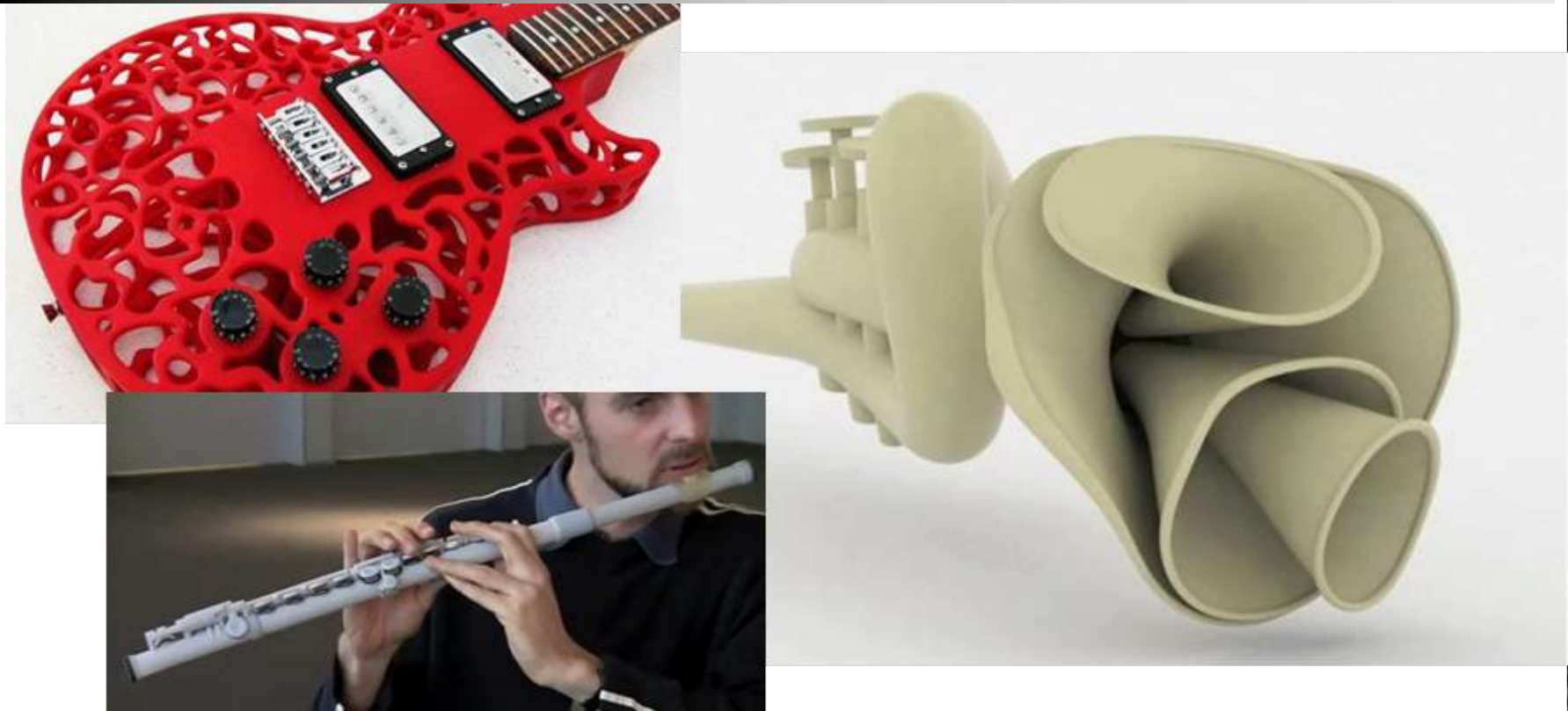
# Fashion



<http://www.ecouterre.com/are-3d-printed-fabrics-the-future-of-sustainable-textiles/3d-printer-fabric-7/> ♪



# Music



Designs like this multi-pipe trumpet, featured in Dr. Amit's video, are imaginary for now. But the 3D printer could make them a reality more quickly, by enabling rapid prototyping and new fabrication techniques. ♪

<http://createdigitalmusic.com/2011/01/a-flute-made-on-a-3d-printer-and-the-possibilities-to-come/> ♪

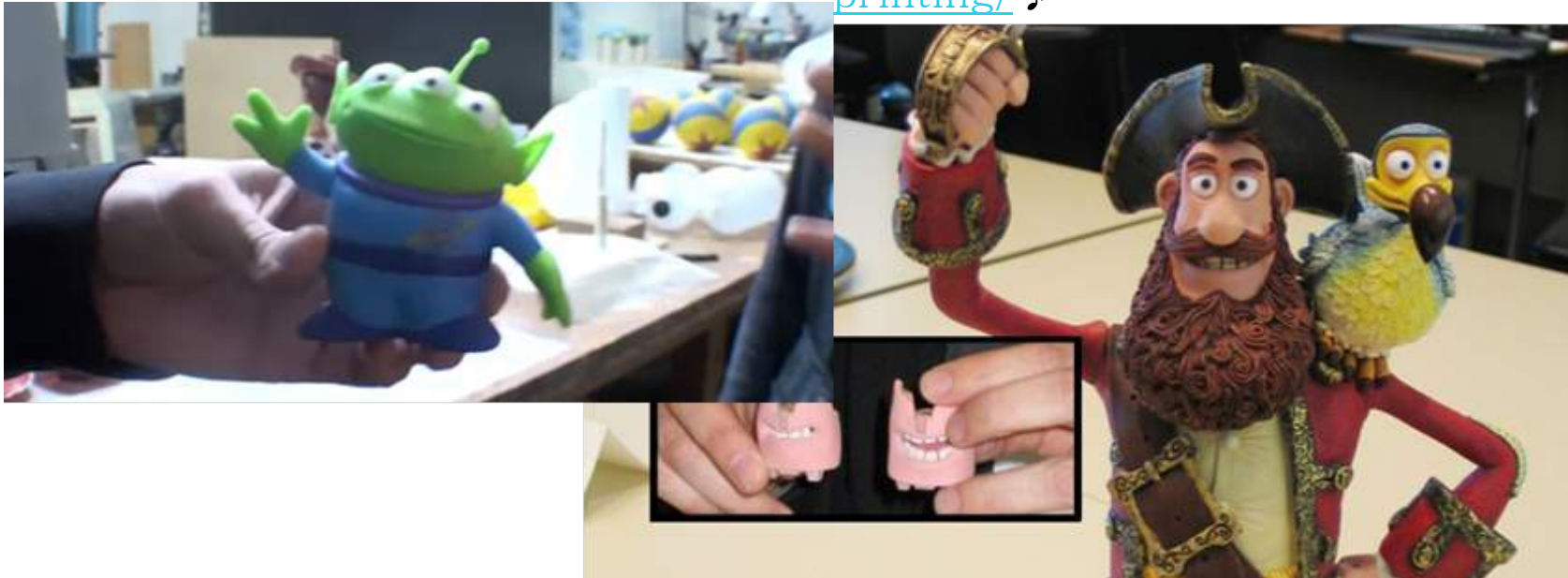


# Film and Animation

[Pixar Studios 3D Printing and Physical Animation](#)♪



<http://pop17.com/pixar-studios-3d-printing/>♪



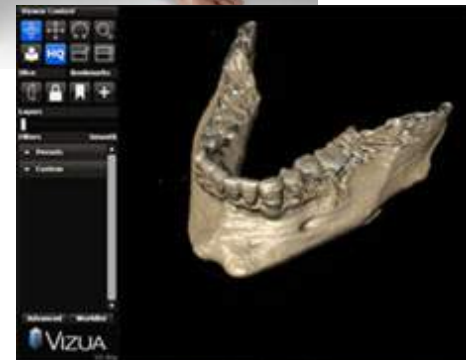
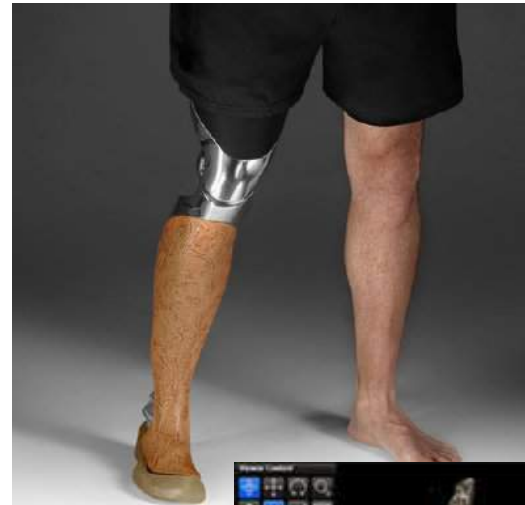
Jan. 13, 2012: Animator Ian Whitlock demonstrates 3D printed mouths for a pirate captain model from "The Pirates! Band of Misfits" film at Sony Animation Pictures Studios in Culver City, Calif. (Meaghan Murphy / FoxNews.com)

Read more:

<http://www.foxnews.com/scitech/2012/01/21/tech-and-moves-3d-printing-brings-new-angle-to-animation/#ixzz1njyQwL89>♪



# Medical

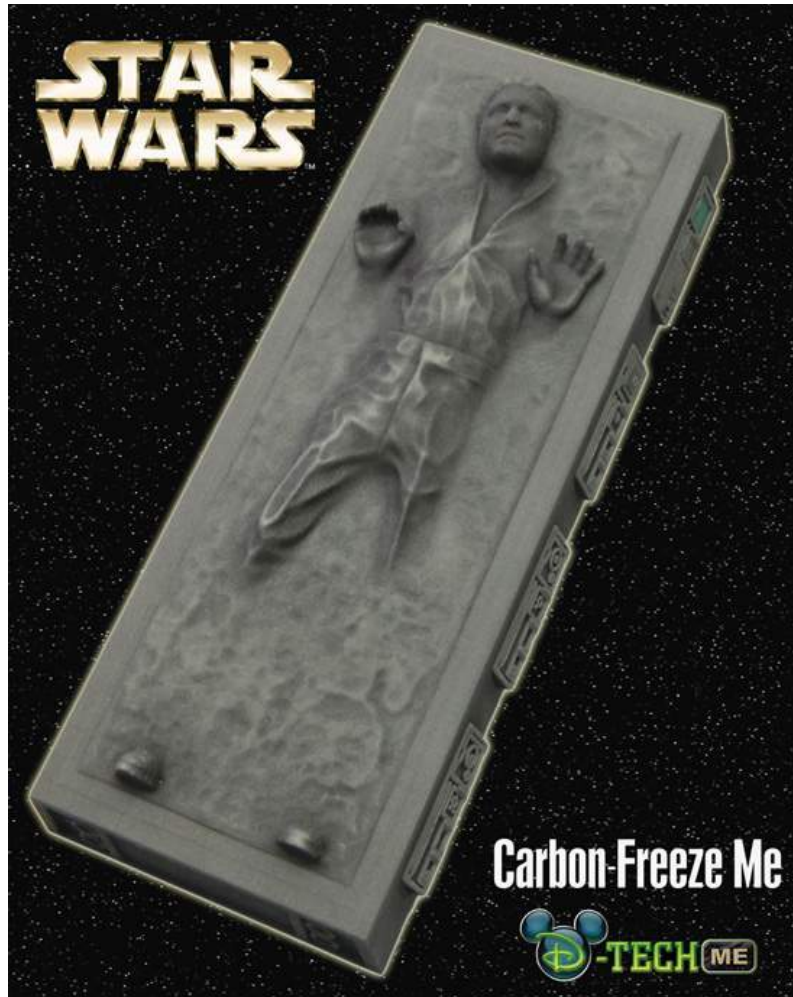


# ***3D Printed Prosthetics***

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# Disney



For this year's [Star Wars Weekends](#) opening May 18, Disney World will offer to 3D scan and 3D print visitors to the park, and place their faces into a Hans Solo style figurine. They call this the Carbon-Freeze Me experience, which is part of our "[D-Tech Me](#)" line that uses technology to take personalization to a whole new level.

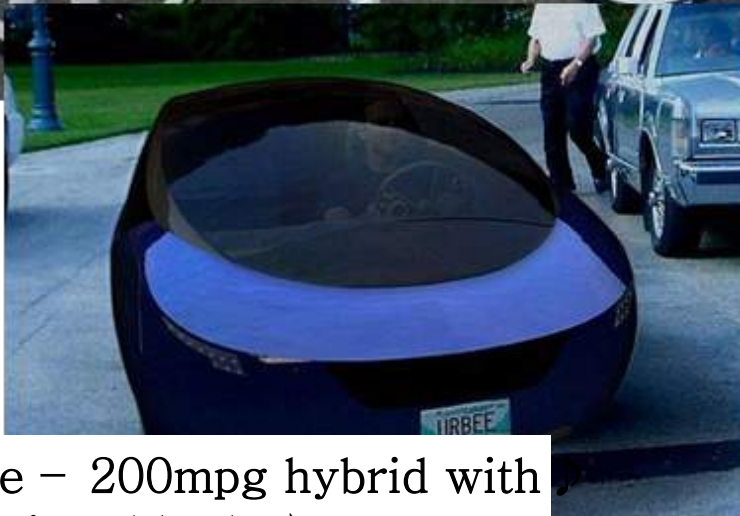


<http://www.3dprinter.net/the-3d-printing-force-is-with-disney>

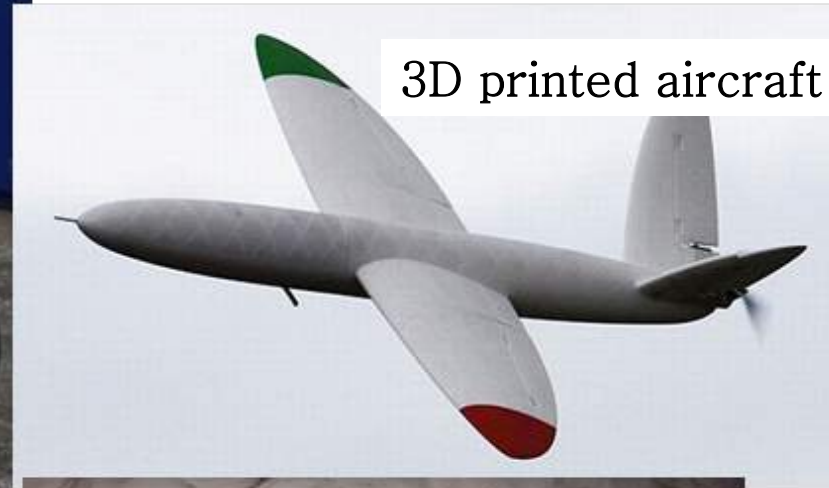
# Products



EADS Airbike ♪



Urbee – 200mpg hybrid with 3D-printed body ♪



3D printed aircraft ♪



Toys ♪



<http://www.greendiary.com/3d-printed-products-green-alternative-conventional.html> ♪

# ***Printed Circuit Structures***



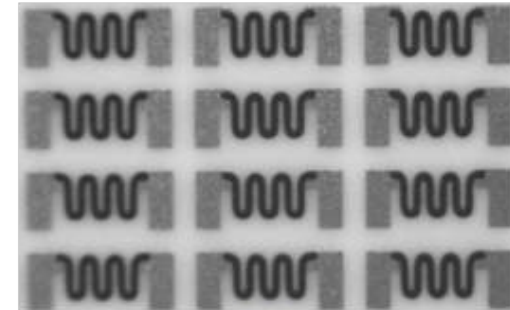
# Directly Printed Electronics & Sensors



sensors



3D scaffold



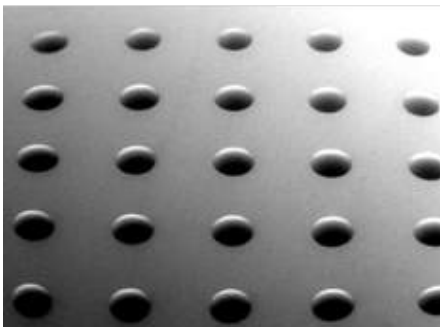
resistors



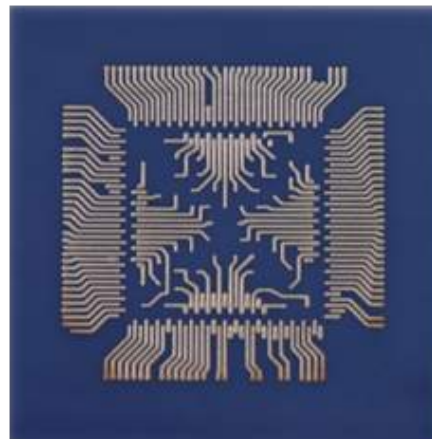
solar cell



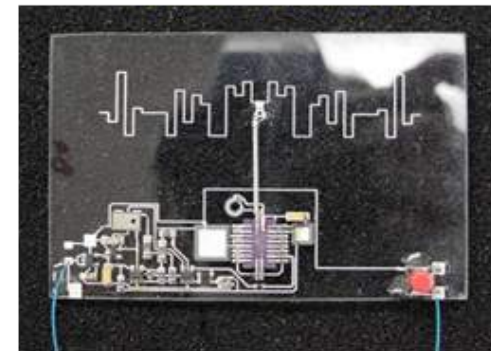
solder and via



micro lens



breakout pattern



Transmit/Receive



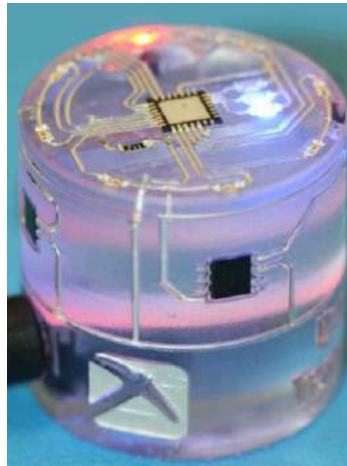
DISCOVER

# What's Been Done?

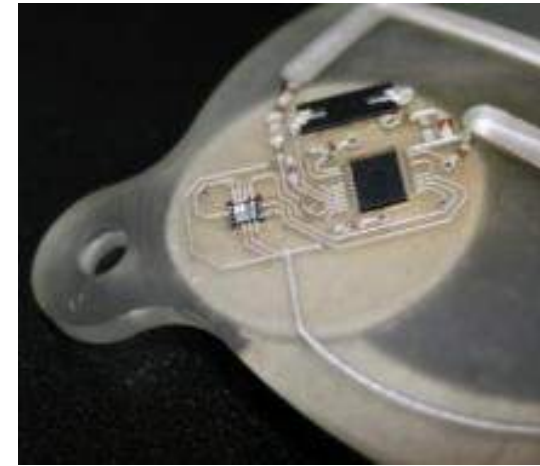
State of the Research



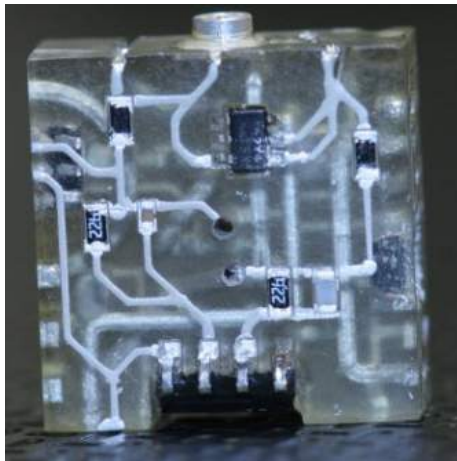
UAV wing with strain sensor



Magnetometer



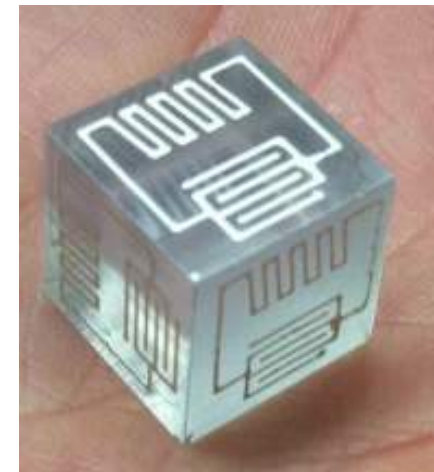
Vibration sensor



Electronic circuits



Monolithic dice



Loaded metamaterial cube

iPhone → myPhone♪



***Personalization***



# ***Next Generation Engineers***



DISCOVER

# STEM ?

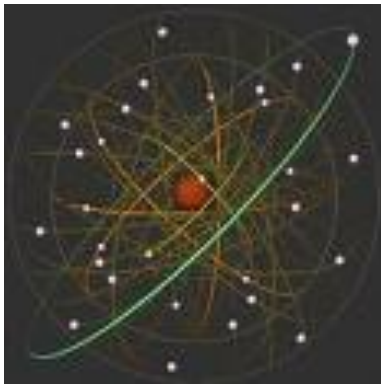


DISCOVER

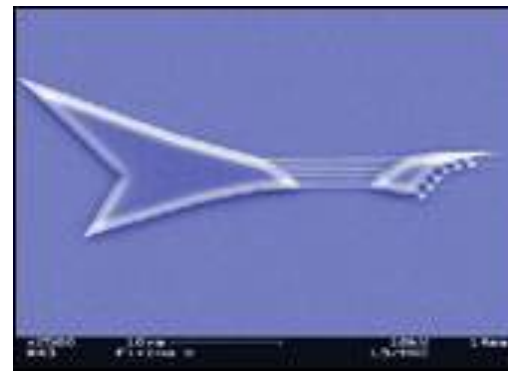
# STE <sup>A</sup> <sub>v</sub> M

Science, Technology, *Art*, Engineering, Math

*The creative application of Science*



Copper Atom



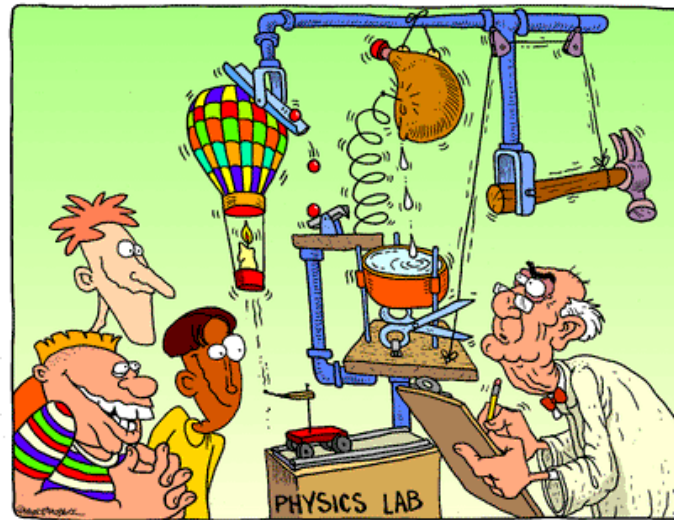
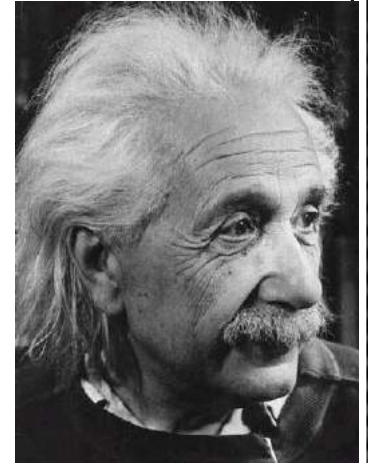
Cornell's nano-Guitar





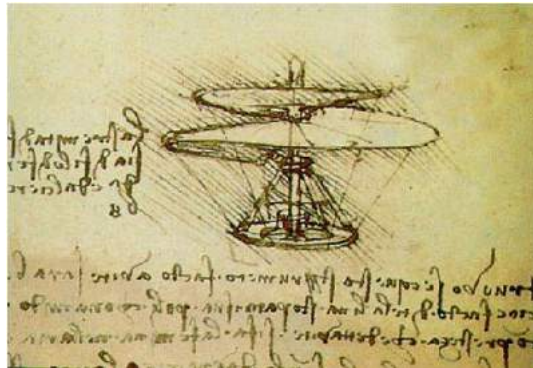
A debate inspired by an Albert Einstein quote...

**"Imagination is more important than knowledge."**



# Imagination & Vision

**Concept**  
**Helicopter**



**Visionary**  
**Leonardo DaVinci**



**Born: April 15, 1452**

**Background**  
**Artist/Philosopher**



**Electric Submarine**

**Jules Vern**

**Writer**



**1870** "Twenty Thousand Leagues Under the Sea"

[http://www.youtube.com/watch?v=siD4JF\\_9Rec&feature=related](http://www.youtube.com/watch?v=siD4JF_9Rec&feature=related)



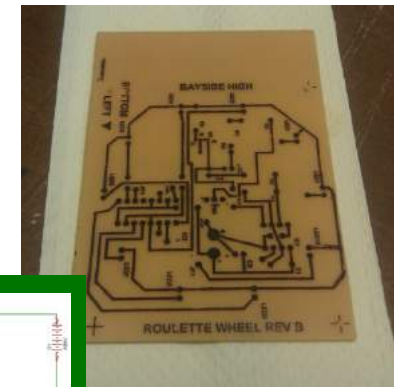
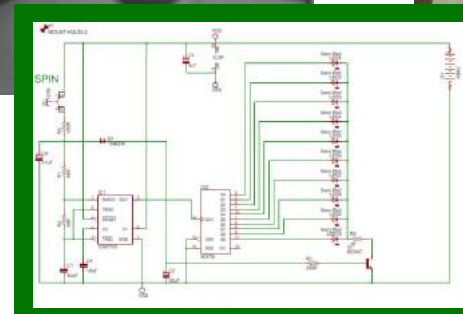
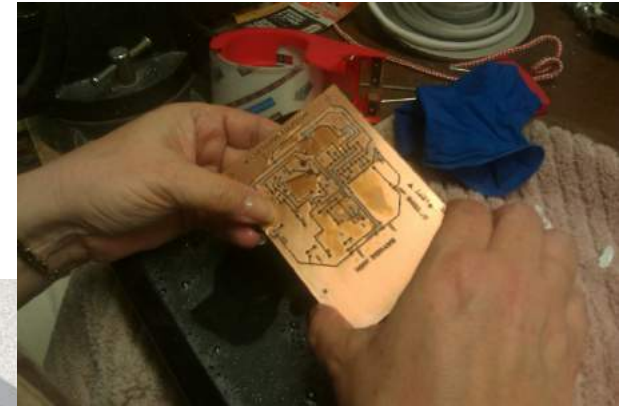
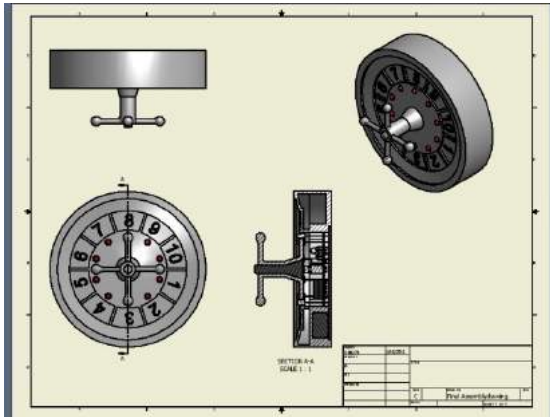
# Bayside High School - Mrs. Robertson

## Printed Devices Advanced Technical Workshop

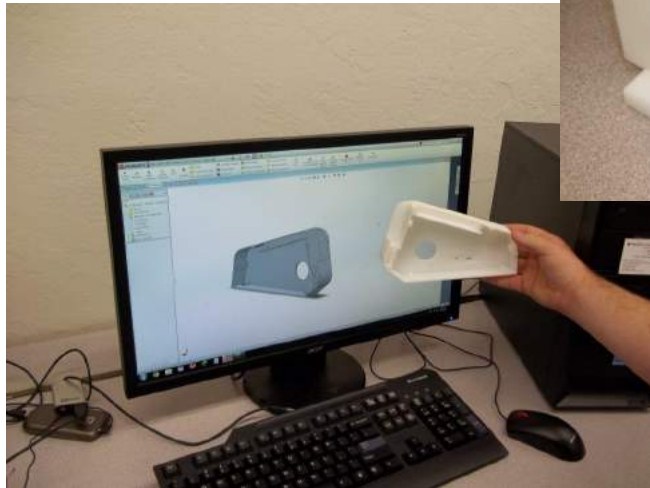


# Bayside High School - Mrs. Kimbrell

## Printed Devices Advanced Technical Workshop



# ***Bayside CyBear Masters***



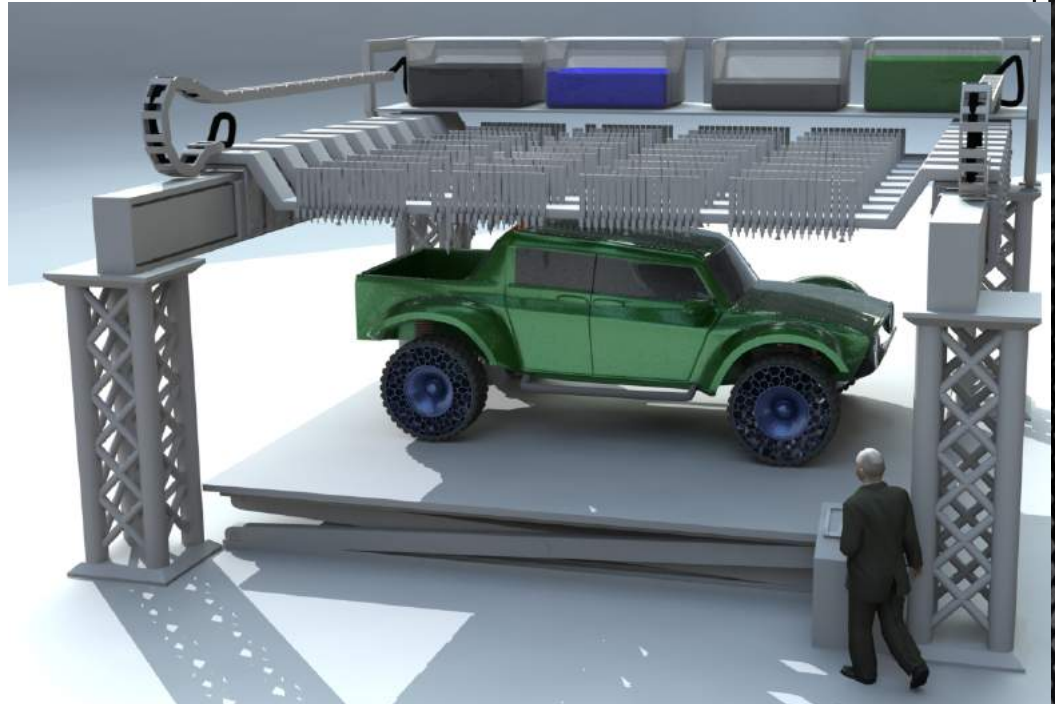
# The Future

3D Printing (Additive Manufacturing) has had an impressive record.

Combining 3D Printing with Printed Electronics will create a disruptive approach with the Cyberfacturing of **ANY** electronic device.

The biggest benefit will be seen by the DoD and consumers.

When entrepreneurs can begin to inexpensively produce the dreams of their imaginations, the manufacturing revolution will begin.



Imagine a day when large automobile factories are replaced by Dealer Cyber Factories.





**2nd Southeastern Microelectronics  
Packaging Conference  
February 28, 2013  
Rosen Centre Hotel  
9840 International Drive  
Orlando, Florida - USA**

The objective of the Florida Chapter Microelectronics Symposium is to provide a forum that brings together experts from science, academia, design, manufacturing and business to discuss the latest advances and emerging applications in microelectronics and high density packaging.



**KEYNOTE SPEAKER:**

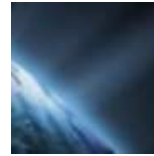
Patrick Simpkins, Director of Engineering

Dr. Patrick Simpkins is the director of Engineering at NASA's John F. Kennedy Space Center in Florida. In this position, Simpkins leads a group of engineers from multiple disciplines in the design, development and operations of spaceflight hardware and ground systems assigned to the Kennedy Space Center.





INTERNATIONAL MICROELECTRONICS  
AND PACKAGING SOCIETY



Space Coast Energy Consortium

# Advanced Electronics for Mobile Energy Systems (AEMES)

## Technical Workshop

Florida Solar Energy Center- Cocoa FL

May 9<sup>th</sup> – 10<sup>th</sup>, 2013

General Co-Chair, IMAPS - C. Mike Newton

General Co-Chair, SCEC – David Mandernack, Space Coast Energy Consortium

**Solar • Batteries • Super Caps • TEG • Rectenna • Fuel Cells**

- Mobile Applications
- Emerging 3D Electronic Packaging
- Power Management
- Thermal Management
- Module and devices
- Advanced materials & Processes
- Additive/Digital Manufacturing

*The objective of the AEMES Workshop is to provide a unique forum that brings together scientists, engineers, manufacturing, academia, and business people from around the world who work in the area of electronic packaging, power generation, harvesting and storage for mobile applications. This workshop enables discussion and presentations on the latest materials, process, design & emerging technologies of Mobile Energy Systems and applications.*