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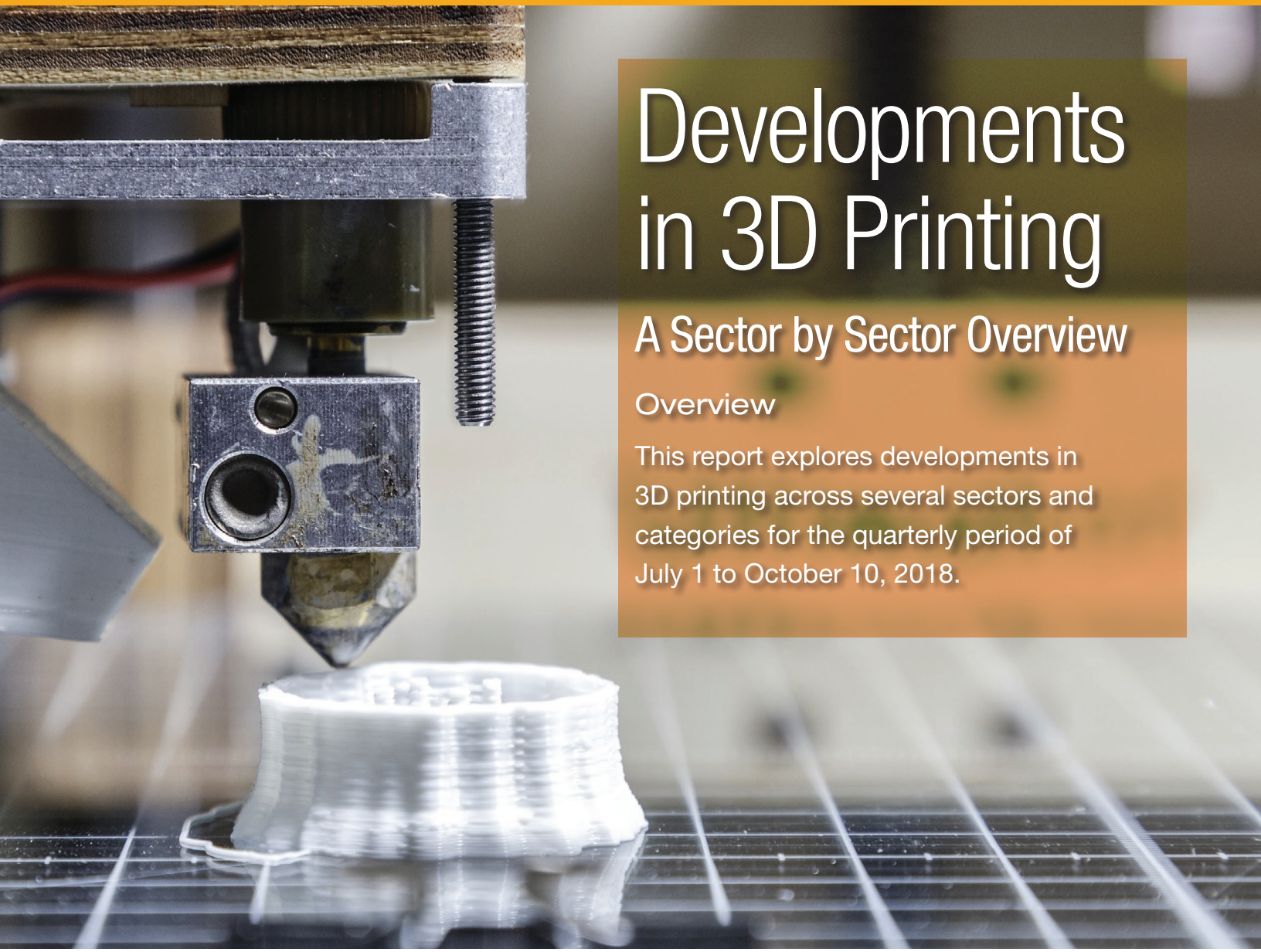
3D Printing Quarterly Report—Q3 2018

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 July 1 to October 10, 2018.

For more information, please contact:

Mark E. Avsec
(216) 363-4151
mavsec@beneschlaw.com

www.beneschlaw.com

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General

Aurora Group to market Nano Dimension 3D printers in China

The deal expands Nano Dimension's already active presence in Asia Pacific beyond Hong Kong, South Korea, Singapore and Taiwan. Founded in 2012, Nano Dimensions develops and manufactures 3D printers for the electronics industry.

Ultimaker opens Singapore APAC Facility to meet global demands

Netherlands-based Ultimaker spent the last seven years developing its range of desktop 3D printers for a variety of applications. The company's latest 3D printer, the Ultimaker S5, illustrates the company's increased focus on meeting industrial production demands. By opening a facility in Singapore, the company sees an opportunity to better serve local and regional markets.

Materialise tackles creation of life-sized replica of first mammoth skeleton

The skeleton is composed of 320 bones which have been scanned and digitally reconstructed. Materialise will enter the fabrication process using its Mammoth Stereolithography 3D printers. With a printer bed dimension of 220 x 70 x 80, the printer will fabricate the bones in approximately a month, applying 1/10th of a millimeter of resin at a time. The 3D printed bones will then be finished, painted, and assembled to resemble the original skeleton.

3D Systems completes first-ever UNESCO restoration with 3D printed dragons

Originally completed in 1762, London's The Great Pagoda at Kew features 72 3D-printed dragons. 3D Systems applied large-scale selective laser sintering (SLS) technology to help restore the 256-year-old building back to its former glory. 3D Systems' biggest SLS 3D printer, the Pro 230, was used to print all 72 dragons, which measured from just under 1 meter to 1.5 meters in length.

3D scanning company raises $55 million, plans expansion

Mantis Vision, an Israel-based enterprise focused on 3D scanning technology, raised $55 million in a Series D funding round led by Luenmei Quantum and the Samsung Catalyst Fund. This brings funding to date to $83 million. Mantis Vision intends to use the funds to extend its technological edge, accelerate its go-to-market strategy, expand its international workforce and support external growth opportunities.

Sinterit releases new generation of Lisa SLS 3D printers

The launch of Sinterit's LISA 1.5 comes two months after the release of the LISA 2, the desktop SLS 3D printer for industrial applications. The LISA 1.5 SLS 3D printer boasts the ability to produce larger prints using enhanced hardware as well as easier maintenance and an improved user experience.

Metal 3D printing startup Velo3D launches first product

Velo3D's Sapphire system utilizes a technology the company calls Intelligent Fusion and is capable of 3D printing complex metal objects by sintering a bed of powder with a laser, in a process similar to standard resin-based 3D printing systems. What helps set the company's machine apart from some of the competition is a focus on additive manufacturing for production, in addition to prototyping.

Josef Prusa introduces a resin-based 3D printer SLA

The resin-based Prusa SL1 is an open source SLA 3D printer, adding to the FDM/FFF range of systems already available. FFF/FDM technology is based on forcing out molten thermoplastic material (filaments). Whereas, SLA is based on transforming liquid materials to solid parts, layer by layer, by curing them by using a light source in a process known as photopolymerization.

3D bioprinting of living structures include built-in chemical sensors

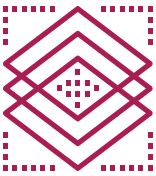
A team of researchers from the University of Copenhagen and the Technical University of Dresden implemented oxygen sensitive nanoparticles into a gel material that can be used for 3D printing of complex, biofilm and tissue like structures harboring living cells as well as built-in chemical sensors. The group developed a functionalized bioink by implementing luminescent oxygen sensitive nanoparticles into the print matrix. When blue light excites the nanoparticles, they emit red luminescent light in proportion to the local oxygen concentration. The distribution of red luminescence and thus oxygen across bioprinted living structures can be imaged with a camera system. This allows for on-line, non-invasive monitoring of oxygen distribution and dynamics that can be mapped to the growth and distribution of cells in the 3D bioprinted constructs without the need for destructive sampling.

KIT expands erasable 3D printer inks portfolio

After 3D printing sample structures, a sample plate was submerged within chemical baths heated at 50°C. In the first bath, the sample Eiffel Tower, made using MSEA, degrades within 20 minutes though the other three structures remain stable. Next, in exposure to another chemical, an Aztec temple of ESEA took around 1 hour to degrade. Then, in a further test, ISEA was completely removed, again taking 1 hour. The sample Asian temple made from PETA remained as a reference structure.

Arkema opens 3D Printing Center of Excellence to develop 3D printing resins

Located at its Sartomer facility in Exton, the 3D Printing Center of Excellence adds to the company's additive manufacturing material development network. This will be enhanced by the $23 million expansion of its Mont site in France, pledged for next year. Arkema is looking to deliver material products to market that can enable mass manufacturing with 3D printing.



Materials

Tethon 3D reveals high alumina Tethonite ceramic powder for ink-jet 3D printing

Designed for use in binder jetting additive manufacturing systems, Tethonite high alumina powder claims an increased resistance to corrosion, wear and thermal stress. Composed of over 96 percent of alumina, a white or nearly colourless crystalline substance, the Tethonite high alumina powder can be used by for unique technical industrial applications, such as oil and gas processing and high voltage bushings.

CityU researchers create novel ink for 4D printed ceramics

Researchers from the City University of Hong Kong developed a novel ink for creating 4D printed ceramics. Containing ceramic nanoparticles and elastic polymers, the ink enables scientists to create transforming objects on a 3D printer. Professor Jian Lu, Vice-President (Research and Technology) and Chair Professor of Mechanical Engineering, believes that this ink can “turn a new page in the structural application of ceramics.”

Evonik develops flexible PEBA-based 3D printing powder

The new high-performance powder, recognized for its high elasticity and strength, is suitable for a variety of powder-based 3D printing technologies such as laser sintering (LS), high speed sintering (HSS) or binder jetting. Parts produced in the new PEBA powder present a high degree of flexibility, chemical resistance and durability over a wide temperature range from -40°C to 90°C. Application areas include high quality, fully functional, flexible plastic parts for prototyping or series production.

Carbon launches first medical grade 3D printing material for its DLS machines

Medical Polyurethane 100 (MPU 100) is a white polymer resin which the company says boasts mechanical strength, biocompatibility and sterilisability. It has been designed to enable the additive manufacture of medical systems, skin-contact devices, drug-contact devices, and single-use medical devices. These applications can range from prosthetics to surgical guides to inhalers, the company has previewed some early applications on its website, including a surgical tool handle and a pill bottle.

UTSC startup Genecis converts food waste into bio-plastic for 3D printing

Genecis is using micro-organisms, microbial engineering and machine learning to turn restaurant food waste into biodegradable plastic known as PHAs. The resulting plastics can be molded and remolded into different products.

Ultimaker announces material alliances, print core for composite 3D printing

The material alliances are for Ultimaker’s S5 machine. The alliance sees material profiles developed for DSM’s Novamid CF10, a carbon fibre filled grade PA6/66 filament capable of producing parts with injection molding-like properties. Reinforced with 10 percent carbon fibre, the material can produce stronger and tougher parts for functional prototyping and end-use parts. The second alliance is for Owens Corning XSTRAND filament, which is designed for functional prototyping and industrial applications due to its strong mechanical and thermal properties enabled by glass-fibre reinforcement.

3D-printed cement paste gets stronger when it cracks

Purdue University researchers have 3D-printed cement paste, a key ingredient of the concrete and mortar used to build various elements of infrastructure, that gets tougher under pressure. The technique could eventually contribute to more resilient structures during natural disasters. 3D-printed cement-based materials, including cement paste, mortar and concrete, would give engineers more control over design and performance, but technicalities have stood in the way of scaling them up. Purdue engineers are the first to use 3D printing to create bioinspired structures using cement paste.

NASA tests antibacterial 3D printing material

NASA Nebraska Space Grant, in collaboration with the University of Nebraska at Omaha and Copper3D, have begun a study about the potential of a new antibacterial material for 3D printing, a polymer of Polylactic Acid (PLA) containing a patented additive based on copper nanoparticles and other enhancing elements, which eliminates a wide range of fungi, viruses, and bacteria called PLACTIVE. The research will describe the development of 3D printed prostheses with antibacterial filament, verify the antibacterial properties of 3D printed prostheses, and develop a remote fitting methodology and determine patient satisfaction after using a 3D printed antibacterial finger prosthesis.

Printing Techniques & Capabilities

TU Wien develops method for high resolution 3D printing of tough photopolymers

An approach for the production of methacrylate-based photopolymers without impeding the curing process was developed by a team at the Technical University of Vienna (Austria). Their approach uses an ester-activated vinyl sulfonate ester (EVS) as a chain transfer agent, because it splits off one portion of itself to activate the process. The more EVS added, the shorter the average length of chain the polymer network will have. Because shorter polymer chains remain mobile longer, the danger of cracks during curing is reduced. Without EVS, the material was too brittle to be 3D printed.

Allevi, Made in Space partner to build zero gravity tissue 3D printer

Allevi, a 3D bioprinting company formerly known as BioBots, partnered with U.S. microgravity 3D printer developer Made In Space to work on a 3D bioprinter capable of working in low-gravity conditions. According to Allevi, the ZeroG 3D bioprinter will allow scientists to simultaneously run experiments on the ground and in space to observe biological differences that occur with and without gravity. The 3D bioprinter will work with living materials, such as human stem cells and, presumably, a range of gravity-resistant hydrogels/materials created to sustain cell life.

Aerosint technology allows multi-material 3D printing

Aerosint, a Belgian startup, created patent-pending technology to save powder, eliminating the need to recycle material and to allow 3D printing in both polymer and metal materials – separately or simultaneously. A few examples the company gave as potential products are rigid prosthetics with localized flexible cushioning, optimally shaped batteries with improved capacity for electric cars and other multi-color, multi-material objects. The company closed a second financing round of $983.000.

Researchers find gold nanoparticles show defects in 3D printed objects

Vanderbilt University researchers have created a way to use gold to detect defects in 3D printed objects and make those defects visible. The team embedded gold nanoparticles inside 3D printing material, once an object is printed, the nanoparticles show up as maroon, highlighting any defects.

Researchers find photosensitizers to print cost-effectively in color

Researchers at The Institute of Photonic Sciences (IFCO) in Spain developed a faster, more cost-effective 3D printing method that can print objects in all colors. To create stable colorful nanocomposite powders, gold nanorods were coated with silica before being mixed with polyamide powders. At resonance, according to the researchers, these composites showed improved light-to-heat conversion compared with equivalent composites using the industry standard carbon black as a sensitizer and could be sintered using low-power light sources. Furthermore, the new photosensitizers could also produce much whiter and, when mixed with dyes, brightly colored 3D objects. The materials are cost-effective for large-scale production, researchers said.

Researchers create 4D method for printing ceramics

A research team at City University of Hong Kong developed the first 4D printing for ceramics. The existing 3D-printed ceramic precursors hinder the production of ceramics with complex shapes. To overcome these challenges, the team developed a “ceramic ink,” which is a mixture of polymers and ceramic nanoparticles. The 3D-printed ceramic precursors printed with this ink are soft and can be stretched three times beyond their initial length which allows complex shapes. With heat treatment, ceramics with complex shapes can be made.

MIT uses process which allows users to make materials with properties that aren’t traditionally possible

Working on the nanoscale, MIT researchers 3D printed centimeter-long structures that could change the face of electronics and optical sensors. In the method, billions of polystyrene colloids fuse together to build structures programmed by the research team. The process means scientists can program a material’s structure from the ground up and they could make materials with properties that aren’t possible with traditional chemistry. Colloidal self-assembly has been compared to 3D printing as new solid structures are built by layering multiple colloids. By changing the size of the particles, the team also succeeded in creating structures that reflect different colors.

Delicate robots made of 3D printed ink and paper can fold or flatten on command

Previously, a team of researchers at Carnegie Mellon University used 3D printing to create a range of self-folding 3D objects. Now, they have developed a paper robot made of conductive 3D printed material and paper that folds and unfolds itself when an electrical current is applied. The team used a 3D printed material called polylactide, a kind of thermoplastic that has shape-memory behavior. This is combined with graphene, which carries current, to make 3D-printed "ink."

Using projection micro-stereolithography, team creates complex aerogel structures

Graphene aerogels are useful in aerospace, energy storage and insulation but using 3D printing to create complex structures has been elusive. One challenge is that 3D printing graphene aerogel has been done using direct-ink or other extrusion-based methods. A team at Lawrence Livermore National Laboratory focused on using a method known as projection micro-stereolithography to 3D print aerogel parts. In projection micro-stereolithography, ultraviolet light projects a part's image into a photosensitive liquid resin, which gets cured and hardened into the shape of the image. Using this method, researchers reduced the resolution possible for 3D graphene aerogels printed through extrusion-based methods from around 100 microns to about 10 microns.

Scientists create 3D printed components which can alert users to damage

Scientists at the United Technologies Research Center and UConn created 'smart' machine components that alert users when they are worn or damaged with voltage reading. They used direct-write technology which allowed them to embed fine lines of conductive silver filament into printed components while they were made and form an electrical circuit when voltage is applied. Damage or wear caused by friction from moving parts would cut into the lines, breaking the circuit. Engineers can assess damage with real time voltage readings without having to take an entire machine apart. The researchers also used direct write technology to create polymer-bonded magnets with intricate geometries and arbitrary shapes. They used low-temperature UV light to cure the magnets which resulted better performance than magnets created by other additive manufacturing methods.

HP launches metal 3D printing technology

HP Metal Jet aims to deliver the mass production of functional end-use metal parts with up to 50 times more productivity compared to current binder jetting and selective laser melting technologies. Metal Jet is a voxel-level binder jetting technology which uses low-cost off-the-shelf metal injection molding (MIM) powders and a binding agent to build parts within a bed size of 430 x 320 x 200mm. These "green parts" are sintered in a standard furnace to produce high-quality isotropic components which meet ASTM standards. HP decided to take a gradual approach, first offering its metal technology through a Metal Jet Production Service starting with select manufacturing partners GKN Powder Metallurgy and Parmatech adopting the technology into their factories before rolling out the service in 2019.

Harvard researchers used soundwaves for 3D printing

Researchers from Harvard University's John A. Paulsen School of Engineering and Applied Sciences (SEAS) created a 3D printing technique which uses sound waves to form drops of viscous fluids into additively manufactured structures. According to the study, this method could drive scientific advances in the areas of optics, electronics and biology. The researchers found the higher the amplitude of the sound waves, the smaller the droplet size, no matter the viscosity of the fluid. In addition, as sound waves do not travel through the droplet, the researchers deemed this method safe to use with biological cargo, such as living cells or proteins.

Prusa develops its own 3D printing filaments

Prusa Research, a manufacturer of open-source 3D printers, unveiled its in-house filament known as Prusament. Unsatisfied with the quality of filament available, Prusa began building a factory to develop its own range of materials. According to Prusa, filament quality can be determined by its physical measurements, consistency of color and materials proprieties, printing properties and the quality of care in manufacturing.

CCC, Immensa, Nowlab partner to 3D Print sensor-fitted concrete screen

Immensa Technology Labs, a UAE-based additive manufacturing expert, worked with CCC and Nowlab on the Sensorial Adaptive Concrete Screen. It was made from 3D-printed formwork produced by Immensa's BigRep One 3D printer. Embedded with sensors, the screen is activated by touching the exterior of the concrete wall, which can help to control the grid's hexagonal lighting fixtures.

Researchers print stretchable electronics which tested well

Researchers have been interested in stretchable electronics based on Ga-based liquid metals (GLMs), which are nontoxic liquids with low viscosity. Due to their high surface tension, however, GLMs are difficult to print. A group of researchers developed a method in which GLMs are printed with elastic materials to overcome their poor printability. The core components of the system were a desktop 3D printer, the coaxial nozzle, and injection pumps. Printing liquid metal so it came in continuous contact with viscous elastic materials inhibited balling which allowed researchers to print stretchable electronic components that showed excellent performance when tested.

Building injection molding tools with 3D printing reduces cycle time by over 34 percent

The main problem with the production of injection molding tools is a long cycle time related to cooling difficulties on the thickest areas of the part. As a result, a group of researchers used Selective Laser Melting to build cooling channels in injection molding tools. They created a part designed to reduce cooling time from 35.5 seconds to 18 seconds. Overall cycle time had a significant reduction of 34.2 percent. The researchers producing injection mold tooling through 3D printing resulted in higher SLM costs as well as lead time. However, manufacturing costs could be optimized if the cavity and core inserts were built in a single process.

Company 3D prints 'woven' benches from concrete

Berlin-based design firm Studio 7.5 worked with the 3D printing company XtreeE to make a series of outdoor benches with a woven concrete pattern. To give the benches their intertwined appearance, a six-axis robot extruded a continuous stream of concrete in a wavering motion, building up one layer of material on top of the next. The result is a woven pattern that gives the benches the appearance of being made from gray rope.

Study combines 3D printing with molecular control of polymer orientation

A team of scientists at the Department of Materials, ETH Zürich, proposed a way to use the shaping properties of 3D printing and the mechanical properties of molecularly oriented liquid-crystal polymers (LCP). The researchers established an approach to generate 3D lightweight, recyclable structures with hierarchical architecture and complex geometries for unprecedented stiffness and toughness. The study demonstrated the ability to combine top-down 3D printing with bottom-up molecular control of polymer orientation, opening the possibility to design and build structures that avoided the restrictions of the existing manufacturing process.

M&A and Investments

BASF expands 3D printing division with two acquisitions

German chemical company BASF acquired Advac3D Materials and Setup Performance SAS. As a result, BASF New Business (BNB) expanded its portfolio and selection of selective laser sintering (SLS) powders and the means to produce them. Advanc3D is a maker of SLS powders that works with Setup Performance in the development and production process. The two companies will be incorporated into BASF 3D Printing Solutions, which also previously acquired Dutch filament maker Innofil3D.

$10 million available to support 3D printing start-ups

The Entrepreneurial Universities programme will receive a $10 million (NZD) boost from the Government and University of Auckland (UOA). The funds will be used to support 3D printing start-ups. The Entrepreneurial Universities programme aims to position New Zealand as a world leader in additive manufacturing. The project will reportedly fast-track New Zealand's ability to develop more commercial products using Additive Manufacturing.

Boeing invests in fourth 3D-printing shop this year: Digital Alloys

Boeing, through its investment subsidiary HorizonX Ventures, participated in the $12.9 million Series B funding round of Digital Alloys, a Massachusetts-based additive manufacturing company. Digital Alloys' printing approach aims for a cost and time reduction over powder-based systems and offers higher resolution than other wire-based 3D-printing techniques. In addition, the company's Joule printing technology is capable of rapidly combining multiple metals into each part to enhance thermal, electrical, magnetic, and mechanical properties. The process allows metals, including titanium and high-temperature alloys, to be 3D-printed for structural aerospace parts used on Boeing products. Digital Alloys is at least the fourth 3D-printing startup Boeing has supported in 2018 through HorizonX,. The Series B funding round in which Boeing HorizonX Ventures participated was led by G20 Ventures, with additional participation by Lincoln Electric and Khosla Ventures.

Another 3D printing unicorn, Formlabs reaches $1 billion valuation, adds former GE CEO to board

Formlabs, a SLA and SLS 3D printer developer and manufacturer, has raised a further $15 million in funding and attained a $1 billion valuation. New Enterprise Associates (NEA), a technology and healthcare venture capital firm, led the round. Prior, Formlabs closed $30 million in Series C funding to help finance its expansion in China and Asia-Pacific regions. Formlabs has also continued to expand its product range, recently releasing the compact Fuse 1 SLS 3D printer and the Form Cell platform.

$2 million funding for new 3D printing virtual hub

The Australian government, in partnership with 3D printing bureau and reseller, Objective 3D, announced $2 million (AUD) in funding for a new additive manufacturing virtual hub. The virtual hub is a forthcoming website, providing access to existing additive infrastructure and R&D capability. The hub will be delivered by Australian Manufacturing Technology Institute Limited, an organization which represents manufacturing technology suppliers and users. The hub will act as the first port of call for any companies based in Victoria, Australia who wish to explore AM technologies.

Evolve Additive Solutions Receives $19 Million Investment from Lego and Stanley Black & Decker

Evolve Additive Solutions, a proprietary developer of a new 3D printing technology, Selective Thermoplastic Electrophotographic Process, received $19 million in equity from three investors, LEGO Brand Group, Stanley Black & Decker, and a third, undisclosed party. The investment from LEGO Brand Group and Stanley Black & Decker will be directed to help the company reach Beta stage rollout of its 3D printers and bring additive manufacturing to a larger market. The company primarily employs the technology to create prototypes in the development of new products.

Miscellaneous Partnerships

Xaar, Stratasys partner on new HSS 3D printing company

The new company, Xaar 3D Limited, will hold all Xaar's High Speed Sintering (HSS) assets. Xaar CEO Doug Edwards will chair the board of the new company. Xaar's HSS technology is an inkjet-based 3D printing method that uses a light-reactive binder to solidify powdered plastic.

Shapeways, Stratasys join forces for 3D printing joint venture

The partnership will see the duo provide designers and creators with easier access to full-colour multi-material 3D printing. The joint venture is inspired by the Stratasys J750, one of the only full-colour, multi-material 3D printers in the world, which the companies anticipate will bring the full potential of the printer to a wider market.

Nanoscale 3D printing company BMF Material Technology partners with CAD software developer

BMF will use Onshape's real-time data management platform to speed communication and collaboration with customers and help them optimize their CAD models for the most accurate parts possible. As BMF Material Technology works with its customers on their CAD models, Onshape records each edit in a detailed history log. Users can then click on any point in the timeline to go back to previous iterations of the design.

Automated metal additive manufacturing facility revealed by industrial NextGenAM collaboration

The facility is made up of a range of 3D printing, post-processing and quality assurance technologies, which are fully automated and integrated. Some manual steps of conventional AM workflows have been removed entirely, and the partners say the production of complex, lightweight and robust components can be achieved more profitably.

Sciaky's EBAM Systems adopted by FAMAero for optimized metal 3D printing

Sciaky, the creator of the Electron Beam Additive Manufacturing (EBAM) system, delivered its technology to FAMAero, a privately-owned metal 3D printed parts bureau based in Michigan. With its custom EBAM system, FAMAero (Future Additive Manufacturing in Aerospace) intends to provide cost and time efficient 3D printed components and prototypes for its clients within the aerospace, defense, oil and gas, and sea exploration industries.

Patents & Copyright

Desktop Metal and Markforged reach agreement over industrial espionage claims

Two Massachusetts-based 3D metal-printing startups, Desktop Metal and Markforged, reached a settlement mid-trial which resolves dueling claims that the companies stole trade secrets from each other to dominate the market for desktop-sized printers capable of making metal objects. The full terms of the agreement remained confidential.

Auto & Transportation

AREVO unveils first 3D-printed carbon-fiber eBike

AREVO, a software-controlled additive manufacturing technology leader, launched its eBike, the world's first battery-assisted bike utilizing a 3D carbon fiber frame. AREVO's 3D printing process combines software, robotics, machine-learning, and thermoplastic materials that provide designers and manufacturers to create durable products. AREVO's eBike can be customized for individual riders and competitively manufactured globally. AREVO partnered with OECHSLER, a manufacturer of automotive and medical parts.

BMW impresses with 3D printed roof bracket for BMW i8 Roadster

BMW created the first metal 3D printed part to be successfully produced for a road car: a roof bracket for the 2018 i8 Roadster. The bracket allows the soft top of the automobile to quickly fold and unfold in a zigzag configuration. The part has been in development for 10 years, delaying until 3D printing technology was capable of mass production. BMW has been previously utilizing 3D printing for over 25 years, primarily creating concept cars.

Michelin wants to 3D print wood tires and is developing a rubber 3D printing technology

Michelin plans to develop and print tires made from a combination of rubber and wood. The company hopes to launch the new tire in two years but may spend as much as a decade developing a 3D printing technology for rubber. The company is also investing in sustainable plantations in Brazil to source materials for its endeavours. The company appears to be partnering with AddUp, its metal 3D printing spinoff, to work on 3D printing polymers.

Volkswagen aims to 3D print parts for mass production cars in two to three years

Volkswagen has partnered with Hewlett Packard and GKN Powder Metallurgy to develop the "HP Metal Jet." It is intended to print "structural components" for vehicle production within three years. The HP Metal Jet is an "additive" process, in which material is added layer-by-layer to form a part. Volkswagen believes this new process will allow for the production of parts on a large scale, eliminating tooling, which is costlier and more time-consuming.

Aviation & Aerospace

Lockheed Martin 3D printed an impressive titanium dome for satellite fuel tanks

Lockheed Martin printed a titanium dome intended for satellite fuel tanks. The dome is the largest space part 3D printed to date. In addition, the company's new structure passed its last rounds of quality testing, ending a multi-year development program that seeks to build large, high-pressure tanks capable of carrying fuel on board satellites. The process of creating the fuel tank has been faster than traditional methods and reduced waste in the construction process. However, the fuel tanks required a traditionally manufactured, variable-length titanium cylinder, serving as the body.

Made in Space plans to turn asteroids into spaceships using 3D printing technologies

California-based Made in Space plans to use 3D printing to turn asteroids into autonomous spacecrafts that can fly to mining stations in outer space. The plan is part of the Reconstituting Asteroids into Mechanical Automata (RAMA) project, which is funded by NASA's Innovative Advanced Concepts (NIAC) program. Made in Space aims to enable space colonization with efficient and economically-viable off-world manufacturing. The NIAC program will provide $100,000 for feasibility studies as Made in Space plans to complete and successfully execute as asteroid spacecraft by 2030. Made in Space was previously the first company to put 3D printers on the International Space Station (ISS).

Auburn University, NASA, EWI and ASTM establish additive Manufacturing Centers of Excellence

ASTM International, a technical standards organization, selected three partners that it believes will help advance the current state of additive manufacturing. The partner organizations have established the Additive Manufacturing Center of Excellence, which will be located at EWI and in Auburn's Samuel Ginn College of Engineering in Alabama. The Additive Manufacturing Center of Excellence will be supported by ASTM through funding, goods in-kind, and other miscellaneous services. NASA will provide insight into aerospace-grade manufacturing at the center. Auburn will contribute its additive manufacturing research expertise to the project. Finally, EWI will generate strategic industry consortia for further collaboration. In addition, NASA and Auburn University are establishing a National Additive Manufacturing Center of Excellence to complement the ASTM center.

Air New Zealand is looking towards 3D printing to produce metal aircraft parts

Air New Zealand has partnered with Zenith Tecnica, a company also based in New Zealand that specializes in the additive manufacture of titanium parts. Zenith Tecnica harnesses electron beam melting (EBM). Air New Zealand has also been looking into new processes in collaboration with Auckland University, Victoria University of Wellington, and a number of technology companies. In addition, it has been using a laser 3D scanner for part and tool designs and interior modelling. The airline is prototyping metal-printed framing for its Business Premier cabin, and novelty wine aerators to test the technology.

Launcher successfully test-fires EOS 3D printed copper rocket engine

Launcher, a company using 3D printing to develop a liquid oxygen/ kerosene rocket to transport satellites into low-Earth orbit, has successfully test fired a 3D printed copper alloy E-1 engine. The company's goal has been to provide low-cost solutions for entrepreneurs seeking commercial satellite launch. With additive manufacturing, Launcher has been able to develop engines at a faster rate than with traditional manufacturing.

NASA tests new antibacterial 3D printing filament

NASA is testing the suitability of an antibacterial 3D printer filament for use in future space missions. The filament is made by Copper3D, a Chilean company with a base in the U.S. The study, which was conducted with the University of Nebraska at Omaha, aims to overcome the health challenges faced by NASA astronauts in space. PLACTIVE contains copper nanoparticles which are effective in removing viruses, fungi and bacteria, and are harmless to humans. Working with the 3D printable PLACTICE material, a polylactic acid polymer with 1 percent antibacterial nanoparticles, the Department of Biomechanics at the University of Nebraska manufactured the 3D printed finger prostheses.

Health & Life Sciences

3D printing trial launched to help amputees in Madagascar and Togo

Humanity & Inclusion launched a trial effort in Madagascar and Togo, utilizing 3D printing to provide affordable prosthetics. HI is part of Impact 3D, a scheme funded by the Belgian Development Agency. Impact 3D is responsible for fabricating 100 orthopedic devices for those in need in Togo, Mali, and Niger, with a focus on remote and conflict-torn regions. Recipients of artificial limbs are scanned by a small and lightweight scanner to render a 3D model of the part of the body which requires a prosthetic, saving time. The scans are then used to create a digital mold which is used by a PC system to adapt a prosthetic to the shape required to fit the amputated limb. Preliminary findings indicate the 3D printed sockets are a "safe and effective alternative to current socket designs." In addition, the process eliminates the need for multiple fittings. HI intends to expand the trial to other areas.

ClearCaps uses Structo 3D printers to produce 250 Clear Aligner models in 24 hours

German clear dental aligner brand, ClearCaps, is leveraging dental-specific 3D printers from Singapore-based company, Structo, to accelerate its expanding volume manufacturing operations. ClearCaps uses state-of-the-art 3D software for tracking its cases including a 3D simulation of the patient's treatment. Now Structo's Mask Stereolithography (MSLA)-powered DentaForm 3D printers form an integral part of the Berlin company's manufacturing facilities. The DentaForm can print up to 10 clear aligner models in 30 minutes thanks to its large-build volume measuring 200 x 150 mm and high print speeds. ClearCaps currently prints around 250 models every 24 hours, but the company plans to improve that scale soon.

University Medical Centre Utrecht researchers experiment with 3D bioprinted living tissues to treat arthritis

A team of researchers at the University Medical Centre (UMC) Utrecht in the Netherlands are experimenting with 3D bioprinted tissues that can be implanted into a living joint affected by arthritis. The method may allow the replacement of damaged cartilage. Using 3D bioprinting, patients can receive cell-specific and on-demand cartilage that would potentially grow as original cartilage. As part of the 3D JOINT project, the UMC Utrecht team is building upon the capabilities of 3D printers and the deposition of stem cells. Using the 3D bioprinting technique and following a medical blueprint, stem cells are deposited by 3D printers creating complex tissues layer by layer. The team uses a 3D printing technique called melt electro-writing that combines melted polycaprolactone with an electrical field that creates fibres to create scaffolding. It is also now developing this process to create larger structures while including different materials for combined bone and cartilage tissue replacements. This will ultimately reach UMC Utrecht's goal to 3D print a complete joint.

University of Minnesota researchers create 3D printed implant that restores function in spinal cord

Researchers at the University of Minnesota (UMN) have developed a prototype for a 3D-printed scaffold with living cells that could help restore some function to patients with spinal cord injuries. In the UMN's study, the researchers demonstrate the process of a bioprinted scaffold made from silicone and stem cells which can be placed within a patient's spinal cord. This device would be implanted into the injured area of the spinal cord where it would serve as a type of "bridge" between living nerve cells located around the injury. This process allows researchers to use any kind of cell from an adult, then by using new bioengineering techniques, the researchers can reprogram the cells into neuronal stem cells. The engineer can 3D print these cells onto the silicone base. This prototype marks the first time anyone has been able to directly 3D print neuronal stem cells derived from adult human cells on a 3D printed guide and have the cells differentiate into active nerve cells in the lab. Several universities have also been developing 3D printed scaffolds for the treatment of damaged nerves and cells.

3D printed placenta on a chip gives clues to how conditions pass from mother to child

One of the least-understood organs in the human body is the placenta, considering its formation and function has been difficult to study. Researchers at TU Wien in Vienna have 3D printed a placenta on a chip, studying the permeability of the placenta and gain a better understanding of how it works. In addition, the researchers wish to study how glucose and nutrients transfer from mother to child. Studies have shown that conditions such as diabetes and high blood pressure can pass from mother to child, but it has been nearly impossible to study exactly how. Tu Wien researchers developed a special femtosecond laser-based 3D printing process to produce customized hydrogel membranes within microfluidic chips, which are then populated with placenta cells. The researchers can use the chip to closely monitor biological parameters. They can also test different drugs on the 3D printed tissue, observing the progression of diseases and the rate of cure.

Researchers 3D print prototype for 'bionic eye'

A team of researchers at the University of Minnesota (UMN) have 3D printed an array of light receptors on a hemispherical surface, marking a step toward creating a "bionic eye" that could help blind people see or improve vision of sighted people. The researchers reached 25 percent efficiency in converting the light into electricity they achieved with the fully 3D-printed semiconductors. Reportedly, their 3D-printed semiconductors are showing that they could rival the efficiency of semiconducting devices fabricated in microfabrication facilities. In addition, the UMN can print a semiconducting device on a curved surface. The team aims to create a prototype with more light receptors and develop the capability to print on a soft hemispherical material that can be implanted into a real eye.

3D printed implant gives Patches the Dachshund a new skull

American and Canadian veterinarians removed a tumor from a Dachshund dog's forehead, which resulted in the removal of almost 70 percent of the animal's skull. The veterinarians used 3D printing to tailor a titanium plate to match what remained of the bone and then implanted the custom-made plate in the dog's head. The technology uses two-dimensional CT scans to make 3D models before operations, which also allows surgeons to plan their approach in advance. 3D printing has been used to make implants that replace damaged mandibles and leg bones, but the practice has not entered mainstream use in surgery in small veterinary clinics. Costs associated with 3D printed custom implants can be prohibitive, but the condition of some animals requires such implants.

Chung-Ang University Hospital succeeds in 3D-printing chest transplant

A team at the Chung-Ang University Hospital's Department of Thoracic and Cardiovascular Surgery announced the successful surgery results of transplanting a 3D-printed ribcage to a patient with a malignant tumor that invaded the thorax. The male patient needed an extensive resection. However, it was difficult to create a prosthesis that fit his thorax through reconstructive surgery using conventional bone cement. The team designed the artificial ribcage, composed of pure titanium, that matched the reconstruction range, using 3D printing technology in consultation in association with the Korea Institute of Industrial Technology. The procedure marked the sixth success in the world following ones in Spain, Italy, the U.S., Britain and China. The titanium chest cavity is lighter than conventional artificial materials and can minimize infections and complications after surgery as it is tailored to the patient's chest to improve precision and strength.

3D-printed implants successful in foot and ankle surgery

Advancements in 3D printing have allowed foot and ankle orthopaedic surgeons to use custom-made implants for difficult foot and ankle cases. The implants offer a new approach to treat complex lower extremity pain and deformities. Researchers at Duke University Department of Orthopaedic Surgery studied 15 patients who received custom 3D-printed titanium implants between 2014 and 2016 to treat poor bone quality, bone loss, and deformity. CT scans showed that the custom 3D-printed titanium implants were successful in 13 of the 15 patients. The benefits of 3D-printed implants include unlimited

shapes, options in size, and less morbidity or complications. The study notes that longer-term follow-up is needed to understand the longevity and potential complications of these 3D-printed implants.

Hornbill gets second chance at life with 3D-printed prosthetic

In Singapore's Jurong Bird Park, a great pied hornbill developed an aggressive form of cancer, and doctors acted quickly to save him with a 3D-printed prosthetic casque. Following a collaboration between the park's team and the Keio-National University of Singapore (NUS) Connective Ubiquitous Technology for Embodiments Center, the NUS Smart Systems Institute, the NUS Center for Additive Manufacturing and the Animal Clinic, the hornbill was provided a 3D-printed prosthetic casque that would cover the original space occupied by the natural casque while it recovered and regrew following the removal of the cancer.

Manufacturing & Construction

Sand 3D printing used for Smart Slab ceiling for ETH Zurich's DFAB house

At its thinnest point, the Smart Slab is only 20 mm thick, and while it was not 3D printed directly, the mold for the slab was made from a 3D sand printer, making it the first full-scale architectural project to use 3D sand printing for its formwork. The ceiling is 80 meters squared, weighs 15 tons and consists of 11 concrete segments that connect the lower floor with the two-story timber space above.

French family first to move into 3D-printed house

As part of an initiative led by the University of Nantes (IUT) in Nantes, France, a family became the first in the world to occupy a 3D-printed, four-bedroom house. The house is part of a social housing project, Yhnova, which seeks to build affordable, adaptable and energy efficient housing in a time- and cost-effective manner. The Yhnova project's stakeholders are planning to construct a suburban neighborhood using the same building principles. The house took 54 hours to print using BatiPrint3D technology, excluding the four months taken for contractors to fit windows, doors and roof fixtures. The building cost of the house totalled an estimated £176,000 ($235,000 USD), which is 20 percent cheaper than an identical construction with traditional methods.

Dutch group planning 3D-printed commercial housing project

Engineers, contractors and architects in the Dutch city of Eindhoven are partnering on Project Milestone, which will use a 3D printer to fabricate five concrete houses. The first home in the commercial housing development, a three-bedroom dwelling of just over 1,000 square feet, is expected to be completed in mid-2019. The initiative is anticipated to take five years because the technology is still being refined. The main goal of the initiative is to demonstrate how 3D printing can cut costs and concrete waste.

U.S. Marines build 3D-printed concrete barracks in less than 40 hours

In Champaign, Illinois, the U.S. Marine Corps built a 500-square-foot concrete barracks using 3D printing in 40 hours. Similar jobs using wood takes 10 marines five days to build. A Marine Corp representative said the exercise marks the first time a 3D building has been built in an onsite, continuous concrete print. Navy Seabees also participated in the project, which was accomplished at the U.S. Army Engineer Research and Development Center.

Wasproject 3D prints trabeculae pavilion in Milan

Italy-based 3D printing company, Wasproject, printed a trabeculae pavilion covering 36 m^2 and weighing 335 kg. at the Politecnico di Milano, Piazza Leonardo da Vinci in Milan. The bioinspired, lightweight structure took 4,352 hours to print using four DeltaWASP 4070 and one 60100 printers to continuously produce the structure out of 352 parts. The structure is made of a biopolymer developed by FILOALFA.

WASP launches 3D-printing construction system for sustainable housing

Italian 3D printing company WASP rolled out a construction system, the Crane WASP, designed to print sustainable houses for WASP's Shamballa village project to develop 3D-printed, eco-friendly houses. The printer is composed of a main printer unit that can be assembled in different configurations depending on the dimensions of the architectural structure to be calculated in 3D. The Crane WASP is designed to have a smaller footprint than the BigDelta WASP, a 36-feet-tall 3D printer the company had previously made to print houses for the Shamballa project.

Lockheed lands $5.8M DoD contract to improve 3D printing automation

Lockheed Martin secured a two-year, $5.8-million contract from the U.S. Department of Defense's executive branch and the Office of Naval Research (ONR) to accelerate the automation of industrial additive manufacturing systems. Lockheed Martin's Advanced Technology Center will apply software and sensor modifications to multi-axis 3D printing robots to develop AI additive manufacturing machinery. Lockheed investigators will measure the performance attributes of systems parameters as well as a part's microstructures, and align them to material properties before integrating this information into a working system. This will allow machines to make decisions on how to print a part.

BASF invests $25M in Materialise to boost industrialization of 3D printing

BASF is expanding its partnership with Belgium-based 3D printing firm Materialise with a $25-million investment intended to accelerate the development of 3D printing applications and create business opportunities. The partnership aims to improve materials and software for 3D-printing technologies and bring them to market faster within the framework of an open business model. The companies principal focus will be on the consumer goods sector and the automotive and aviation industries.

VEEM, Aurora Labs partner to develop 3D printed boat parts

Australian companies VEEM and Aurora Labs signed a five-year agreement to explore whether Aurora Labs' 3D printing and large format technology can achieve cost and efficiency savings in the manufacture of VEEM's propellers, fin systems and gyrostabilizers. VEEM will use the S-Titanium Pro, which uses Aurora Labs' Large Format technology (LFP) to print metal components with Direct Metal Laser Sintering (DMLS), Direct Metal Laser Melting (DMLM) or Directed Energy Deposition (DED) processes. In the first stage of the partnership, VEEM will review and analyze Aurora's products. Next, Aurora will assist VEEM in the assessment of the potential value of utilizing Aurora's technology and products in VEEM's operations. In the third stage, both companies will evaluate the potential opportunities for government R&D funding towards projects related to its venture program. The final stage will include VEEM making an equity investment in Aurora Labs.

3D Systems partners with Georg Fischer to develop factory automation software

3D Systems entered a strategic partnership with Georg Fischer division GF Machining Solutions to develop software for material handling systems, milling equipment and other subtractive and additive manufacturing methods. The companies intend the software to allow a seamless workflow within smart factories. the companies say manufacturers will be able to more efficiently produce complex metal parts within tight tolerances. The integrated system is intended to foster new designs, business models and markets.

BigRep, Bosch Rexroth collaborate to create 3d printing systems for smart factories

Germany-based large-format 3D printer manufacturer BigRep is partnering with global engineering firm Bosch Rexroth to integrate CNC control systems and drives into novel additive manufacturing systems. The collaboration plans to create 3D printers for use in smart factories which incorporate IoT and end-to-end digital monitoring of machines.

Singapore researchers develop smart tech for synchronized 3D printing of concrete

Investigators at Nanyang Technological University, Singapore (NTU Singapore) created a technology called swarm printing, in which two robots work in tandem to 3D-print concrete structures. The NTU robots 3D-printed a concrete structure measuring 1.86m x 0.46m x 0.13m in eight minutes. It took two days to harden and one week for it to achieve its full strength before it was ready for installation. The researchers envision the printing technique evolving into highly-mobile teams of robots able to move quickly to the next job once they've finished printing a structure.

Robot 3D prints temporary architectural installation using stones, twine

ETH Zurich used a mobile construction robot to build an outdoor architectural installation with 120 km of string and more than 30 metric tons of loose stones in front of the Gewerbemuseum Winterthur in Switzerland. The university created the structure as part of its ongoing "Design and Robotic Fabrication of Jammed Architectural Structures" research project to investigate and develop techniques for the design and robotic aggregation of low-grade building material into load-bearing architectural structures.

U.S. students 3D print sustainable house for Solar Decathlon China 2018

For the Solar Decathlon China 2018, a team of students from Washington University 3D printed a 650-square-foot, single-story solar house, the Lotus House, designed to look like a flower. The team worked with Additive Engineering Solutions in St. Louis to produce sample wall framework and furniture. Then, in China, they spent five weeks working with Beilidato to create the walls and roof. During this time, they also finalized electrical systems, floors, HVAC, and insulation. Construction began in September. The team created custom formworks using 3D printing and the results served as molds for the concrete side panels. According to the team, just after 10 uses the 3D printed mold paid for itself.

U.K. researchers develop asphalt printer to patch potholes

Investigators from University College London (UCL) developed an asphalt 3D printer designed to repair cracks and potholes in roads. The team aimed to create a ductile solution to address cracks and potholes forming in worn out or damaged roads. By using the frame and control system from an existing RepRap Mendel 90 3D printer, the researchers began to develop a portable asphalt 3D printer. Using a customized 3D printer, the researchers found asphalt can be extruded into crevices in road surfaces, eliminating the need for costly, large-scale paving.

Clothing & Wearables

Designers use 3D printing to create high-heeled shoes

Designers Ica and Kostika rolled out a studio dedicated to creating footwear using computational design and 3D printing. To make the team's Mycelium Shoe, the wearer downloads an app and takes a series of photos of their feet. An algorithm then creates a 3D representation with allowances for improved fit. Each shoe is 3D printed and finished with automotive grade technologies to form the final structure. Ica and Kostika will only make five limited edition Mycelium Shoes available for pre-order later this year as part of an ongoing collection entitled Exobiology. The shoe will be discontinued indefinitely once sold.

Japanese designer develops 3D-printed shoes

Japanese fashion designer Mikio Sakabe launched a fashion tech label called Giddy Up, for which Sakabe combine his affinity for architecture with advanced 3D printing. Sakabe intends the Giddy Up line of shoes to be "the most recognizable sneakers you can buy right now."

STAINLESS, Utinam Besançon 3D print functional metal watch

Global specialist metals supplier STAINLESS partnered with France-based clockmaker Utinam Besançon, to 3D print a fully-functioning metal watch. The wristwatch was designed by Utinam's Grand Prix winning clockmaker, Philippe Lebru and 3D printed by the company's apprentices at the Créativ Lab of Union des industries des metiers de la metallurgie de franche comte (UIMM). Commissioned by STAINLESS to mark its 90th anniversary, the UIMM said the watch is the first of its kind.

Food

Pixels to plate: Dutch chef uses 3D printers to create tasty works of art

Jan Smink, a top Dutch chef, is using local ingredients from his parents' farm to 3D print food in unique shapes, such as an avocado octopus or meat "bowls" filled with curry sauce. Although other chefs have printed dishes before, Smink is the first to give printed food a permanent place in each course on the menu at the new Restaurant Smink. He said 3D printing provides "something extra" for his guests. Smink is testing the technology at his restaurant in his hometown of Wolvega, testing the technology on friends. If 3D printed dishes prove popular and the devices, each nearly $4,000, get cheaper, pixels to plate could improve nutrition and fight waste by transforming unappealing food into works of art.

Barcelona researcher develops 3D printer that makes 'steaks'

To bring together haute cuisine and 3D printing, scientist Giuseppe Scionti, who specializes in biomedicine and tissue engineering, created an alternative to meat that can be printed out. Using entirely plant-based ingredients, he's created "steaks that imitate the texture of meat. Scionti spent three years developing his creation at the Polytechnic University of Catalonia (UPC) and believes his idea could reduce the impact of animal agriculture. He wants to present the project to the World Food Organization because the meat could be produced with specific properties to combat malnutrition. Scionti said celebrity chef Ferran Adrià and the research center run by the Roca brothers, who head the top-rated Celler de Can Roca restaurant in Girona, have expressed interest in "something that looks like a steak but tastes like a mushroom." Using his creation, based on AutoCAD software, it takes between 30 and 50 minutes to create a 100-gram piece of "meat." Once the steak comes out of the printer, it is ready for cooking. Scionti said work needs to be done to improve the appearance of the steaks, which he said could be improved with an "investment of time and new prototypes." For now, printing 100 grams of this meat alternative costs €2, although the price will go down as volume increases."

Filaments.ca releases fully food safe PLA for 3D printers

Filaments.ca, a Canadian webstore for 3D printer materials, released a fully food safe filament range called True Food Safe PLA (True FS PLA), which can be used to 3D print cups, cutlery, cookie cutters, utensils, cake toppers and other culinary equipment. The PLA is made using FDA-approved raw materials and follows a six-stage process for safety. Good Manufacturing Practices (GMP) and clean manufacturing procedures are maintained on-site to guarantee the elimination of any pathogens and contaminants. The PLA is sourced from bioplastic manufacturer NatureWorks LLC's Ingeo range of materials, which are produced to improve upon the standard toughness and adhesion properties of standard PLA. Like all PLA filaments, True FS is a plant-based polymer, made from renewable resources and byproducts like corn starch and cassava roots. Filaments.ca cautions that while the PLA is food safe, other components that come into contact with the material when 3D printing may not be.

Canning Town school 3D prints its lunches

St Helen's Primary School in Chargeable Lane, London, U.K., is 3D printing its lunches to highlight the role STEM (science, technology, engineering and math) subjects play in children's lives. The project is being organized by The Bing Bang Fair, an event aimed at getting children interested in STEM subjects. In a study conducted by the fair, researchers found 71 percent of students through it was important to have access to emerging technologies like 3D printing. The lunch menu included geometric fish and chips, space broccoli and fibonacci spiral squash.

Consumer Goods & Retail

Researchers develop 3D-printed batteries

Scientists at Carnegie Mellon University and Missouri University of Science and Technology invented a method of 3D printing battery electrodes that creates a 3D microlattice structure with controlled porosity. 3D printing the microlattice structure significantly improves the capacity and charge-discharge rates for lithium-ion batteries, the research team showed.

Investigators create 3D-printed toilet

Researchers at National University of Singapore (NUS) developed a toilet unit design that can be 3D printed in less than five hours and is 25 percent less expensive to produce than conventional toilets. The team is aiming to deliver their first unit to India. The project is one of two research projects by the NUS Centre for Additive Manufacturing's Construction 3D Printing Programme. The second project could help speed up the construction of a typical public flat's bathroom by nearly 24 times. The bathroom's formwork, molds into which concrete or similar materials are poured, is 3D printed and consists of polymers instead of steel and timber. Using the 3D printed formwork, up to 24 bathroom units could be constructed in a day using a semi-automated production line.

Chinese sex doll maker adopts additive manufacturing

Dalian, China-based colloid model maker DS Doll is using 3D scanning and printing techniques to manufacture parts for sex robots with AI and full body movement. The company is planning to release the first generation of its cyborg companion that can be mass produced and sold to customers across the world. While DS Doll currently only uses 3D printing to make individual parts for the robots, the company is aiming to quickly make large quantities of sex robots by integrating 3D printing technology into its production line process.

Education

PrintLab expands 3D printing curriculum

PrintLab, a 3D printing reseller in the U.K., launched additional language options for its PrintLab Classroom learning program. A Polish program, which was developed in collaboration with Polish 3D Technology & Education supplier Paxer, will be the first to launch. Spanish and Chinese versions are slated to launch later this year. The program aims to educate students in 3D printing to boost interest in STEM-based careers. The PrintLab Classroom began in January 2018 and educates children in additive manufacturing (AM) technology by integrating it into core STEM topics. The program includes supplementary information on 3D printing and modelling and tutorials for popular EdTech software such as Tinkercad, SketchUp and Meshmixer. PrintLab joins others in the effort to encourage the development of AM skills, such as MakerGirl, a non-profit organization that uses 3D printing to teach young girls STEM skills, and Project Magnify, Los Angeles-based initiatives to offer students after-school 3D printing workshops to encourage STEM education.

Sculpteo launches cloud-based 3D printing educational service

3D printing service bureau Sculpteo launched a Fabpilot Education Program under which institutions will be able to integrate its cloud-based management software into their 3D printing efforts. The service provides educational tools to increase the efficiency and reduce the operating costs of 3D printers. Sculpteo, which provides on-demand 3D printing services for rapid prototyping, developed Fabpilot, cloud-based Software as a Service (SaaS) that allows third parties to manage their 3D printing fleet. The program comes with educational tools for 3D printing design and nesting software to improve the quality of the projects, project quotations, and order tracking. It also allows for students and teachers to ability to monitor machines and material usage, and cloud-based storage for designs.

Unique 3D printed tactile map helps visually impaired students navigate USF campus

A visualization specialist at the University of South Florida in Tampa, Howard Kaplan, may soon provide visually impaired students with a unique 3D printed tactile map for some classrooms on campus. Kaplan developed an encoding system that creates tactile symbols, ensuring they have a proper height, texture and depth for proper finger navigation. They are then 3D printed using plastic filament. So far, six USF classrooms have been encoded, which include details such as location of emergency exits. The department connected Kaplan with five students who started testing personalized tactile maps this summer. The 3D printed USF tactile maps are expected to be ready for public use in spring 2019 and will be located outside classrooms.

Environmental Efforts

Nano Sun 3D printing reduces water pollution

Nano Sun, a Singapore based start up and a spin-off from Nanyang Technological University (NTU), has opened a new 3D printing factory that it hopes will have a major impact on water pollution. The company will use 3D printing to make water filtering membranes with millions of extremely fine fibres. With additive manufacturing, these membranes are five times more efficient than membranes built with traditional processes. The water filtering membranes are used by industrial enterprises to remove pollutants from waste water. Early customers include two large multinational semiconductor enterprises based in Singapore. A waste water treatment plant in China, with capacity to process 20 million litres of water per day will also be using the 3D printed membranes. To date, approximately $6 million has been invested by Nano Sun to open the factory. Additional applications for the technology include kidney dialysis and potential a man-made skin product.

World's largest 3D printed reef installed at Summer Island Maldives

Scientists at Monaco's marine-protected Larvatto Bay used 3D printing to create artificial coral reefs to restore the Maldives' biodiversity and promote the growth of a coral reef ecosystem. On August 11th, the world's largest 3D printed reef was installed at Summer Island, in what is hoped could be a new method to help coral reefs survive a warming climate. The artificial reef, made from hundreds of ceramic and concrete modules, was submerged at 'Blue Lagoon.' The project started in Melbourne, Australia, where industrial designer Alex Goad of Reef Design Lab used computing modeling to design reef structures that resembled the coral reefs found in the Maldives. The new reef sits in seven meters of water, close to the resort's existing coral nursery. Fragments of coral were transplanted onto the 3D printed reef and will hopefully colonize the 3D printed reef. The resort aims to study the 3D printed reef with the help of marine biologists over the coming years. Goad will make his modular 3D designs open source for other researchers to benefit without having to pay a licence fee.

Arts & Entertainment

3D printing harnessed to produce wheelchair Comic-Con costume for young Star Wars fan

A Massivit 1800 3D printer has been used to produce a Poe Dameron X-Wing Fighter wheelchair costume for a young Star Wars fan to wear to Comic-Con International, San Diego. Magic Wheelchair, a non-profit organisation who provide bespoke costumes for children who rely on the use of wheelchairs free of charge, collaborated with a host of companies to design and manufacture the costume for 13-year-old Vedant Singhania. The charity welcomed contributions from Pixologic, who designed and modelled the costume, Dangling Carrot Creative, who 3D printed the costume with materials donated by Massivit 3D, and Monster City Studios, who completed assembly.

Sports

3D printed surfboard fins help surfers optimize performance and catch extra waves

Researchers from the University of Wollongong (UOW) have used 3D printing to quickly prototype and test numerous surfboard fin designs. The researchers hope to kick-start a niche manufacturing industry and revolutionise surfboard designs with their 3D new shapes of 3D-printed surfboard fins, designed and manufactured at the Australian National Fabrication Facility node at the UOW. These 3D printed surfboard fins are part of the UOW's Global Challenges program. The team's main goal was to break through design and manufacturing conventions for surfboards, and develop new sizes and materials that are more efficient and tailored to suit the individual user and the waves. As part of their effort, they also packed surfboards with sensors and GPS tracking devices to gather data on every wave, at every speed and during all turns and airs.