TECHNOLOGIES OF THE FUTURE

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> “DESIGN, IN ITS BROADEST SENSE, IS THE ***ENABLER*** OF THE ***DIGITAL ERA*** - IT'S A PROCESS THAT CREATES ORDER OUT OF CHAOS, THAT RENDERS TECHNOLOGY USABLE TO BUSINESS. DESIGN MEANS BEING GOOD, NOT JUST LOOKING GOOD.”
>
> - Clement Mok

THE NEXT BIG THING...

INTERNET OF EVERYTHING | DRONES | WEARABLE TECHNOLOGY | 3D PRINTING

DATA TRANSMISSION

Telephone to Telephone
1892

First Computer to Computer connection
1969

A.R.P.A.N.E.T
(Advanced Research Projects Agency Network)

Packet Switching

N.C.P.
(Network Control Protocol)

Internet W.W.W.
1991

First 4G
2010

Cloud
2008-2010

First App Store
2008

Bluetooth
2000

Internet of Everything

Fog Computing
2020

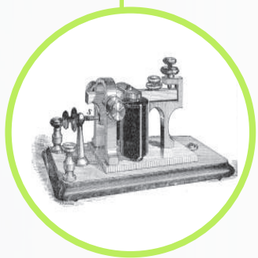
1800 | 1870 | 1900 | 1970 | 1990 | 2000 | 2010 | 2015 | 2020

PEOPLE + PEOPLE

PEOPLE + THINGS

THINGS + THINGS

1844
Telegraph to Telegraph



1901
Trans-Atlantic Radio Signal

1972
T.C.P/I.P
(Transmission Control Protocol/ Internet Protocol)

"Internetting"

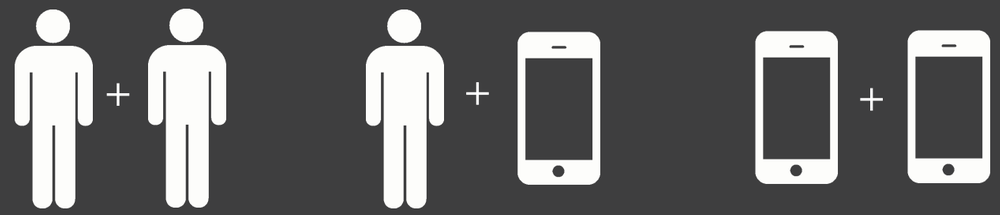
1999
Wireless Connection

W.A.P
(Wireless Application Protocol)

2015
First pocket-sized computer board "UDOO"

INTERNET OF EVERYTHING

The **Internet of Everything** is a network of **connected things.**



Machine to Machine Technology
(M2M)

PRECEDENT

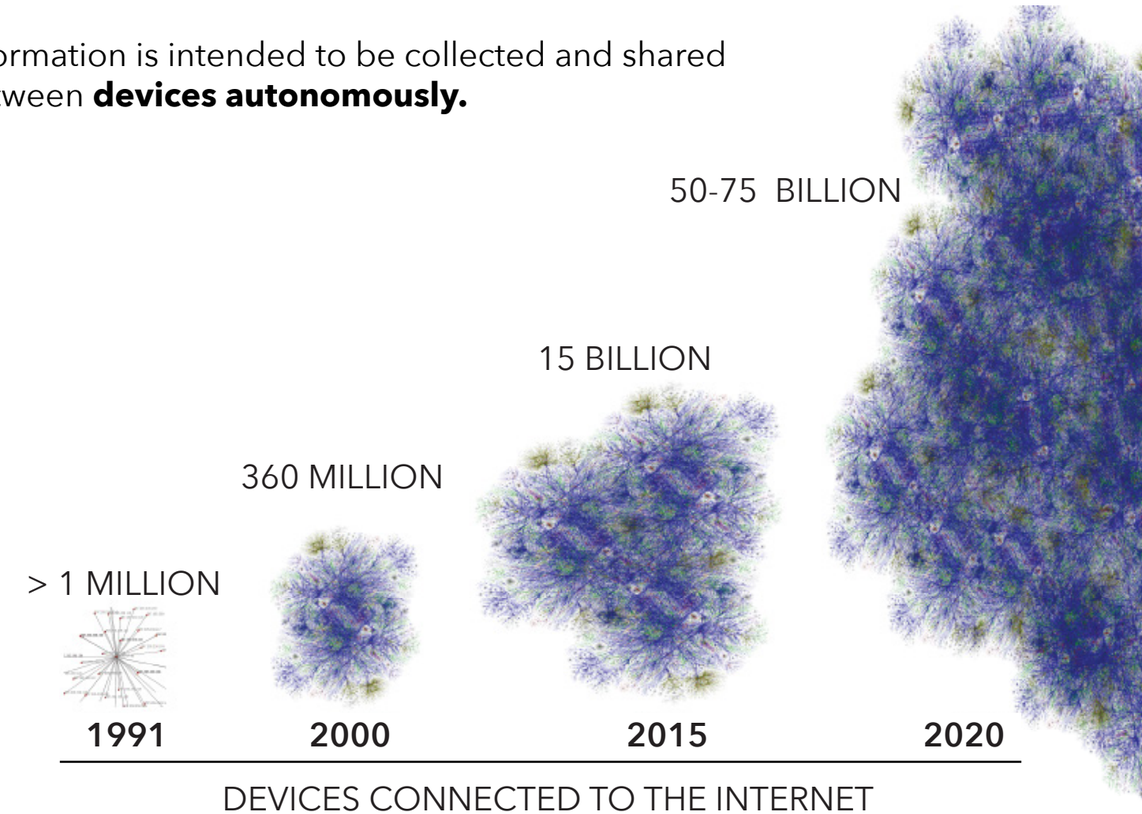
TODAY data is created, controlled and shared by **humans.**

INFORMATION IN **REAL TIME** = sensors + actuators + networked intelligence

- Mini-checkup from your bathroom mirror every time you brush your teeth
- Ambient light turn red when your bus is five minutes away
- Street lights self adjust to season, time of day, and weather
- Self-maintained, auto-diagnosis and assets control machinery
- Control of rotation of products in shelves to automate restocking process

FUTURE

Information is intended to be collected and shared between **devices autonomously.**



WORKPLACE IMPACT

sensors + actuators + networked intelligence

EXAMPLE WORK DAY ROUTINE WITH IMPLEMENTED INTERNET OF EVERYTHING

Walk out front door

Door locks automatically

Car already started

Car knows you will say “I’m going to Starbucks” when you enter

Navigation chooses quickest route to closest location

Order is already placed and paid for when you get to Starbucks

Meeting room is prepared with lights, furniture, tools adjusted accordingly

Waiting room equipped with devices for clients to prepare for the meeting as they wait

Meeting time is changed

Car recognizes that you’re late for a meeting based on location and synced schedule

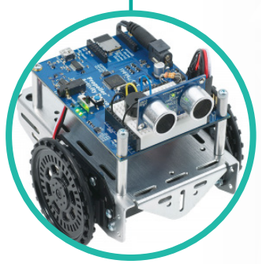
CAUSE	M2M **DATA ENTRY** WILL ELIMINATE **MANUAL ENTRY**	WIRELESS CONNECTION **ELIMINATES** ALL **WIRES**	**POWER MANAGEMENT**-WHEN OBJECTS **ARE/NOT** IN **USE**
EFFECT	**HUMAN** FOCUS ON **DATA ANALYSIS** RATHER THAN **DATA INPUT**	ABILITY TO WORK **FREELY AROUND** WORKPLACE- A **CLEANER** MORE **OPEN** ENVIRONMENT	**GREENER,** MORE **ENERGY** AND **FINANCIALLY EFFICIENT** BUSINESS

DATA COLLECTION

1940

Japanese unmanned balloon bomb kills six people in the US during WWII
1945

1956
World's first robotics company is founded



1960

1970

First drone lands Autonomously
1975

1991
US uses one single drone in the Invasion of Iraq

1990

2000

US Military has 12,000 drones in service
2010

First CIA "Predator" drone targeted attack unleashed a missile at who was thought to be Bin Laden
2002

2010

2013
Congress signs FAA Reform Act for $63 billion plan for commercial & governmental drones

2011
Police use the first drone to help find and arrest US citizens in a search

2020

Researchers begin testing Micro Aerial Vehicles within animals
2025

Amazon PrimeAir delivers first package
2020

2030

2030
First life saved using Nanoparticles released to prevent heart attack

DRONES

Unmanned Aerial Vehicles (UAVs) more commonly known as Drones, are aircrafts and associated elements that maneuver with **no human operator on board**

PRECEDENT

MILITARY DRONES

Autonomous Programming:
Acts upon environment & surrounding conditions to "self-operate"

- Accelerometers
- Satellites & GPS
- Cameras
- Remote control algorithms
- Sensors

LAUNCH&LAND

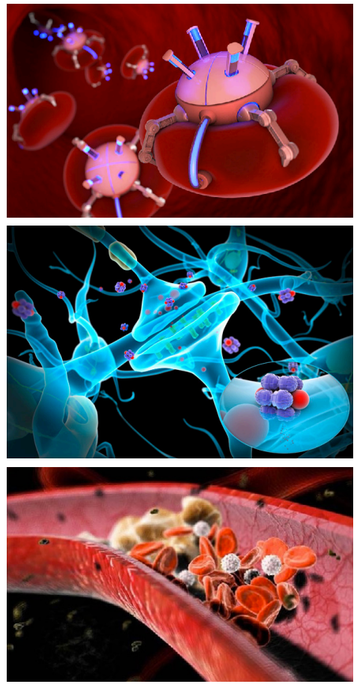
Takeoff of drones is controlled in a command center. Once the drones are in flight, they operating autonomously

SURVEILLANCE

Several drones with weapons operate together to locate potential targets

ACTION

The drones could engage the target themselves immediately or call in autonomous land units to confirm before an attack



FUTURE

MICRO AERIAL VEHICLES

Using NBIC technology, **Microscopic** drones travel inside the body and release **nanoparticles** that could be used to seek and repair damages (EX: arteries, preventing heart attacks and strokes).

SWARM INTELLIGENCE

Collective behavior of **self-organized systems**, natural or artificial, Interacting with each other and their surrounding environment in order to produce an outcome. (Ex: a single bee isn't much harm, but a colony is deadly)

WORKPLACE IMPACT

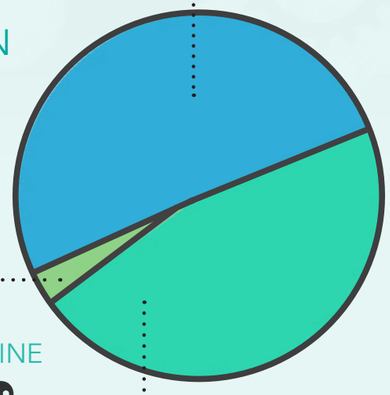
PROS

- Enhancing and creating a more accurate data collection process
  Cuts back time spent on field work, therefore projects are completed faster
- Replacing humans on difficult or impossible tasks
  Creating a safer research practice and performance environment
- Creation and reformation of jobs
  Shifting to a more highly developed technology based work environment
- Less expensive than current technology or human operations
  Redistribute funds to allow for more efficient budgeting

CONS

- Data Hackers
  The widespread use of drones could infringe upon our privacy. These machines are capable of tapping into iphone and computer Wifi settings. In addition, this will increase the need for Information Technologists..
- Security Breaches
  Once it has access, the drone was able to read and steal personal information (credit card, bank details, passwords, locations and business information)
- Potential for longevity of lifespan therefore a population increase
  Overcrowding causes lack of livable space and resources, along with an increase of older generations

Projections by the FAA, "the use of drones by 2020 will result in a **positive economic impact** of over $5 billion"
- The Washington Post

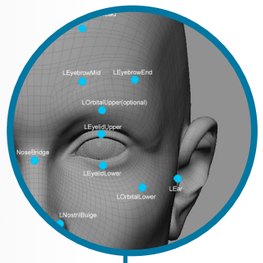


JOURNALISM AGRICULTURE WEATHER MEDICINE

DELIVERIES FIRST AID SEARCH&RESCUE 3D MAPING

DATA APPLICATION

Pedometer
1788



Facial Action
Cofding System
1970

Humanistic
Computing
1996

Fitbit
2007

EQ Devices
2020

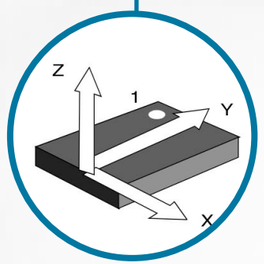
EQ/Wellness
sync with IoE
2030

1800

PHYSICAL

1900

1923
Accelerometer



2000

2010

COGNITIVE

2015
Portable EEG

Expression analysis
via Google Glasses

Health Insurance
Linked to Fitbits

2020

2025
Rewards
linked to EQ

2030

SYNC

WEARABLE TECHNOLOGY

QUANTIFIED SELF
The phenomenon of self-tracking that incorporates data technology into everyday life for the purpose of self-knowledge.

Measure to improve.

PRECEDENT

FITBIT

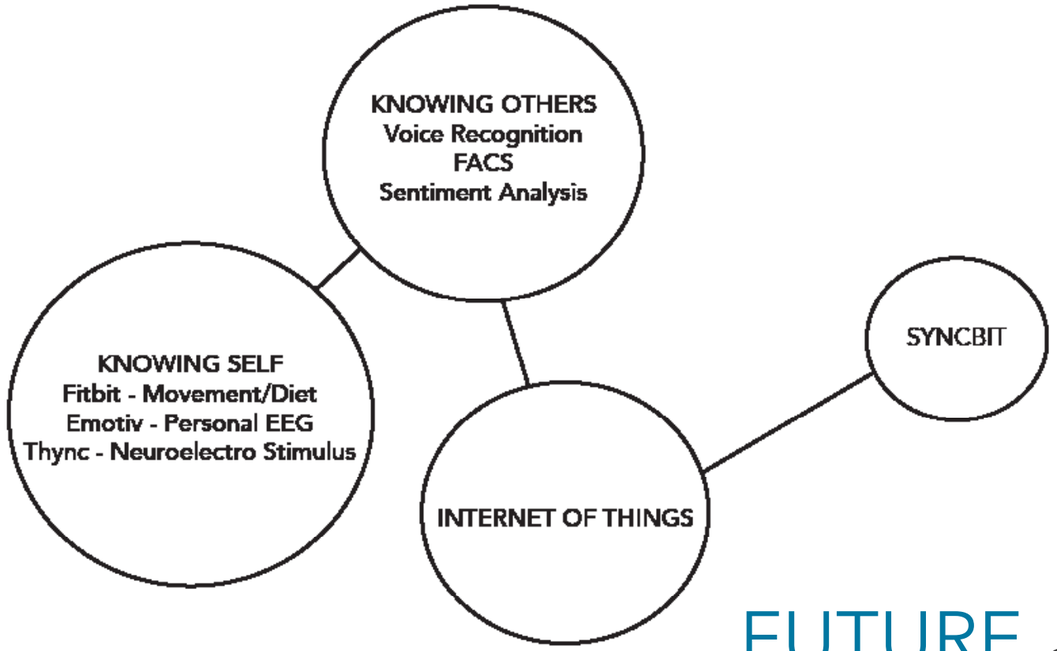
In 2007, Eric and James, realized that sensors and wireless technology could change the experience of health and fitness.

CULTURAL DRIVERS
-Image sharing, selfies
-Values youth and beauty

ECONOMIC DRIVERS
-Increasing healthcare costs
-More sedentary work

SALES
-2014 sales $745.2 million
-2011 sales $14.5 million
-20.8 million devices since 20017 (50% of global wearable market)

IMPACT
-More data required to determine effects on general population
-Privacy concerns (sex)
-Fitbit tracking tied to employer insurance (BP Oil)



FUTURE

Bio-data and psycho-data will be tracked by devices and **synchronized** via the internet to other devices. These devices for **emotional intelligence** will foster better interpersonal **communication** and give us **control** of ourselves and our physcial environment.

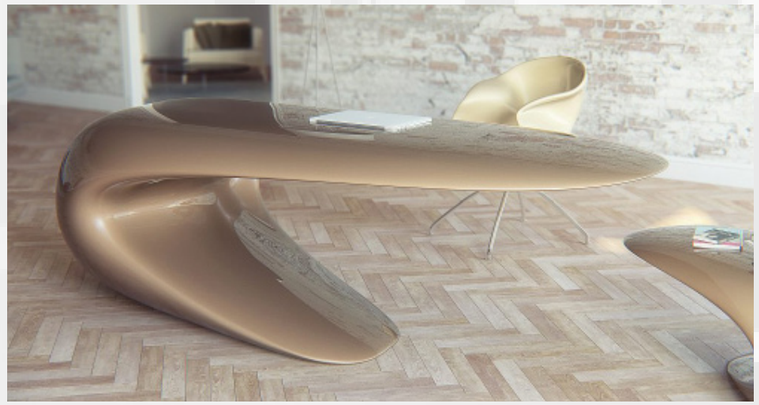
Emotiv's Insight headseat enables users to modify environment and objects inside specially designed video games.

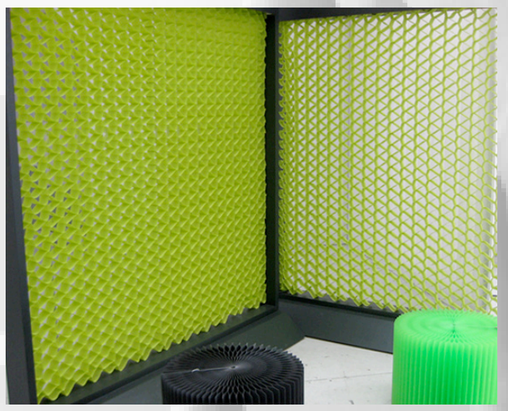
WORKPLACE IMPACT

Imagine a world where our **thoughts inform design**, where our environment responds to our moods, **anticipates** our needs.

Interior designers will be able to gain **objective data** about how people use and respond to space.

SMART OBJECTS connected to biological devices re-design themselves on a molecular level to suit any requirement.

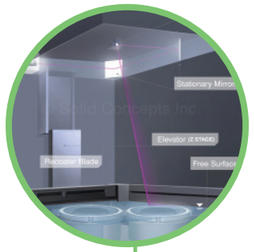




VARIABLE DENSITY partitions adjust to levels of concentration.

FIBER OPTIC walls change color to alter or enhance moods.

DATA
FABRICATION



Invention of Sterolithography
1984

First usable prosthetic leg
2008

Working 3D animal kidney created
2002

3D Printed Clothes
2020

2045
Self- Assembly 4D Printing is used in manufacturing

1980

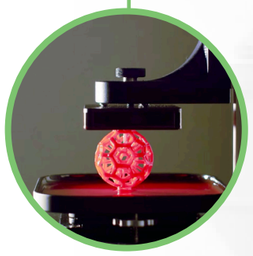
1990

1992
3D Systems Produced The first SLA Machine

2000

2010

2015
Carbon3D Printing, which uses UV light and oxygen



2020

2030

2035
Fully Constructed 3D Printed Moon Base

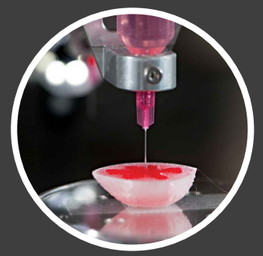
2040

3D PRINTING

3D printing, also known as **additive manufacturing,** is a process whereby physical objects can be created from **visual 3D models.**

Ceramic

Hamburger



Kidney

Carbon Fiber

PRECEDENT

+45.7%

The compound annual growth rate from 2013 - 2018 predicted by Canalys, a market research firm

10 Years

The number of years until 3D printing will reach mainstream adoption in consumer and enterprise markets as predicted by Gartner, a technological research company

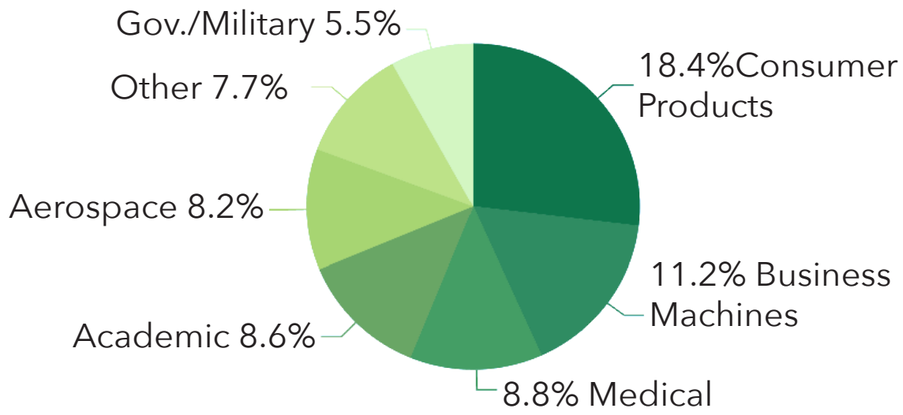
$21 Billion

The amount of annual revenue predicted to be generated worldwide by the 3D printing industry by 2020

OBJECTS ON

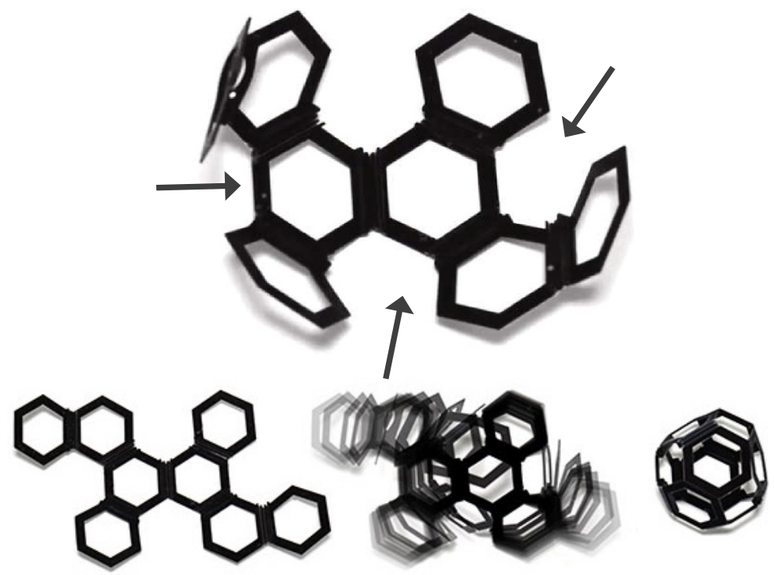
DEMAND

WORLDWIDE PROTOTYPING USE



FUTURE - 4D PRINTING

4D printing is the added of capability of **embedded transformation**, or **self-assembly,** from one shape to another though an **external stimulus** such as water directly off the 3D printer.



WORKPLACE IMPACT

- Creation of possible jobs with the need for new skills
- Acceleration of the design process with rapid prototypes
- Internal production will reduce outsourcing
- Offices will be increasingly tuned to individuality, control, and instant demand
- New spaces will be needed to accommodate 3D printers and the products they produce

ADVANTAGES

- Little waste
- Environmentally friendly
- Gives customer more control
- Cheap Production
- Downloadable Products

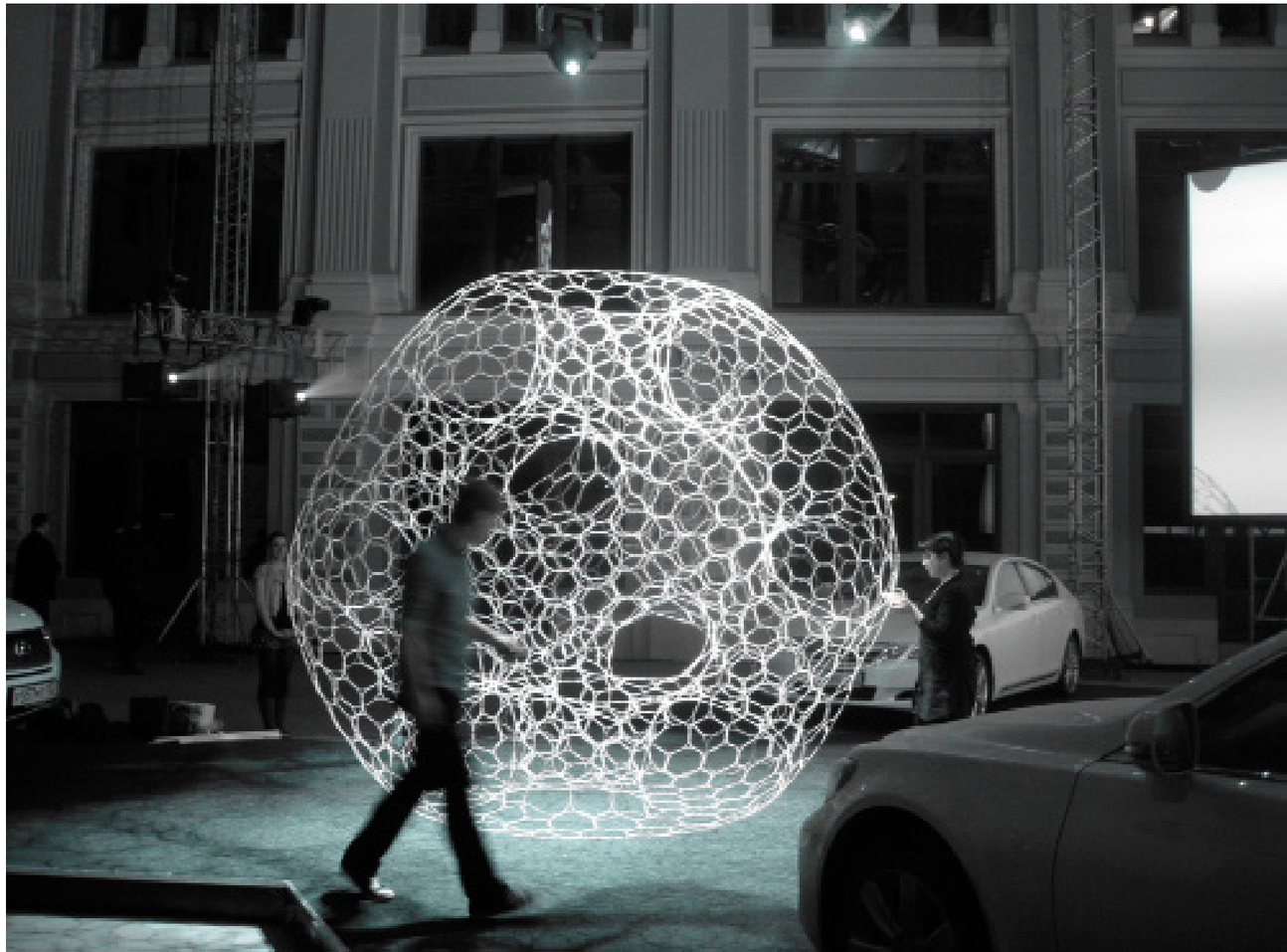
4D PRINTING POSSIBILITIES

Responsive environments

Furniture and even buildings that will evolve into a finished product

Mechanisms that respond to user-demands

Programmable materials



WORKS CITED

INTERNET OF EVERYTHING

"Samuel F.B. Morse Sent the First Telegraphic Message." Samuel F.B. Morse Sent the First Telegraphic Message. N.p., n.d. Web. 26 May 2015. http://www.americaslibrary.gov/jb/reform/jb_reform_morsecod_1.html

"Internet of Everything: World of IoE Design (Part 2)." Internet of Everything: World of IoE Design (Part 2). N.p., n.d. Web. 26 May 2015. http://www.rtkl.com/you-are-here/internet-everything-world-ioe-design-part-2/

"UDOO Neo = Raspberry Pi + Arduino + Wi-Fi + BT 4.0 + Sensors." Kickstarter. N.p., n.d. Web. 26 May 2015. https://www.kickstarter.com/projects/udoo/udoo-neo-raspberry-pi-arduino-wi-fi-bt-40-sensors?ref=category

"1G, 2G, 3G, 4G: The Evolution of Wireless Generations." Phone Arena. N.p., n.d. Web. 26 May 2015. http://www.phonearena.com/news/1G-2G-3G-4G-The-evolution-of-wireless-generations_id46952

"Internet Society." Brief History of the Internet. N.p., n.d. Web. 26 May 2015. <http://www.internetsociety.org/internet/what-internet/history-internet/brief-history-internet#LK61>.

Wikipedia. Wikimedia Foundation, n.d. Web. 26 May 2015. <http://en.wikipedia.org/wiki/ARPANET#Creation>.

"Network Control Program." Wikipedia. Wikimedia Foundation, n.d. Web. 26 May 2015. <http://en.wikipedia.org/wiki/Network_Control_Program>.http://en.wikipedia.org/wiki/Network_Control_Program

"History of the World Wide Web." Wikipedia. Wikimedia Foundation, n.d. Web. 26 May 2015. http://en.wikipedia.org/wiki/History_of_the_World_Wide_Web

"Smartphone." Wikipedia. Wikimedia Foundation, n.d. Web. 26 May 2015. http://en.wikipedia.org/wiki/Smartphone

"History of the Bluetooth Special Interest Group." Our History | Bluetooth Technology Website. N.p., n.d. Web. 26 May 2015. http://www.bluetooth.com/Pages/History-of-Bluetooth.aspx

"Internet Society." A Brief History of the Internet & Related Networks. N.p., n.d. Web. 26 May 2015. http://www.internetsociety.org/internet/what-internet/history-internet/brief-history-internet-related-networks

"Wi-Fi." Wikipedia. Wikimedia Foundation, n.d. Web. 26 May 2015. http://en.wikipedia.org/wiki/Wi-Fi

"Wireless History Timeline." Wireless History Timeline. N.p., n.d. Web. 26 May 2015. http://www.wirelesshistoryfoundation.org/wireless-history-project/wireless-history-timeline

"Internet of Things' Future Looks Foggy." Cisco's The Network. N.p., n.d. Web. 26 May 2015. http://newsroom.cisco.com/feature/1613641/Internet-of-Things-Future-Looks-Foggy

"A History of Cloud Computing." ComputerWeekly.com. N.p., n.d. Web. 26 May 2015. http://www.computerweekly.com/feature/A-history-of-cloud-computing

"Cloud through the Ages: 1950s to Present Day - Thoughts On Cloud." Thoughts On Cloud. N.p., 05 Apr. 2015. Web. 26 May 2015. http://www.thoughtsoncloud.com/2015/04/a-brief-history-of-cloud-1950-to-present-day/

"#IoE: Present and Future." Cisco Blog RSS. N.p., n.d. Web. 26 May 2015. http://blogs.cisco.com/ioe/ioe-present-and-future

"Internet of Things Examples - Postscapes." Internet of Things Examples - Postscapes. N.p., n.d. Web. 26 May 2015. http://postscapes.com/internet-of-things-examples/

"What Is It Like To Own And Drive A Tesla? An Early Adopter Explains." Forbes. Forbes Magazine, n.d. Web. 26 May 2015. http://www.forbes.com/sites/quora/2015/05/20/what-is-it-like-to-own-and-drive-a-tesla-an-early-adopter-explains/

"The Incredible Growth of the Internet since 2000." Pingdom Royal. N.p., n.d. Web. 26 May 2015. http://royal.pingdom.com/2010/10/22/incredible-growth-of-the-internet-since-2000/

"IPhone 7 Rumors: How Accurate and Truthful Can They Get?" GeekSnack. N.p., 20 Jan. 2015. Web. 26 May 2015. http://www.geeksnack.com/2015/01/20/iphone-7-rumors-accurate-truthful-can-get/

DRONES

Donnelly, Laura. "Drones Could Be Used to Seek out Arteries to Prevent Heart Attacks." The Telegraph. Telegraph Media Group, 18 Feb. 2015. Web. 21 May 2015. <http://www.telegraph.co.uk/news/uknews/11421366/Drones-could-be-used-to-seek-out-arteries-to-prevent-heart-attacks.html>.

Frey, Thomas. "Future Uses For Flying Drones." Futurist Speaker. Futurist Speaker, 02 Sept. 2014. Web. 23 May 2015. <http://www.futuristspeaker.com/2014/09/192-future-uses-for-flying-drones/>.
"Future of Our Sky." Future of Our Sky. Aerospace Industries Association, n.d. Web. 17 May 2015. <http://www.eviexing.com/futureofoursky/>.

Johnson, Eric. "Droning On." Droning On. Credit Suisse Group, 10 Aug. 2014. Web. 24 May 2015. <https://www.credit-suisse.com/us/en/news-and-expertise/news/economy/global-trends.article.html/article/pwp/news-and-expertise/2014/10/en/droning-on.html>.

Lee, Joel. "5 Amazing Uses For Drones In The Future." MakeUseOf. MakeUseOf, 24 Nov. 2014. Web. 22 May 2015. <http://www.makeuseof.com/tag/5-amazing-uses-drones-future/>.

Love, Dylan. "A Look At Our Inevitable Drone-Filled Future." Business Insider. Business Insider, Inc, 16 Dec. 2013. Web. 18 May 2015. <http://www.businessinsider.com/how-drones-will-be-used-in-the-future-2013-12>.
Shankland, Stephen. "Why Our Drone Future Is for Real – Someday." CNET. CNET, 16 Dec. 2014. Web. 18 May 2015. <http://www.cnet.com/news/why-our-drone-future-is-for-real-someday/>.

Shaw, Ian G. R. "History of U.S. Drones." Understanding Empire. Wordpress, 21 May 2014. Web. 21 May 2015. <https://understandingempire.wordpress.com/2-0-a-brief-history-of-u-s-drones/>.

Smith. "The Future of Drone Surveillance: Swarms of Cyborg Insect Drones." Network World. Network World, Inc., 18 June 2012. Web. 20 May 2015. <http://www.networkworld.com/article/2222611/microsoft-subnet/the-future-of-drone-surveillance--swarms-of-cyborg-insect-drones.html>.

Sprey, Karen. "Drug-delivering Nano "drones" to Help Prevent Heart Attacks." Gizmag. Gizmag, 2 Mar. 2015. Web. 22 May 2015. <http://www.gizmag.com/nano-drones-healing-drug-heart-attacks/36342/>.

Spring, Tom. "Drone Nation: 15 Ways Drones Are Changing the World around Us." ITworld. IDG Enterprise, 20 Jan. 2013. Web. 21 May 2015. <http://www.itworld.com/article/2822961/security/107025-Drone-nation-15-ways-drones-are-changing-the-world-around-us.html#slide9>.

Todd, Daniel. "History of Drones Timeline." History of Drones. Timetoast, n.d. Web. 20 May 2015. <https://www.timetoast.com/timelines/history-of-drones>.

WEARABLE TECHNOLOGY

Andrade, Norberto. "Computers Are Getting Better Than Humans at Facial Recognition." The Atlantic. Atlantic Media Company, 09 June 2014. Web. 26 May 2015. <http://www.theatlantic.com/technology/archive/2014/06/bad-news-computers-are-getting-better-than-we-are-at-facial-recognition/372377/>.

Chandler, Nathan. "How FitBit Works." HowStuffWorks. N.p., 02 May 2012. Web. 20 May 2015. <http://electronics.howstuffworks.com/gadgets/fitness/fitbit2.htm>.

Delgado, Mikel. "How Fit Is That Fitbit? - The Berkeley Science Review." The Berkeley Science Review. Berkeley Science Review Magazine, 07 Oct. 2014. Web. 25 May 2015. <http://berkeleysciencereview.com/fit-fitbit/>.

Dillow, Clay. "Wearable Technology That Controls Your brain." Fortune Wearable Technology That Controls Yourbrain Comments. N.p., 30 Jan. 2015. Web. 19 May 2015. <http://fortune.com/2015/01/30/wearable-technology-that-controls-your-brain/>.

"Emotient Announces Private Beta For "Sentiment Analysis" Glassware For Google Glass." Emotient. N.p., 27 Feb. 2014. Web. 19 May 2015. <http://emotient.com/about/press/emotient-announces-private-beta-for-sen`nt-analysis-glassware-for-google-glass/>.

Emotiv. N.p., n.d. Web. 26 May 2015. <https://emotiv.com/>.

"The Evolution of the Pedometer." Walker Tracker Blog. N.p., 13 Aug. 2014. Web. 16 May 2015. <http://walkertracker.com/blog/index.php/2014/08/13/the-evolution-of-the-pedometer/>.

Future of Recruiting. Photograph. N.d. Dice Resources. Web. 25 May 2015. <http://dhhp3c129bp03.cloudfront.net/wp-content/uploads/2011/08/future_recruiting2.jpg>.

Godin, Seth. "The Future of Work." Time. Time Inc., 14 May 2009. Web. 20 May 2015. <http://content.time.com/time/specials/packages/article/0,28804,1898024_1898023_1898077,00.html>

Honeycomb Partitions. Photograph. Procedes Chenel. N.p., N.d. Web. 24 May 2015. <http://www.chenel.com/fr/cloison_papier_honeycomb?PHPSESSID=8071d550f1dd09759640d81ac6a320b9>.

Pedometer by Payne. Digital image. Denhams. N.p., n.d. Web. 29 May 2015. <http://www.denhams.com/auction-catalogue/antique/573/silver-jewellery/watches-clocks/>.

Kerr, Dara. "Fitbit Rules 50 Percent of the World's Wearable Market." CNET. N.p., 21 May 2014. Web. 26 May 2015. <http://www.cnet.com/news/fitbit-rules-50-percent-of-the-worlds-wearable-market/>.

Le, Tan. "A Headset That Reads Your Brainwaves." TEDGlobal, July 2010. TED. Web. 22 May 2015. <http://www.ted.com/talks/tan_le_a_headset_that_reads_your_brainwaves?language=en>.

Le, Tan. "Tan Le: Reimaging How the Human Brain Is Observed." TEDTalks, 14 Apr. 2013. TED. Web. 26 May 2015. <https://www.ted.com/watch/ted-institute/ted-ibm/tan-le-reimaging-how-the-human-brain-is-observed>.

Night Sky Fibre Optic Lighting System. Photograph N.d. Helo. Web. 24 May 2015. <http://www.helo.co.uk/dbimg/1001751_l.jpg>.

Olson, Parmy. "Wearable Tech Is Plugging Into Health Insurance." Forbes. Forbes Magazine, 19 June 2014. Web. 22 May 2015. <http://www.forbes.com/sites/parmyolson/2014/06/19/wearable-tech-health-insurance/>.

Thync. N.p., n.d. Web. 22 May 2015. <http://www.thync.com/>.

Vanaman, Robert E. Facial Recognition Data Points. Digital image. EForensicsMag. N.p., 16 May 2014. Web. 29 May 2015. <http://eforensicsmag.com/wp-content/uploads/2014/05/facial-recognition-data-points.jpg>.

"Vesna Nuvist Architecture & Design, Ltd." NVST Architecture Design Ltd. N.p., n.d. Web. 26 May 2015. <http://www.nuvist.com/works/vesna/>.

Wolf, Gary. "The Quantified Self." TED@Cannes. France, Cannes. June 2010. TED. Web. 24 May 2015. <http://www.ted.com/talks/gary_wolf_the_quantified_self?language=en>.

Wong, Kerry D. LIS3LV02DL Orientation. Digital image. Biometric Research Software. N.p., 20 Sept. 2010. Web. 29 May 2015. <http://www.kerrywong.com/2010/09/02/a-digital-level-using-accelerometer/>.

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"4D Printing Course." 4D Printing Technology. Stratasys, 2015. Web. 18 May 2015. <http://www.stratasys.com/industries/education/4d-printing-project>.

Earls, Alan, and Vinod Baya. "The Road Ahead for 3D Printers." PWC. 2014. Web. 27 May 2015. <1. http://www.pwc.com/us/en/technology-forecast/2014/3d-printing/features/future-3d-printing.jhtml>.

Funk, Kelly. "Workplace in 2015: Pop-Ups Change the Office." DIAmeter. Interior Architects, 29 Jan. 2015. Web. 23 May 2015. <http://www.interiorarchitects.com/blog/workplace-in-2015-pop-ups-change-the-office/>.

Gilpin, Lyndsey. "3D Printing: Building the Future." ZDNet. 1 Aug. 2014. Web. 16 May 2015. <http://www.zdnet.com/topic/3d-printing-building-the-future/>.

Gmachl, Mathias. Digital image. Loop.pH. Web.

Heller, Steve. "The Future of 3D Printing Just Arrived." Time. 6 Apr. 2015. Web. 18 May 2015. <http://time.com/money/3772087/3d-printing-clip/>.

Leckart, Steven. "How 3-D Printing Body Parts Will Revolutionize Medicine." Popular Science. 6 Aug. 2013. Web. 23 May 2015. <http://www.popsci.com/science/article/2013-07/how-3-d-printing-body-parts-will-revolutionize-medicine>.

NZ, Canon. "How Will 3D Printing Change Your Workplace." Better Business. Canon, 15 Feb. 2015. Web. 20 May 2015. <2. http://betterbusinesses.co.nz/how-will-3d-printing-change-your-workplace/>.

Royte, Elizabeth. "What Lies Ahead for 3D Printing?" Smithsonian. 1 May 2013. Web. 16 May 2015. <3. http://www.smithsonianmag.com/science-nature/what-lies-ahead-for-3-d-printing-37498558/>.

Weisinger, Dick. "4D Printing: A Revolution of Smart Objects." Formtek Blog. 6 Jan. 2014. Web. 21 May 2015. <http://formtek.com/blog/4d-printing-a-revolution-of-smart-objects/>.