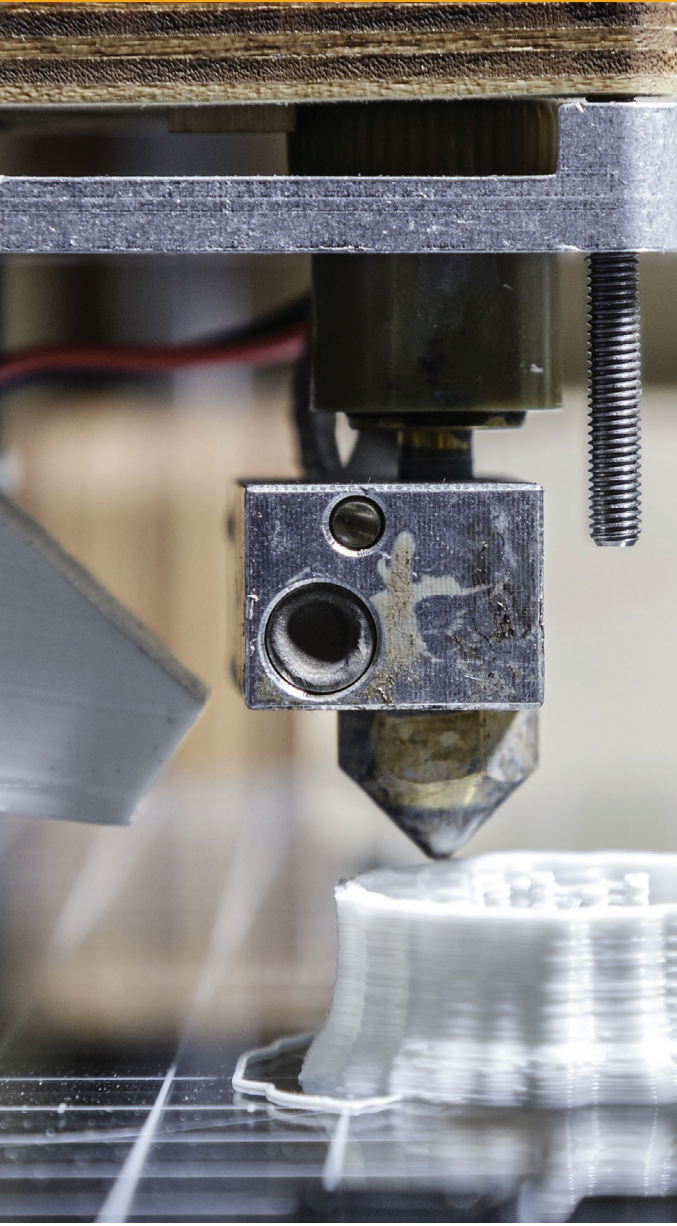


3D PRINTING - A FAST MOVING MARKET



Developments in 3D Printing

A Sector by Sector Overview

Overview

This report explores developments in 3D printing across several sectors and categories for the quarterly period of April to June 2018.



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General

Global Advanced Metals and LPW Technology partner on 3D printing of tantalum devices

Global Advanced Metals (GAM), a maker of tantalum and niobium products, and LPW Technology, a metal powder for additives manufacturer, have agreed to further demonstrate the suitability of spheroidized tantalum for 3D Printing. The partnership will allow GAM to measure and share physicochemical data for spherical tantalum and resulting 3D-printed parts. LPW will bring the solution to its partners, which include practitioners, designers and manufacturers of tantalum-based surgical implants and other high-reliability and critical devices.

Siemens launches Additive Manufacturing Network

Siemens launched Additive Manufacturing Network, a new online collaborative platform designed to bring on-demand design and engineering expertise, digital tools and production capacity for industrial 3D printing to the global manufacturing industry. The platform is launching with an early adopter program for designers and engineers, manufacturing service providers, 3D printing machine OEMs, material vendors and software providers to join the new ecosystem. Siemens' Additive Manufacturing Network is looking to reduce the overall adoption risk of additive manufacturing and create new business opportunities for global manufacturers.

Australia reviews regulation of personalized and 3D printed medical devices

Australia's Therapeutic Goods Administration (TGA) has gathered the public's responses to proposed regulatory changes for personalized and 3D printed medical devices. Overall, the consensus is that the proposal needs more clarity. Therefore, the regulatory development for 3D printed personalized medical devices has been halted in favor of seeking further responses from stakeholders.

Fincantieri testing Titomic Kinetic Fusion technology with view to adoption for manufacture of ship components

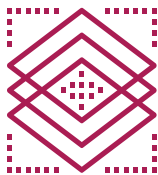
Global shipbuilding company Fincantieri is testing the capabilities of the Titomic Kinetic Fusion (TKF) technology developed by Titomic. Fincantieri will assess a specific alloy produced by the TKF process for hardness, strength, and porosity, as well as carrying out chemical analyses of manufactured parts. The parts are likely the kind of mechanical components that Fincantieri installs on naval and merchant ships.

SAE International publishes standards for aerospace-grade metal 3D printing

SAE International issued four aerospace additive manufacturing technical standards. The standards, to support the certification of aircraft and spacecraft parts, provides a framework to protect the integrity of material property data, as well as traceability within the aerospace supply chain.

HP to open Chinese 3D printing center

HP is opening a 3D printing center in China through a partnership with Guangdong 3D Printing Collaborative Innovation Platform. The Lanwan Intelligence-HP Multi-Jet Fusion Technology Mass Manufacturing Center is expected to turn out production-grade components and prototypes for manufacturers of cars, motorcycles, consumer goods, and other products using HP's Multi-Jet Fusion 3D printing systems. It's HP's largest deployment of production-grade 3D printing in the Asia Pacific.

**Materials****Dartmouth College researchers create “smart” 3D printing ink**

Researchers from Dartmouth College created a new type of smart ink that changes size and color when introduced to various stimuli. The new ink will provide additional functionality, branching into 4D printing which could offer a low-cost option for various areas, from energy to biomechanics. The Dartmouth researchers have the capacity to shrink printed objects to 1% of their original size and with 10 times the resolution. The printed objects could additionally change color in response to stimuli such as light. The smart ink is developed from a polymer-based vehicle that combines molecular systems into the printing gel, allowing the molecules to shift their functions.

EnvisionTEC to showcase ‘mega-chain’ 3D printed in strongest material to date

EnvisionTEC will demonstrate its strongest 3D printing material to date with a 328-foot 3D printed chain. The chain is composed of E-RigidForm, which is a polyurethane-like resin capable of printing hard and stiff parts. With a high tensile strength, E-RigidForm is ideal for both prototypes and end use parts. The piece took more than two weeks to design and was produced on EnvisionTEC's largest resin printer, the Xede 3SP. E-RigidForm is a breakthrough material for the company's 3SP line of 3D printers, which aim to offer large build areas while preserving speed and accuracy.

New 3D-printed smart gel walks underwater, may be useful in creating artificial body parts

Rutgers University engineers have created a 3D-printed smart gel that walks underwater, grabs objects and moves them. The creation could lead to soft-form robots that mimic sea animals, like an octopus. The material may also be useful in creating artificial hearts, stomachs and other muscles, along with devices for diagnosing diseases, detecting and delivering drugs, and performing underwater inspections. Soft materials like the smart gel are flexible, and often cheaper to manufacture than hard materials. The initial study focuses on a 3D-printed hydrogel that changes shape when activated by electricity.

MIT researchers say their 3D-printed walking, drug-transporting magnets show limitless potential

MIT's magnetic objects are 3D printed on a specially designed platform, from a newly-formulated ink infused with magnetic particles. The platform hosts a 3D printer nozzle in the center of an electromagnet, which is used to control the orientation of particles in the ink. With magnetic particle control, combined with a flexible material, the researchers are capable of programming a 3D printed shape to move in a certain way when a field is applied. MIT researchers believe that objects developed in this latest research could find promising applications in the field of biomedicine, much like other micro-robots.

Perstorp and 3D4Makers partner to introduce new material production venture

Perstorp AB, a specialty chemicals company, has partnered with 3D printing filament producer, 3D4Makers, to create the Netherlands-based company ElogioAM, a new material production venture. ElogioAM is introducing Facilan, a strong, compostable filament for FDM/FFF 3D printing. Facilan filaments are comprised of three materials, offer a smoother texture than PLA and ABS parts, and address issues such as layer adhesion, warping, surface quality and misprints in a wide range of medical and manufacturing products.

Scientists develop extremely stretchable hydrogels which can be used with UV curing-based 3D printing

Scientists from the Singapore University of Technology and Design's Digital Manufacturing and Design Centre, along with scientist from the Hebrew University of Jerusalem, have developed a group of extremely stretchable and UV curable hydrogels that can be stretched by up to 1300%, and that are ideal for UV curing-based 3D printing methods. The scientists say the printed stretchable hydrogels show an excellent biocompatibility, which allows them to directly 3D print biostructures and tissues, adding that the optical clarity of the hydrogels offers the possibility of 3D printing contact lenses. The scientists also note the 3D printable hydrogels can form strong interfacial bonding with commercial 3D printing elastomers, which allows them to directly 3D print hydrogel-elastomer hybrid structures such as a flexible electronic board with a conductive hydrogel circuit printed on an elastomer matrix.

CMU algorithm can predict biomaterial 3D printing parameters

An algorithm developed by a team at Carnegie Mellon University (CMU)'s College of Engineering is capable of sorting through possible parameters for soft-material 3D printing to identify the perfect settings for success. Called the Expert-Guided Optimization (EGO) method, the algorithm combines expert judgement with 3D printer optimization data to expedite new material development. Material availability can be a barrier to the adoption of additive manufacturing, and material development can be lengthy, leaving researchers faced with trillions of different possibilities before achieving the optimal result. As a proof of concept, the team used EGO to 3D print complex objects made from PDMS and epoxy.

Researcher studying potential of 3D-printed “dirt houses”

University of Arkansas professor Michelle Bernhardt-Barry received a \$500,000 National Science Foundation grant for her work with 3D printers. She says the grant will be used to develop printing capabilities with sand and soil. Bernhardt-Barry works with a binder jet printer, which prints using an adhesive and a powder medium to build shapes. Bernhardt-Barry’s project will run for five years, from July 1 of this year through June 30, 2023, at the end of which the researchers will perform a life-cycle analysis to determine if the dirt-printed building material can last as long as materials like concrete.

3D printing viscous materials: advances toward 3D printed rocket fuel, pharmaceuticals, cookie dough

Researchers at Purdue University are experimenting with high-amplitude ultrasonic vibrations at the 3D printer’s nozzle to ensure that highly-viscous liquids maintain their shape throughout the printing process. So far, they’re able to achieve fine-precision results with media the consistency of cookie dough or clay. Researchers say the technology could have utility in areas such as the 3D printing of food and pharmaceuticals, as well as biomedical implants or dentals applications, and even solid rocket fuel.

**Printing Techniques & Capabilities****Researchers develop breakthrough method to 3D print liquids inside other liquids**

Researchers at the Department of Energy’s Lawrence Berkeley National Laboratory have developed a process to 3D print liquids inside other liquids. The printer is an augmented model which has been fitted with a syringe pump feeding a very fine needle that squirts water instead of molten plastic. The machine was re-programmed to create 3D patterns. The goal of this research was to create continuous liquid structures that hold their shape over time. The researchers used silicon oil as the base medium. Tiny gold nanoparticles were added to the water, while polymer ligands were mixed into the silicon oil. The gold nanoparticles interact with the polymer ligands to create a flexible elastic sheath. This new technique eventually could be used to create liquid electronics that flex inside stretchable devices without becoming damaged.

Aussie company launches world’s ‘largest’ 3D metal printer

Australia-based Titomic plans to use its new 3D metal printer – which it claims is the largest in the world – to print large titanium components, from golf clubs to ship hulls to titanium bike frames. While the company has earned massive interest, its facilities have not yet been cleared for market production. The company uses technology similar to traditional metal 3D printing, where objects are printed layer-by-layer using a spray of metallic particles. However, Titomic uses a CSIRO-developed method known as “kinetic fusion,” via which titanium powder particles are accelerated to supersonic speeds. Kinetic fusion methods are still under testing to determine their efficacy. The company hopes that once kinetic fusion is fully understood and perfected in production, it will be able print aircraft wings and submarine parts.

3D printed sugar scaffolds could positively affect bioprinting and microfluidics

University of Illinois engineers and Greg Hurst of Wolfram Research have discovered that isomalt sugar will lend itself to making 3D printed scaffolds. While sugar has been 3D printed before and been subject to burning or crystallization, isomalt is demonstrated to be more effective. The researchers have built a special 3D printer that maintains the right temperature, speed, and nozzle pressure and diameter necessary to print the material smoothly. The resulting 3D printed free-form structures can make thin tubes with circular cross-sections, which is not possible with conventional 3D printing. When the sugar dissolves, it leaves behind connected cylindrical tubes and tunnels that act like blood vessels, transporting nutrients in tissue or creating channels in microfluidic devices. The researchers hope that others can use their models to build printers and explore different applications for isomalt structures.

Washington State University team simplifies multimaterial 3D printing

Researchers from Washington State University have made a breakthrough that could make multimaterial 3D printing easier and more accessible. They were able to 3D print with two materials in a single step, a process that could help manufacturers reduce the number of steps needed and use a single machine to make complex, multi-part objects in one operation. The team was able to 3D print structures containing metal and ceramic in one piece, as well as a bimetallic tube that is magnetic at one end and non-magnetic at the other. The researchers used a laser 3D printer to print a structure from Inconel 718, a nickel-chromium alloy, and copper. They were also able to 3D print a structure made from both metal and ceramic in a single piece.

RP Platform changes name to AMFG, launches AI software platform for industrial 3D printing

AMFG, a U.K.-based provider of automation software for industrial 3D printing, made available a software platform that, for the first time, uses AI to automate additive manufacturing production. The company also announced a brand name change from RP Platform to AMFG as it expands its software capabilities to target AM end part production. AMFG believes its AI capabilities provide manufacturers with complete production automation for end-use parts, including scheduling automation, printability analyses, and post-processing automation.

Sandia develops robot to test 3D printed parts

Sandia National Laboratories developed an automated 3D printed part testing robot called Alinstante to accelerate the part qualification process, which may be a barrier to the adoption of additive manufacturing. The robot, which is made as a modular work cell, consists of six walls arranged in a hexagonal formation around a central robot arm. It is designed to be versatile and scalable, and the Sandia team believes it could theoretically “run forever” with minimal human input. At this stage of development, the team had demonstrated the robot’s ability to service three different stations – input, metrology and a load frame where parts undergo tensile or compression testing. The idea is to have the robot print a part in multiple ways and then test each one to determine which process works best.

Prellis Biologics develops technology to 3D print human organs

Prellis Biologics developed a high-resolution 3D printing technique that can produce living tissue with viable blood-carrying capillaries – a step towards the printing of human organs for transplant. Current 3D bioprinting technology is slow and can take weeks to print a cubic centimeter of human tissue, meaning cells are dead before a structure can be completed. The usual technique is therefore to print tissue in very thin sheets that can be kept bathed in a flowing stream of nutrients. Prellis' approach – which allows cells to receive enough oxygen and nutrients to survive while the structures are built – uses a holographic printing technique with a resolution of 0.5 microns, or 10 times smaller than conventional bioprinters, and 1,000 times faster. Prellis believes that when its optical support system to cure the hydrogel scaffold using an infrared laser is finalised, it could print a block of tissue – such as a kidney – and its entire vascular system in less than 12 hours.

**M&A and Investments****Shapeways closes \$30 million Series E funding round**

3D-printing marketplace Shapeways's most recent funding round brings its total funding to over \$100 million. The company will use its funding for expansion, developing a platform which will help creators design, make and sell products, regardless of their previous 3D modeling experience. Shapeways will introduce the new Design with Shapeways tool, which aims to walk creators through the 3D-printing process, starting with a 3D file, 2D drawing or other conceptual basis. The company's new Spring & Wonder line offers a hands-on approach to creating personalized jewelry through the service.

Arevo names new CEO and announces \$12.5 million funding round

Arevo, a 3D printing startup that combines robotics, software and specialized composite materials, announced a new CEO, Jim Miller, and \$12.5 million in Series B funding. The company is examining a potential \$1 trillion opportunity to convert metal parts into composite materials. The company has also received interest from companies in the consumer products, aerospace, oil and gas, and consumer electronics space.

3D-printing startup Formlabs raises \$30M as it eyes Chinese market

Massachusetts-based 3D printing startup Formlabs raised a \$30 million Series C round of investment as it eyes an expansion in China and the rest of Asia. The company's machines allow designers to print plastic objects in fine detail, while its Fuse 1 printer can print sturdier nylon material, and a new software system, Form Cell, allows printers to coordinate the production of a large quantity of parts. Formlabs also wants to expand its Somerville headquarters with the addition of an 18,000-square-foot facility.

AddUp acquires DED metal 3D printing manufacturer BeAM

The additive manufacturing venture of French industrial engineering group Fives and Michelin, AddUp, acquired BeAM, a manufacturer of directed energy deposition (DED) machines. The acquisition strengthens AddUp's position in the French metal 3D printing market. BeAM manufactures the Modulo and Magic ranges of industrial metal 3D printers, and its technology is especially valuable to maintenance repair and overhaul (MRO) operations. The deal will see BeAM's DED machines be added to the AddUp portfolio.

SolidCAD acquires Quebec's Le Groupe A&A's Autodesk Division (SIM)

Canada-based SolidCAD, a technology solution and professional service provider, acquired Le Groupe A&A's Autodesk Division (SIM), which caters to design and data management professionals in the architecture, engineering, construction and manufacturing industries. As an Autodesk Partner, Le Groupe A&A (SIM) analyzes, recommends, and implements CAD and data management processes. The acquisition is part of SolidCAD's strategy to increase its presence across Canada, particularly in Québec. Le Groupe A&A will leverage its presence in the small and wide format industry, as well as in the 3D printing equipment and electronic document management solutions markets in Québec. It says the decision was part of a realignment strategy to focus on the technological integration of 2D/3D printing systems and electronic document management.

Directa Plus seeks IPO for Graphene clothing

Directa Plus, a company selling Graphene-infused sportswear created with the help of 3D printing, is set for an IPO to fuel its expansion. Graphene is a fabric that turns simple clothing into smart clothing that regulates heat distribution to ensure the wearer stays at optimal temperature. The company, formed in 2005 and based in Italy, will seek admission of its Ordinary Shares on AIM, which is part of the London Stock Exchange.

AddUp acquires DED metal 3D printing company BeAM

AddUp, the additive manufacturing venture of French industrial engineering group Fives and Michelin, has acquired BeAM, a manufacturer of directed energy deposition (DED) machines. Headquartered in Strasbourg, France, BeAM also has sites in Cincinnati and Singapore. It manufactures the Modulo and Magic ranges of industrial metal 3D printers.

Coherent observes 'tremendous growth' in metal AM, acquires OR Laser

German industrial laser technology company OR Laser, maker of the ORLAS Creator metal 3D printer, has been acquired by California-based photonics manufacturer and developer Coherent. Coherent said it observed tremendous growth in the metal additive manufacturing industry during Q2 2018, in large part due to the demand for OLED displays used in mobile phones, digital cameras and media players. Future direction of OR Laser will be guided towards the aerospace and automotive industries.

Airbus restructuring as Premium AEROTEC acquires APWORKS

Germany-based APWORKS will become a wholly owned subsidiary of Premium AEROTEC as Airbus relinquishes its share holding. Premium AEROTEC is a tier one supplier of metal components for Airbus aircraft. APWORKS covers the full metal additive manufacturing ecosystem and has a broad customer base including enterprises working in robotics, automotive, medical technology and aerospace. The company is well known for the world's first metal 3D printed electric motorcycle, the Light Rider. Terms of the deal weren't disclosed. In 2017 Premium AEROTEC reported revenue of 2 billion euros.

Boeing invests in 3D printing startup for stronger engineering capabilities

Boeing is investing an unspecified amount in California-based 3D printing startup Morf3D to seek greater engineering capabilities for its aerospace development. Morf3D produces 3D-printed titanium and aluminum components for Boeing satellites and helicopters. The company's metallurgy experts leverage a new set of additive manufacturing design rules to advance the technology and accelerate 3D-printing capabilities for commercial use, Boeing said. Boeing has previously partnered with Norway's Norsk Titanium and Swiss-based Oerlikon to produce structural titanium parts and additive materials for its commercial airplanes.



Patents & Copyright

Innovative 3D printing method patented to print semiconductors

Michael McAlpine filed a patent that covers work on 3D printing medical equipment, specifically semiconductors that can be used for wearable displays, on-eye glucose sensors, MEMS devices, transistors, solar cells and other equipment. The patent is the result of work between McAlpine and Yong Lin Kong when they were at Princeton University. 3D printing semiconductors allows for smart functions inside soft and complex biomedical devices, which are otherwise incompatible with microfabrication. So far, McAlpine had managed to entirely print certain electronic devices.

U.S. Army patents cement mixture for 3D printable barracks

The U.S. military has made use of 3D printing in a range of areas relating to battlefield operations, surveillance, lowering the footprint of convoys and even clasps for radios. Now, they've produced a 3D printed barracks, which led to a U.S. patent. The barracks are made of cement, where the unincorporated elements can easily be transported onsite for construction. The technology may have applications in building and home construction.

U.S. QA Sigma Labs expands into Europe, patents part quality monitoring process

Sigma Labs, a quality assurance software company based in New Mexico, is expanding to Germany and the European market. The company's expansion comes as adoption of its PrintRite3D software increases in Europe. The company will add a technical applications engineering team to its European operations, which will work with clients and partners to support further adoption of the software. Meanwhile, Sigma Labs received a U.S. patent for its technology that provides protection for methods of assuring part quality using real time data from multiple sensor types, assuring a consistent and repeatable process.

MELD patents 3D printing that produces metal parts without melting

A subsidiary of Aeroprobe, MELD Manufacturing has patented its namesake technology, which is the first additive manufacturing process to produce metal parts without melting anything, using friction and pressure instead. The 3D printing technique, which took more than a decade to develop, uses a robotic arm, as opposed to lasers, and its products are made with fewer defects and faults. The process is more accessible in terms of cost with the company beginning to sell the first model of its MELD metal 3D printer, the B8.

Immensa first UAE-based company to file 3D printing-related patent

Immensa Technology Labs submitted the first 3D printing-related patent from a UAE-based company. The patent – a proprietary method for the production of moulds for concrete and other aggregates using 3D printing – aims to revolutionize the way regional construction companies and engineering firms approach urban design.

General Electric files patent to use blockchain in 3D-manufacturing process

General Electric (GE) filed a patent application for the use of blockchain technology to validate and verify 3D printed objects in its supply chain. The application discusses methods for implementing a distributed ledger system into 3D printing. GE believes that a tighter leash on the manufacturing process would help reduce counterfeit products and introduce more transparency and visibility.



Auto

BMW and MIT developing concept for Liquid Printed Pneumatics that morph into desired shapes

MIT's Self-Assembly Lab are working on a Liquid Printed Pneumatics project with BMW. The project applies the Self-Assembly Lab's "Rapid Liquid Printing" technique to the development of next generation car interiors capable of taking on any shape and size. Rapid Liquid Printing was developed in collaboration with UK-based furniture and interior design company, Steelcase. In the process of Rapid Liquid Printing, a needle-like nozzle injects a continuous stream of liquid ink which cures into a solid when exposed to a solid. The process takes place in a vat of silicone. As an extension of Rapid Liquid Printing, Liquid Printed Pneumatics are the first 3D printed inflatables that can expand and morph into any desired shape when stimulus is applied. Currently, Liquid Printed Pneumatics is only a concept. However, as autonomous vehicles develop, MIT and BMW expect cars may become more like "mobile living spaces."

GM software, 3D printing, AI and cloud computing to reduce vehicle weight

GM will use generative design software, 3D printing, AI and cloud computing in the next generation of vehicle lightweighting. GM and Autodesk engineers applied the new technology to produce a proof-of-concept part: a 3D printed seat bracket which is 40% lighter and 20% stronger than its original counterpart. The bracket additionally consolidates eight different components into one 3D-printed part.

Audi strikes deal with Stratasys for 3D printing prototypes

To reduce prototyping time, Audi has enlisted Stratasys 3D printing technology. Of special interest is the J750 printer's ability to handle colour, texture mapping and gradients. The printer can also handle various plastics. Audi said that just the 3D printed plastic tail light covers alone cut lead times by 50%.

Race team Triple Eight signs partnership with HP Australia

Racing team Triple Eight signed a commercial deal with HP Australia to serve as the team's official technology supplier. HP will offer computer hardware and software, data transfer and play a key role in 3D printing for the team. Its services will enhance the team's current capacity to print components that it engineers in-house.

ETSEIB Motorsport team reduces costs, improved logistics efficiency with 3D printing

An ETSEIB team, comprised of engineering students at the Polytechnic University of Catalonia, Spain, has streamlined the manufacturing process working with 3D printers from local manufacturer BCN3D Technologies. The student engineers are using 3D printing to reduce costs and improve logistics during day-to-day operations. Specifically, ETSEIB Motorsport has improved its workflow in three main areas including design validation and component iteration times, cost-effective manufacturing and improved overall car cost and lead times.



Aviation & Aerospace

NASA to launch spacecraft using 3D-printed parts before 2023

To overcome problems associated with the plastics used in NASA's Orion spacecraft, which will also perform an unmanned test flight at some point in 2019 and may eventually send human crews to Mars, NASA turned to 3D-printing firm Stratasys. The firm is using a new type of plastic, called Antero 800NA, that can withstand the extreme temperatures and forces involved in launching a spacecraft hundreds of thousands of miles away from Earth. The material is also designed to minimize the risk of anything going wrong with the spacecraft's electrical systems.

Airbus saves 15% in material weight due to 3D printing

Airbus is working with Materialise's Certified Additive Manufacturing, creating plastic parts for aircrafts through 3D printing. Through additive manufacturing, Airbus has reduced its time-to-market for customized parts from conventional manufacturing using tool-production. In April 2018, the two companies started producing the first 3D-printed parts for commercial aircrafts. The parts mark Airbus' first bionic design certification. The 3D-printed panels are reportedly 15% lighter than Airbus' previous manufactured cabin panels.

3D systems Figure 4 selected for US Air Force research

Under a new initiative, U.S. Air Force-sponsored research will look at how 3D printing can be used in the aircraft maintenance supply chain. Figure 4 is a high accuracy and speed modular 3D printing platform that permits a significant increase in throughput. The research will be overseen by America Makes, the U.S. national additive manufacturing innovation institute that frequently serves as a collaborative partner and facilitator between industrial 3D printing enterprises and wider industry. The University of Dayton Research Institute will lead the Figure 4 research project. Other participants include 3D Systems, Lockheed Martin, Orbital ATK, and Northrop Grumman. The participants intend to explore how the Figure 4 system can be used to 3D print aircraft components across a range of older planes. This is anticipated to allow the rapid delivery of parts on demand and reduce the time aircraft are out of service. The project is part of an ongoing Air Force program, "Maturation of Advanced Manufacturing for Low-cost Sustainment" (MAMLS).

Premium Aerotec drives 3D printing efforts with APWorks buy

Premium Aerotec, an Airbus-owned aerospace supplier, has acquired a 3D printing specialist. The company seeks to boost its expertise in developing plane parts made by additive manufacturing. The deal to buy APWorks, an Airbus spin-off which assists customers from the aerospace and automotive industries to identify components suitable for 3D printing, will also give Premium Aerotec access to a new high-strength aluminum alloy material, scalmalloy.

Boeing collaborates with Assematrix to secure 3D printing

Boeing has signed a deal with Israeli software company Assematrix to secure its digital inventory of 3D printable parts. Assematrix's technology includes a cloud-based platform made for industrial 3D printing. Boeing itself has demonstrated its commitment to additive manufacturing and has signed multiple other collaborative deals and funding arrangements in this field. Previously, Boeing signed a collaboration agreement with Swiss listed technology company Oerlikon to create an FAA and DoD recognizable standard for 3D printed titanium components, and completed production of Boeing's 787 Dreamliner aircraft in collaboration with El Al Airlines. In terms of funding, Boeing also contributed to \$37.6 million in funding for Reaction Engines Limited, a UK-based aerospace company working on the 3D printing enabled SABRE engine and future hypersonic travel.

General Electric wins 3D printing Navy contract

The U.S. Navy awarded GE a \$9 million contract to speed up the development of new parts with 3D printing. The Office of Naval Research awarded the four-year contract to GE to "develop a rapid process for creating exact digital models of replacement or newly designed parts." The program will take place in a two-step process over two years. The first will focus on underlying software and hardware developments, while the second will focus on creating and printing a part with a 3D Direct Metal Laser Melting printers. The parts will be for use on ships, aircraft and other critical military assets. The printing process is expected to significantly reduce the time spent designing parts.

European Space Agency receives prototype microgravity 3D printer

The European Space Agency (ESA) has developed a prototype microgravity 3D printer through Project Melt (Manufacturing of Experimental Layer Technology). The Additive Layer Manufacturing breadboard machine is designed to 3D print high performance polymers aboard the International Space Station and other off-world locations. ESA's Project MELT has been undertaken by a consortium of 5 European technology companies. Portuguese 3D printing technology startup, BEEVERYCREATIVE, was responsible for the overall design and development of the 3D printer prototype and its operating software.

MTU Aero Engines prioritizes additive manufacturing in new department

MTU, a German aircraft engine manufacturer, will launch a new additive manufacturing department in Munich, committing to 3D printing. The new facility includes about 30 professionals in engineering, process, operations and design, optimizing the company's additive output. MTU Aero Engines is a main supplier to US engine manufacturer Pratt & Whitney. MTU projects that 15% of parts in the PW1000G-JM engine will be 3D printed by 2030.



Health & Life Sciences

3D printed drug-filled dentures may be key to preventing infection

A team of University at Buffalo researchers are working on a new treatment for denture-related stomatitis, using 3D printing and potentially preventing the condition. The researchers 3D printed dentures filled with microscopic capsules that periodically release an antifungal medication. A study confirmed the efficacy of the preventative design. 3D printing also allows for the rapid production of customized dentures, which can potentially take weeks using conventional methods. The work involved the development of a new type of acrylamide, the current standard material for 3D printed dentures, designed to carry antifungal payloads, as well as a syringe pump system to combine the dental polymer and microspheres during the printing process.

3D-Printed ovaries let mice deliver healthy babies

Researchers at Northwestern University in Chicago successfully implanted 3D-printed ovaries in mice, who then delivered healthy babies. The researchers hope their work could lead to helping infertile adult women who have undergone cancer treatment, as well as childhood cancer survivors who would otherwise need hormone replacement therapy to trigger puberty. The ovary implants utilized bioprinters that can produce living tissue. In the preliminary trial, the researchers removed the mice's ovaries and replaced them with bioprosthetic ovaries.

MIT and Harvard develop process to 3D print brain models

A collaboration between MIT's Mediated Matter Lab and the Wyss Institute for Biologically Inspired Engineering at Harvard University has yielded an image-processing method that has simplified 3D printing of patient-specific medical models. The MIT/Harvard team have succeeded in processing MRI and CT data in less than an hour and used it to 3D print accurate multimaterial models of human anatomy, adopting a pixel-by-pixel layering approach.

DWK Life Sciences creates first commercial labware product with metal 3D printing

DWK Life Sciences has successfully designed a fully functional 4-port GL 45 bottle connector cap with 3D printing in medical grade 316L stainless steel. Traditionally, the development of new lab ware, especially glass products, is a slow process, whereas this initial development took about two months. Previously, the GL 45 caps have been manufactured using conventional machining and welding processes.

Italian startup turns to metal 3D printing for dental implants with 24-hour turnaround

Only two years into production, Yndetech, which produces high-quality dental implants and devices, is currently printing a complete portfolio of dental devices with laser melting technology. Yndetech uses 3D Systems' cobalt-chrome material, including bridges, abutments and implant bars. Cobalt-chrome has many advantages for dental applications. Demand has been increasing for the 3D Systems technology that the startup offers, as the throughput and quality allow Yndetech to provide its customers with 24-hour turnaround service, which is supported by the 3D systems workflow.

Researchers at new R&D center will use 3D printing to manufacture early prevention implants

Early intervention implants, which can fix early problems in joints and bones before conditions develop more serious problems, is one of multiple technologies that will be developed in a new research and development center at the Department of Mechanical Engineering at Imperial College London. The new unit will use advanced imaging techniques and 3D printing to manufacture parts with nanoscale features, so they can study their interactions with the human body.

Surgeons use 3D printing to check dad's kidney would fit son's abdomen in pioneering operation

A British hospital claims to be the first in the world to use 3D printing to pre-plan a complicated transplantation of an adult kidney into a small child. Dexter Clark, age two, was born with severe kidney problems which left him only able to eat from a feeding tube. Although his father agreed to donate his kidney, the adult organ was huge compared to cavity in which it was to sit, leaving surgeons worried that it would not fit. Doctors scanned both the father's and son's kidney, as well as the son's abdomen, and 3D printed both so that surgeons could find out if the transplant was even possible, and then work out the best way to insert the organ. In similar cases where surgeons are worried that transplanted organs will not fit, subjects need to be placed under anaesthesia so that a surgical exploration can be carried out to determine feasibility.

A 3D printing factory will make replica human organs in Boston

Paris-based medical device company Biomodex is opening a factory in the Boston area to produce replicas of individual patients' organs using 3-D printing. The synthetic organs are used by doctors to "test drive" procedures on patients. The companies use medical images of the organ that is to be operated on to design the replica. Products are currently in the testing stage.

3D-printed living tissues could reduce arthritis pain

Bioinks containing stem cells are being used to 3D print living tissues that can be inserted into the body and provoke a damaged joint to heal itself. This development could reduce the discomfort and pain in arthritis sufferers over a lifetime. 3D printing technology could enable new cartilage to be printed on demand using patients' own cells as the building blocks, a technique known as bioprinting. Professor Jos Malda is working with such 3D bioprinting in his lab at the University Medical Centre Utrecht in the Netherlands. As part of a project called 3D-JOINT, his team is working to make bioprinted tissues that can be implanted into a living joint to replace the damaged part. These would eventually mature into a tissue that is the same as the original healthy cartilage.

**Manufacturing & Construction****Netherlands to build world's first habitable 3D printed houses**

The Dutch city of Eindhoven will be the first in the world to have habitable homes made by a 3D printer. Of the first five new houses to be put on the rental market next year, the smallest, with two bedrooms, has already attracted applications from 20 interested families just a week after images were made available. The 3D printer being used is essentially a huge robotic arm with a nozzle that squirts out a specially formulated cement, said to have the texture of whipped cream. The cement is "printed" according to an architect's design, adding layer upon layer to create a wall, and increase its strength. Only the exterior and inner walls of the first of the new homes will be made using the printer, which will be located off-site. By the time the fifth of the homes is built – comprising three floors and three bedrooms – it's hoped the drainage pipes and other necessary installations will also be made using the printer, which will be located on the site of the new houses.

Speeding up prototyping with 3D printed injection molds

Openlab has been working with Prodways and the Platinum 3D platform to incorporate Prodways' MOVINGLight technology into the development cycle of its electrical components, in order to 3D print plastic injection molds. Nearly 25 tooling molds were 3D printed using the technology; as a result, hundreds of parts could be injected on an injection molding machine under manufacturing conditions that resulted in parts that matched the final shape and complied with the certification prerequisites with the correct polymer grade. Prodways' 3D printing materials feature high mechanical and heat resistance, allowing Openlab and Platinum 3D to inject charged and non-flammable polyamide parts. Glass-charged polyamide is one of the most commonly used materials for technical components that require high heat resistance.

HP teams with Jabil, Forecast 3D to expand Multi Jet Fusion presence

HP is in the process of expanding the reach of its Multi Jet Fusion 3D printing technology with existing partners. Jabil will deploy additional HP Jet Fusion systems in Singapore for the Jabil Additive Manufacturing Network. Forecast 3D is adding six new HP Jet Fusion 4210 systems. HP has committed to use its own additive manufacturing technology in its supply chain to lower costs, cut design time and lead times. From multinational design engineering and manufacturing to localized production, Jabil and Forecast 3D, among other major companies, are expanding their 3D printing capacities to facilitate manufacturing.

Cintec uses 3D printing to restore Trinidad and Tobago's historic landmark, the Red House

Cintec helped in the restoration of the historical Government building in the Republic of Trinidad and Tobago, the Red House, utilizing additive manufacturing for the first time within sacrificial structures and claims to have the longest reinforcement anchors inserted into a structure. These anchors, along with Cintec's reinforcement bars, works as an invisible repair solution to buildings that have previously been through damage caused by natural disasters, which traditional repair anchors cannot achieve.

Startup to make 3D-printed concrete homes for US\$4,000

A non-profit partnership is raising funds to 3D-print durable and affordable concrete homes in El Salvador in order to offset the global housing crisis. Each single story, 650-square-foot home will cost \$4,000 to build. The process will use a concrete-extruding printing apparatus, which is programmed to create the foundation and walls of the structure. The design will also leave room for windows and a non-concrete roof. It can also be adjusted to make room for wiring and plumbing. The Texas-based entrepreneurs leading the non-profit effort say that printing with liquid concrete allows for faster and cheaper projects, while retaining creative flexibility and customizability. The process also simplifies construction by eliminating the need for drywall, wood framing, insulation and other materials used in traditional homes. The non-profit group uses a concrete-printing apparatus, the Vulcan.

Newport News Shipbuilding to build U.S. Navy warships with 3D systems metal 3D printing

3D Systems is collaborating with Huntington Ingalls Industries' Newport News Shipbuilding division to use metal additive manufacturing (AM) technologies to build naval warships. The company will convert portions of its traditional methods to AM to enhance production rates with equal accuracy and reduced waste. The company also hopes the switch will save costs over traditional production processes. Newport News Shipbuilding is the primary designer, builder and refueler of U.S. Navy aircraft carriers and one of two providers of U.S. Navy Submarines. 3D Systems delivered and installed a ProX DMP 320 metal printer. The companies plan on using 3D printing to design and produce marine-based alloy replacement parts for castings, valves, housing and brackets, among others. 3D Systems has been contributing its AM expertise to the U.S. Navy for several years.

Singapore company uses 3D-printing, silicon molds to create sensors for aquaculture industry

Sensocore is a Singapore-based technology company focused on electronic devices to monitor water temperature and oxygen and pH levels inside tanks used in the aquaculture industry. To streamline production of its Aquafarm water sensor system, it turned to another Singaporean firm, Creatz3D, to develop silicon molds to produce multiple prototypes through a 3D printing process. Sensocore says the technology enables it to achieve time and cost savings of 86% over traditional manufacturing processes.

**Clothing & Wearables****3D printer puts electronics directly on skin**

Researchers from the University of Minnesota have placed electronics directly onto a person's hand using a portable 3D printer they designed and developed that costs less than \$400. They are developing the technology with the intent that a soldier could pull a printer out of a backpack and print a chemical sensor or other electronics directly on skin. The customized printer works with a moving hand, so the subject doesn't have to keep perfectly still. In the existing prototype, the printer installs a wireless LED. The electronics can also be peeled off or washed off when no longer needed. The 3D printer can also be used with bioink for medical needs.

UC researchers create 3D printed wearable stomach monitor

A team of researchers from the University of California at Berkeley and the University of California at San Diego have developed a 3D printed, wearable electrocardiogram for the gastro-intestinal (GI) tract that's intended to monitor electrical activity in the stomach for 24 hours. The device is paired with an app that allows patients to log activities such as meals and sleep. The device could help reduce healthcare costs since it can be used to monitor GI activity for patients outside of a clinical setting. By monitoring stomach activity for long periods of time, there's also an increased chance of capturing abnormal events. The device could be used to improve the management of patients with diabetes and Parkinson's, as GI problems such as delayed emptying of the stomach are common symptoms of these diseases. It could also be used to monitor the GI activity of athletes and pregnant women suffering from heartburn and other issues.

MIT students create 3D printed wearable device that transcribes internal verbalizations

Students from MIT have created AlterEgo, a prototype 3D printed wearable device that can transcribe words that the user verbalizes internally. In addition to the 3D printed wearable device, AlterEgo consists of an associated computing system and includes a pair of bone-conduction headphones. Electrodes in the device pick up neuromuscular signals in the jaw and face that are triggered by internal verbalizations but are undetectable to the human eye. The signals are then fed to a machine-learning system that has been trained to correlate particular signals with particular words. AlterEgo is effectively a complete silent-computing system that allows the user to undetectably pose and receive answers to difficult computational problems.

Chanel's latest watch movement utilizes chemical 3D printing

Chanel's new BoyFriend Skeleton watch houses the company's latest in-house movement. Since the company wanted the timepiece's wheels to be plain, it had to have them galvanically grown through a process that's best described as chemical 3D printing. Although some brands are using galvanic growth for elements such as dials, it has never been used for movement components before because it's a complicated process.

Flowbuilt facility provides brands with mass customizable 3D printed footwear

Washington-based Flowbuilt Manufacturing is the only footwear manufacturing facility in the U.S. that provides mass customization through 3D printing. Its newly opened Flowbuilt facility also has the country's only commercially available multi-section-injection (MSI) machine, allowing brands to personalize midsoles based on a person's individual biometric data, which is collected by HP's FitStation platform. Customers visit worldwide retail locations to have their feet scanned by FitStation. Flowbuilt takes the data and manufactures the custom footwear, which reduces sample times so its partners can quickly achieve full-scale production.

Clothing designer combines knitwear, 3D printing inspired by children's toys

London-based fashion designer Lingxiao Luo is mixing traditional knitting methods with 3D printing to produce apparel inspired by toys. Her collection, called AddiToy, is produced via a method that involves 3D printing threads of plastic directly onto knitwear. She does this by either by adding 3D printed patterns to the fabric to attach two different knitted fabrics into a single piece, or felting, which entails directly weaving 3D printed patterns into the knitted fabric. Luo believes AddiToy provides a new aesthetic and promotes zero-waste fabrication.

Designer's 3D printed fashion is biodegradable, sustainable

Designer Julia Daviy said she believes 3D printing will change the way clothing is produced, one day replacing traditional textiles. In addition to being biodegradable, Daviy's 3D printed plastic clothing is environmentally friendly because its one-time customizable – a customer buys a design file and 3D prints a piece at home. Daviy uses both 3D printers and 3D printing pens to produce her fashion.

Nike introduces first 3D printed upper in Flyprint running shoes

Nike applied its 3D printed upper designs to its Vaporfly Elite, developing a new shoe called the Nike Flyprint. Although Nike has created partially 3D printed shoes for professional athletes and collaborated with 3D printing companies for footwear solutions before, this is the first shoe with a 3D printed upper. The company used TPU filament in the process and was able to prototype its shoes 16 times faster than any other method.

**Consumer Goods & Retail****Crayola rolls out crayon-based 3D-printing pen**

Crayola launched a pen – the Crayola Crayon Melter – designed to melt crayons to a temperature suitable for writing in melted wax. The instrument has a self-contained heating element, making it safe to touch the tip that extrudes the quick-drying liquid wax. The pen needs about a minute in order to melt down enough to write with the liquid wax. The true magic is how quickly and easily it dries after writing.

HP enters into additional 3D printing collaborations

HP has unveiled additional collaborations that will see its Multi Jet Fusion (MJF) 3D printing technology further utilized by some industry heavyweights. Service bureau Protolabs, which was one of HP's original partners when MJF technology was initially launched, is now upgrading its seven HP Jet Fusion systems to industrial HP Jet Fusion 4210 systems in order to meet growing demand for production-grade 3D printing. Materialise, another early MJF partner, has been using eight HP Jet Fusion 4200 3D printers. It has joined with HP to scale an end-to-end solution for the production of personalized 3D printed insoles. Belgian service bureau ZiggZagg, which has already invested in six HP Jet Fusion 4210 3D printers, plans to buy five more by year-end. Additionally, IAM 3D Hub, an organization that brings together private companies, public entities and R&D organizations to integrate and coordinate 3D printing activities around the world, has installed eight HP Jet Fusion 4200 systems.

3Doodler promises jam-free 3D printing with latest pen

Create+, the latest 3D printing pen from 3Doodler, builds on the original Create with what the company says is the first dual drive system in any 3D printer, promising “almost entirely jam-free” drawing. The dual drive system will help the pen work smoothly with a greater range of plastics. Create+ also touts a new heating algorithm for better performance, auto-retraction to prevent plastic from oozing out and more distinctive fast and slow settings.

egf Manufaktur teams up with Formlabs for 3D printed customer-facing ring customization

German engagement and wedding ring brand egf Manufaktur is introducing 3D printing to the on-site customer experience in Europe for consumer-facing jewelry customization.

The brand is working with Formlabs to combine desktop digital fabrication with a custom software. Pre-loaded engagement ring designs in the customized software allow for e.g. Manufaktur employees with no formal CAD training to adjust and make changes on the spot while working directly with a customer. The company then sends the completed file to Formlabs' PreForm print preparation software, where it's 3D printed on the desktop Form 2 with Grey Resin.



Education

MakerBot Launches Teacher Certification Program, First Training for 3D Printing Curriculum

MakerBot is launching the most currently comprehensive 3D printing certification program for educators. The MakerBot Certification Program trains educators on operating MakerBot 3D printers, but also trains educators on how to create their own 3D printing curriculum. Teachers can become certified in one of two ways. First is a series of online, self-paced courses that trains users to become operators and then curriculum creators. The second method cover the same material as a blended workshop that combines online coursework and an additional 5-hour hands-on training session. MakerBot developed the Certification Program in collaboration with faculty from the NYC Department of Education and developed the program to address common national PD standards. The in-person training is currently only available in Brooklyn, but MakerBot is beginning partnership around the country to extend access to the local blended program.

Penn State rolls out Navy-backed 'super finishing lab' for 3D-printed metal parts

Penn State opened a "super finishing lab" for metal 3D printed parts which is intended to complement the existing subtractive processing technology in the Factory for Advanced Manufacturing Education (FAME) Lab within the Harold and Inge Marcus Department of Industrial and Manufacturing Engineering. The university received over \$535,000 in funding for the lab from the Defense University Research Instrumentation Program, which operates through the Department of Defense's Office of Naval Research. The finishing equipment will transform 3D printed parts into components ready for product assembly.

Educators seek funding to bring 3D printing to students

U.S. educators are aiming to bring 3D printers into the classroom as educational tools, but the machines' high cost have left some teachers seeking grants to obtain them. Although the printers are expensive, Pennsylvania elementary school art teacher Adam Gebhardt says the price of filament is lower than the cost of typical art materials. Depending on size and brand, the cost of a basic 3D printer ranges from about \$1,200 to more than \$6,000. Some companies, including Skriware, offer bundled packages that include both a printer and curriculum materials curriculum materials. Education regulators are also partnering with 3D printing companies to bring the technology to students. The New York City Department of Education partnered with MakerBot to offer the company's STEM certification program to teachers so they can learn how to work with 3D printers and include them into existing curricula.

Kettering University launches pilot 3D-printing art class

Kettering University launched a pilot course designed to teach students to design and successfully use 3D printing to improve scientific instruments and problem solve. Students learn how to use SolidWorks, a CAD program, and become certified in using the program. The course material covers the chemistry and materials behind 3D printing, best practices and the uses for 3D printing. As part of the class, students were assigned an art project, which was intended to allow them to practice their skills in designing and printing and see what works and what doesn't.

Robo acquires MyStemKits to provide 3D printing bundles for educators

3D printer manufacturer Robo has acquired Ga.-based MyStemKits, the provider of the largest online library of STEM (Science, Technology, Engineering, Math) curriculum in the world, including 3D printable kits for K-12 schools. Robo intends to offer educational bundles that include its 3D printers, a supply of filament, one-year subscriptions to MyStemKits, and additional online resources.

**Arts & Entertainment****Company 3D prints stegosaurus skeleton for Colorado museum**

Fossil-related service provider Triebold Paleontology used 3D scanning and 3D printing technology to produce a 1:1 scale model of a stegosaurus skeleton displayed at the Denver Museum of Nature & Science. The company used the Artec Spider 3D scanner and the Artec Studio processing software to scan individual bones and regions of the skeleton and upload them as individual projects in Artec Studio. Once scanned and uploaded to Artec Studio, the data was aligned, cropped, and converted to 3D mesh files. The company then printed the scans by combining the capabilities of both small desktop printers and larger-format options. Printing of the entire skeleton took around six months.

Massivit 3D prints life-size triceratops model for Paris museum

Metropole used Massivit 3D's Massivit 1800 3D printer to create a full-size triceratops model to promote a palaeontology exhibition at Paris' Musée national d'Histoire naturelle. Printing the model took two days. The printer's speed of up to 35 cm per hour and dual printheads allowed Metropole to meet the museum's deadline by producing the triceratops in just eight components. Once assembled, the company strengthened the construction with ballast to guarantee its longevity. Metropole's artistic team then covered the dinosaur with a textured surface to achieve its natural looking skin, while also producing realistic eyes.

French artist creates microscopic 3D-printed self-portrait

France-based bioprinting company Microlight3D partnered with artist Michel Paysant to create what the company says is the smallest sculpture in the world. Paysant gave a 3D scan of his head to Microlight3D, which took the high-resolution scan and printed it at a resolution of 0.2 microns. At a height of 80 microns, the sculpture is so small that it requires a microscope to see.

Artist teams with Metropolitan Museum of Art to create 3D-printed suits of armor for art installation

Icelandic artist Steinunn Thorarinsdottir collaborated with the Metropolitan Museum of Art in New York City to 3D print life-size copies of real suits of armor from the museum's Medieval collection for an art installation on the Cloisters Lawn in NYC's Fort Tryon Park. Thorarinsdottir partnered with the Met's Advanced Imaging Department to create 3D scans of three suits of armor from the collection. The suits were 3D-printed, then reproduced in cast aluminum by a foundry in China using the lost wax method.

Circular economy company uses 3D printing to turn ocean waste into seashells at Athens exhibition

During the "Second Nature" exhibition in Athens, Greece, a 3D printer turned a ghost net – a deadly form of ocean trash and environmental threat – into 3D printed seashells. The exhibition, organized by the design and research studio New Raw in collaboration with the Aikaterini Laskaridis Foundation, was held to raise awareness on marine plastic pollution. When fishermen lose or abandon fishing nets in the sea – so-called ghost nets – they may remain on the bottom of the sea for years and create dangerous traps for fish and marine life. New Raw, which developed circular economy products, collaborated with local fisherman and divers in Greece to recover fishnets from the bottom of the sea, which were then recycled, sorted according to their material, processed in a grinder and extruded to produce filaments for 3D printing. New Raw's vision is a zero-waste future – the exhibition was meant to demonstrate that marine plastic can be used as a raw material for a new economy and technological and cultural innovation can bring about social change.

Actress Portia de Rossi launches startup to 3D print paintings

Portia de Rossi, an actress known for her role on the TV show *Arrested Development*, launched a startup called General Public to transform the art market by creating three-dimensional reproductions of artwork. The startup will use a mix of original painting and printing technology designed in collaboration with Fujifilm. De Rossi trademarked a 3-D printing technology called the Synograph, which captures the color and graphics of a painting as well as the physical texture of each mark and brushstroke. The goal is to create high-priced, one-of-a-kind works available to those who don't have the means to know-how to purchase artwork from galleries. General Public offers a mix of prints by emerging and established artists, with some limited-edition reproductions and others that are open-ended and available for on-demand orders. Prices range from around \$500 to \$3,000, but come in at \$1,000 on average.

Canadian artist displays sculpture made from 3D printed heads

After spending three years scanning and 3D printing the heads of Canadians, artist Douglas Coupland is displaying artwork comprising 1,000 multicolored heads made of 71 kilometers of plastic filament at the Ottawa Art Gallery. Coupland started 3D printing the artwork, called “The National Portrait,” four years ago. He said 3D printing may change the sculpture landscape, similar to how photography freed painters to be impressionists. He added that the technology is “surprisingly democratic” and could provide a tangible alternative to the “selfie,” noting that it represents an untapped art medium. Coupland travelled across Canada to create the sculpture and said people would line up in every city to have their miniature sculpture created. He said most people had never encountered a 3D printer before.

PepsiCo leverages Protolabs’ 3D printing technology in marketing campaign for Black Panther

Minnesota-based 3D printing service provider Protolabs worked with PepsiCo to 3D print a collector’s kit to generate publicity for Marvel’s Black Panther. Protolabs helped design, prototype and manufacture the kit, which was sent to social media influencers and those involved in the production of the movie. The kit contained cans representing each of the movie’s main characters, along with a 3D printed Black Panther mask for the cans, a Samsung tablet, comic books, behind-the-scenes photos, “kimoyo beads” from the film, and a box or “cairn” that folds open to show one of the cans lit with Hi-Light LEDs. PepsiCo packaging engineer Andrew Phinney said the collaboration provided an opportunity to incorporate new technologies to develop unique textures, graphics, dimensional elements and lighting to bring kits to life. The complexity of the geometry and need to produce 250 parts led the team to 3D printing, which was a good fit for the detailed features of the mask. Five 3D printing technologies were considered, including SLS, SLA, CLIP and HP’s Multi Jet Fusion (MJF), but MJF was used because the team wanted parts that could last 10 to 20 years.

Artist duo uses 3D printing to design mini lounge for watchmaker Audemars Piguet

As part of an ongoing series of artistic collaborations, Chilean artist and designer Sebastian Errazuriz and Italian artist Quayola transformed part of the VIP Collectors Lounge at Art Basel in Hong Kong into a mini-lounge for watchmaker Audemars Piguet. The installation, called “Foundations,” is inspired by iron ore and suspends roughly 500 3D printed, scanned and hand-molded rocks, which rotate and move in “perfect harmony.”



Sports

BMW leverages 3D printing technology for sport bike following \$12.3 million investment

BMW Group invested €10 million (approximately \$12.3 million) in a new additive manufacturing campus in Germany and designed a 3D printed chassis of a BMW sports bike as a demonstration of the possibilities to come from the company's developing additive hub. The BMW S1000RR motorcycle was initially developed for the 2009 Superbike World Championship and is now used in races by multiple world championships, including MotoGP and Isle of Man TT riders. The bike entered commercial production in 2010. Using 3D printing, BMW has been able to reduce the weight of the bike, offsetting the weight of heavier components, and optimizing the design for rideability. In a concept model, the frame and swingarm have been 3D printed using a powder-based selective laser melting technology. BMW's additive manufacturing campus in Germany develops and manufactures over 100,000 precision components each year.

South Aussie triathlete using 3D printed gloves for Commonwealth Games push

Athlete Scott Crowley will be wearing 3D printed gloves when he competes at the Commonwealth Games paratriathlon. The idea was born out a conversation between Crowley and Morgan Hunter, the TechLab manager and 3D engineer in charge of ThincLab's 3D printers, when Morgan asked him about how he managed to push his way through the course. Scott described his use of self-made gloves with plastic beads formed to his hands to hit the top of the tires on his track chair to proposal himself forward during the final leg of the race. The pair then decided to try to produce something better using plasticine, scanned and digitised using CAD and 3D printed. The final design was printed with Onyx carbon fibre reinforced plastic to reduce the weight of the gloves, which cost \$100 each. Two pairs were printed – a wet weather version with an abrasive face to stick to wet tires and a dry weather pair that has a rubber face. Morgan says ThincLab's prototyping lab and design studio is open to anyone looking to develop a product and offers a competitive rate that includes access to the University of Adelaide's expertise in engineering.

NASCAR's Brad Keselowski says 3D printing will improve race cars, has broad applications

NASCAR driver Brad Keselowski said 3D printing will "change the world dramatically in a very quick time," and is already have inroads in auto racing. Keselowski said he's raced with 3D printed parts in his car. Though he wouldn't provide specifics about the 3D printed parts in his car, citing the need to maintain competitive advantage, Keselowski said he expects additive manufacturing to improve the power and efficacy of engines. He noted that 3D printing can produce "very precise parts that can be available very quickly without tooling costs." When citing manufacturing discrepancies in the sport, he said Toyota is ahead of the pack. "I would say that the team that won the championship last

year won the championship because of their manufacturing prowess, which included additive technology,” he said. Keselowski, who was appearing on a panel along with GE’s chief manufacturing engineer for additive, Ron Daul, and the head of BMW’s additive manufacturing center, Dominik Rietzel, said there’s a disconnect between technology’s transformative power to reinvent manufacturing and the amount of attention being paid to the industry. He sees broad applications for the technology, predicting that its use will help improve fuel efficiency, help humans land on Mars and enable safe operations of nuclear power plants, while reducing manufacturing waste.

DSM, 3Dmouthguard join forces to develop 3D printed mouthguards

Royal DSM is partnering with 3Dmouthguard to develop custom-made and instantly printed 3D mouthguards. Along with Carestream Dental and NHL Stenden Hogeschool, the pair created a new technology to print custom-made mouthguards in 3D on the spot. By scanning the upper jaw using video technology and digitally capturing the curves and shapes of the mouth and teeth, a perfectly fitted mouthguard can be printed using a continuous filament of DSM’s Arnitel – a bio-based material that meets strength, flexibility and health requirements. The first 3D printed mouthguards are expected to be tested in the coming months by athletes from Dutch field hockey clubs. The partners’ scientists and developers will use the data captured to further fine-tune and scale-up the 3D printing process.

International rugby player turns to 3D printing to replicate kicking tee

Dan Biggar, a Welsh rugby player, used 3D printing technology available through a partnership between the Welsh Rugby Union (WRU) and Cardiff University to create an exact replica of a kicking tee he had used since he started playing for Gorseinon and Swansea school boys at the age of 14. The efforts, led by Professor David Marshall, an expert in computer vision from the University’s School of Computer Science and Informatics, included using an Artec Space Spider 3D scanner to take multiple images of the tee. The images were stitched together to form a complete 3D computerized representation of the tee, which was then sent to Dr. Peter Theobald, from the School of Engineering, who reproduced a replica using a 3D printer and a filament-based thermoplastic polyurethane material called ‘Ninjaflex.’

Peak launches first 3D printed volleyball shoes

China-based company Peak introduced the first 3D printed volleyball shoes, demonstrated by a member of the country’s Olympic volleyball team, Ding Xia. Peak used SLS laser technology and a more lightweight and flexible TPU powder printed on the bottom of the shoe in its manufacturing.