Benesch

3D Printing Quarterly Report—Q3 2020

3D PRINTING–A FAST-MOVING MARKET

Developments in 3D Printing

A Sector by Sector Overview

This report explores developments in 3D printing across several sectors and categories for the quarterly period of June 1, 2020 to August 31, 2020.

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General and Services

Freeform injection molding service by Mitsubishi Chemical Advanced Materials

Mitsubishi Chemical will be offering Free Form Injection Molding (FIM) as a service, building on a prior collaboration in this process with Danish startup Addifab. With Addifab's process, molds are 3D printed out of photopolymer resin and then cured. This mold is then filled and later dissolved similar to lost wax casting. Addifab performs short-run manufacturing with many more materials than are possible with 3D printing alone. Startup costs are lower than molding and the lead times are faster as well. Mistubishi Chemical will begin by offering FIM services at three locations: Mesa, AZ; Tielt, Belgium; and Tokyo, Japan. Mitsubishi will offer FIM as a service in Arizona in early Q3 and somewhere toward the end of 2020 at the other locations.

AMCM launches M 4K industrial metal additive manufacturing machine for meter-high parts

Additive Manufacturing Customized Machines (AMCM), an EOS Group company based in Germany, launched its AMCM M 4K-1 (single laser) and AMCM M 4K-4 (four laser) industrial Laser Beam Powder Bed Fusion metal additive manufacturing machines. Built on the EOS M 400 platform, the AMCM M 4K is designed for the production of large components, with a build height of up to one meter. Additional features include increased robustness of the frame design, a filter system (RFS 2.0) and optional soft recoating. The AMCM M 4K can produce parts from a wide range of materials, including aluminum, nickel alloy and copper alloy.

Researchers mimic nature for fast, colorful 3D printing

Researchers at the University of Illinois, Urbana-Champaign, studied how a modified 3D printing process can provide a versatile approach to producing multiple colors from a single ink. Some of the most vibrant colors in nature come from a nanoscale phenomenon called structural coloration. When light rays reflect off these periodically placed structures located in the wings and skins of some animals and within some minerals, they constructively interfere with each other to amplify certain wavelengths and suppress others. When the structures are well ordered and small enough, about a thousand times smaller than a human hair, the rays produce a vivid burst of color. The team is working on expanding the industrial relevance of the process, as the current method is not well suited for large-volume printing.

Shining 3D launches EinScan Pro HD 3D scanner

Shining 3D, a Hangzhou-headquartered 3D printer and scanner manufacturer, launched its EinScan Pro HD, a handheld 3D scanner. Featuring a multi-functional and modular design typical of Shining 3D's EinScan Pro line, the EinScan Pro HD aims to deliver improved performance in capturing high resolution scans for a versatile range of applications. Shining 3D implemented a modular projection light structure in the EinScan Pro HD scanner, which means the stripe reserved for the Fixed Scan Mode is utilized in the Handheld HD Scan Mode. This helps to improve the overall resolution of the scanner; the EinScan Pro HD's handheld mode matches the levels achieved by its fixed scan alternative.

Korean researchers 3D print efficient gamma radiation detectors

A team of researchers from Hanyang University, Seoul 3D printed plastic scintillators capable of detecting gamma radiation in an efficient manner. The DLP printed parts were tested against a commercially available scintillator, BC408, and the team found that their creation showed a similar decay time and intrinsic detection efficiency. The researchers would like to develop the research further and formulate a resin recipe, one that creates parts with high density and an even higher detection efficiency in the presence of gamma radiation.

ProtoSpray enables 3D printed touchscreens for interactive parts

Researchers at the University of Bristol found a way to advance the modern touchscreen with 3D printing. Using an interactive display that is sprayed onto 3D printed parts, the team introduced ProtoSpray, in collaboration with the MIT media lab. The team expects that they will continue with this project in designing a machine that offers an all-in-one production technique for 3D printing and spraying. The researchers liberated displays from their 2D rectangular casings by developing a process so people can build interactive objects of any shape. The process is accessible, allowing end-users to create objects with conductive plastic and electroluminescent paint even if they don't have expertise with these materials.

Ultimaker Essentials 3D printing software targeted at enterprises

Dutch-based Ultimaker launched a software solution meant to help customers get past some of the main barriers of additive manufacturing adoption. The paid subscription-based platform is called Ultimaker Essentials, and will allow companies to integrate 3D printing into their IT infrastructures, in addition to distributing and updating their existing additive manufacturing software. Ultimaker Essentials includes an eLearning platform to help customers gain knowledge about the technology. Ultimaker's software offering can streamline the process by ensuring that any plugins and updates are introduced to an organization's users at the same time, which gives employees more control access especially helpful during this time when COVID-19 is disrupting daily business.

Proplanner set to integrate 3D visualization into Assembly Planner software using HOOPS

Tech Soft 3D, a provider of software development kits, will be using its HOOPS Platform to help Proplanner integrate 3D model data into its Assembly Planner software. This will allow Proplanner's customers to better plan out their engineering workflows, consolidating 3D model data, the Bill of Materials and the Bill of Process all into one wrapper. Using the HOOPS platform, customers can easily import and visualize CAD models in all their 3D glory, while also extracting to underlying numerical data. The functionality aims to create linkages between process models and CAD models. HOOPS Exchange will be used to build robust CAD data translation capabilities into the application. HOOPS Visualize and HOOPS Communicator will be used to develop the 3D model visualization functionality on desktop, mobile and the web.

PrintSyst.ai's 3D printing AI promises superior print success rates

AI specialist PrintSyst.ai launched its AI engine for 3D printing, the 3DP AI-Perfecter. The pre-printing evaluation tool is designed to enable professionals working in aerospace, defense and automotive to increase their print success rates with ever-improving ML algorithms. The company believes its product will reduce labor costs in the long run, while shortening the time-to-market for its clients.

ExOne launches Sand 3D Printing Network powered by over 40 binder jetting machines

ExOne will launch an international Sand 3D Printing Network, made up of more than 40 binder jet printing platforms throughout North America. The network was set up to provide greater access of ExOne's sand 3D printing technologies to manufacturers working in industries such as aerospace and automotive. Through this service, ExOne S-Max and S-Print platforms will be deployed by premium patterns shops and foundries to provide 3D printed sand moulds and cores to manufacturers within typical timeframes of three to five days. The network is comprised of S-Max and S-Print machines spread throughout the U.S., Canada and Mexico. ExOne's machines can also support an array of foundry materials, including aluminium, bronze, copper, nickel-based alloys, iron, magnesium, steels, titanium and zinc.

Thor3D releases Calibry Mini 3D scanner for digitizing small objects

Dusseldorf- and Moscow-based Thor3D released the Calibry Mini 3D scanner to the handheld Calibry product range, which is meant for capturing high-resolution data of smaller objects. Designed to digitize objects from up to 30 cm in length, the Calibry Mini features a high resolution of up to 0.15 mm, which Thor3D says allows the small 3D scanner to "capture even the most intricate details," such as fingerprints. These functionalities of high-quality resolution combined with the scanner's intuitive interface may result in a useful tool for museums and archaeologists, medical professionals, and schools and universities.

Protocube Reply presents virtual interactive showroom solution

3D printing company Protocube Reply has made available its Virtual Interactive Showroom solution aimed at virtualizing environments and products for B2C and B2B markets. The solution enables an effective digital transposition of objects and events traditionally necessitated by physical interaction, such as exhibition venues, trade shows and consumer products, and aims to respond to the needs for opportunities and forms of business outlined by the companies and customers that were most affected by the COVID-19 outbreak. Virtual Interactive Showroom is aimed in particular at operators and players in the trade fair industry due to its high level of involvement and engagement with customers and visitors. The solution allows for the exploration of virtual environments, either independently or with the support of remote operators, which reproduce physical experiences such as making purchases in showrooms or taking part in events and trade fairs.

Optisys creates one-meter-long 3D printed metal antenna

Utah-based Optisys produced an antenna fitted with slots, in the form of a large, flat panel. The Optisys team claims that this is the "largest single print all metal antenna" to date worldwide. They expect it to be used for development in aerospace applications, as well as on the ground, and in the ocean. Versatile and modular, the 3D printed large metal tile can be built into a larger array. The tiles can be fabricated as "building blocks" and used in a range of applications, especially those requiring flat parts with tight tolerances.

ORNL's new AI platform assesses 3D printed parts in real-time

Oak Ridge National Laboratory is developing an AI software called Peregrine, meant to improve the quality of functional parts being produced via powder bed 3D printers. Peregrine requires no "expensive characterization equipment," yet possesses the ability to evaluate parts during manufacturing. Throughout the production process, information is collected and assessed, analyzing the details of design, selection of materials, print builds and material testing.

MakerBot CloudPrint software makes remote, collaborative 3D printing seamless

To facilitate increasing need of remote print capabilities, MakerBot is launching a workflow meant to make remote 3D printing collaboration easier. The MakerBot CloudPrint software, formerly called MakerBot Cloud, is a next-generation 3D printing platform that ensures all individuals and teams can collaboratively use 3D printing across multiple devices both onsite and remotely. MakerBot CloudPrint marries cloud scalability with familiar software features to create a 3D printing workflow management solution that makes it easier for users to prepare, queue, print, manage and monitor their jobs.

Dubai Electricity and Water Authority deploys Markforged Metal X 3D printer

In association with its 3D printing strategy, Dubai used the technology for a variety of applications, from mobility and environmental applications to medical and construction, and many of the initiatives have come from the Dubai Electricity & Water Authority (DEWA). DEWA uses 3D printing to create both spare parts and prototypes for its distribution, generation and transmission divisions, as well as to support the digitizing of its inventory. Its R&D center supports rapid prototyping through 3D printing, in addition to offering mechanical testing, training, techno-economic analysis and additive manufacturing R&D. DEWA is working to create advanced infrastructure and special additive manufacturing software through the R&D Center, in order to develop solutions that can increase Dubai's operational productivity. It's the first organization in the Cooperation Council for the Arab States of the Gulf to deploy the Metal X 3D printer by Markforged for this purpose.

3D Metalforge launches industrial 3D printing facility with 21 Ultimaker FFF 3D printers

Manufacturing bureau 3D Metalforge partnered with Dutch 3D printer manufacturer Ultimaker to launch a Fused Filament Fabrication 3D printing facility in Singapore. 3D Metalforge built its print farm, consisting of 21 Ultimaker S3 systems, to ramp up its additive manufacturing capabilities. The production complex, which is reportedly the largest in Southeast Asia, will enable the firm to better cater for its clients in the defense, maritime, medical, and oil and gas industries.

Wayland Additive set to launch Calibur 3 NeuBeam system in January 2021

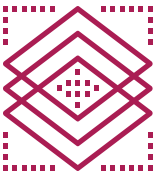
UK-based 3D printer manufacturer Wayland Additive will launch its first industrial 3D printer, the Calibur 3 in January 2021. The machine will be the first to feature the company's NeuBeam electron beam melting (EBM) technology, which promises multiple advantages over existing manufacturing processes. NeuBeam was unveiled in April 2020, after Wayland licensed the process from parent company Reliance Precision. It aims to consolidate the best of both laser and electron beam powder bed fusion for production applications. EBM systems often have issues with charge accumulation, which can limit the range of print parameters and materials compatible with the technology. NeuBeam is a "charge neutral" process, making it more flexible than its competitors. The Calibur 3 is a hot part machine, rather than a hot bed machine. As a result, partially sintered powder is not an issue, so any material unused after the print job can be reused with ease. This makes post-processing less tedious while reducing the overall energy consumption of the system.

Thermwood demonstrates a vertical layer print additive technology for large parts

Thermwood Corporation demonstrated an approach to large scale 3D printing using its patented Vertical Layer Print (VLP) technology. VLPs on a vertical rather than horizontal plane, allowing parts to be printed which are much taller than would be practical using traditional horizontal layer print. On these machines, when parts need to be vertically printed, they are printed on a moving table and supported by stainless steel belts which slide on the main table. With this approach, parts are printed on a support structure which is fixed to the back and rides on the moving table. A second five foot by 10-foot print table is mounted vertically to the back of the main table. As the part grows, the moving table pulls the part onto the support structure. Using this approach, the LSAM–MT can then print parts up to five foot (Z Axis) by 10 foot (X Axis) by 10 foot (Y Axis).

Kiel University scientists 3D print low-cost, open-source photography lighting domes

Researchers from Germany's Kiel University developed low-cost 3D printed dome-shaped systems that optimize lighting for wildlife photography. The modular illumination devices offer a cheaper, less complex alternative to existing lighting setups, while remaining capable of supporting scientific micro and macrophotography. Having made the STL files publicly available, the Kiel team's system is also designed to be customized, allowing it to be tailored to the specimen being photographed.



Materials

Cationic polymerization of epoxy-silicones with Coumarin Systems for 3D printing

Researchers from France and Lebanon performed a study of eight chemical compounds known as coumarinsconsidered for use in the cationic polymerization (CP) of epoxysilicones when combined with 4-isopropyl-4'-methyldiphenyliodonium tetrakis(pentafluorophenyl) borate. The researchers explain that as light-induced cationic polymerization processes become more popular for industrial use, mechanical and chemical resistance properties are expanded, along with better opportunity for "low shrinkage." The researchers noted superior reactivity in the coumarin systems, displaying "very high efficiencies" of the compounds with lower power irradiation sources. Comparisons in the study were made with other common photosensitizers like CPTX and an anthracene derivative known as DBA, along with other commercial coumarins. Ultimately, the researchers hoped to use the coumarin-based formulations to 3D print "thick 3D polymer samples."

HP announces 3D printing polypropylene material, partnership and alliances

HP released a new material called High Reusability Polypropylene (PP). The material is meant for HP customers in the consumer space as well as those in sectors like automotive, medical and industrial. PP has a low rate of moisture absorption, a long rate of durability, and is resistant to chemical wear and tear. The material is ideal for fluid systems, containers and piping constructs. Engineers in the automotive industry will be able to leverage the material for prototyping as well as for finished production interior, exterior and under-the-hood parts. The material was developed through a partnership with BASF for 3D printing in HP Jet Fusion 5200 3D Series machines. PP will also help customers cut down on waste because the surplus powder not 3D printed into a part is reusable. To help develop applications for PP and HP's other materials, the company partnered with design and manufacturing company Oechsler.

Researchers use 3D printing to assemble nanoparticles into robust macroscale structures

Researchers from the Technical University of Hamburg and the Massachusetts Institute of Technology, in collaboration with Bremen University, used 3D printing to assemble nanoparticles into strong macrostructures. The research team developed a direct-write self-assembly technique, which was reinforced with cross-linking, that allowed for the structural strength of microstructures to be reflected in their macro counterparts. Combining 3D printing with this colloidal assembly method, could lead to the development of mechanically robust, multifunctional 3D structures, and open applications for the materials in the aerospace industry.

Researchers 3D print partially magnetic structure from a single grade of metal powder

Researchers at the Swiss Federal Laboratories for Materials Science and Technology 3D printed a partially magnetic metal structure, using only a single type of steel powder, by changing its properties. Described as a "small metallic chessboard," the piece is composed of 16 squares, eight of which are magnetic, and the others non-magnetic. 3D printed using a laser powder bed fusion (LPBF) technique from a single grade of metal powder, the differing properties were created only by varying the power and duration of the laser, while making use of LPBF's high temperatures. The ability to produce alloy compositions with micrometer precision in a single component could prove useful to metal production and processing.

Sartomer and Paxis developing custom materials for WAV 3D printing

Paxis, launched by a team within 3D printing service bureau CIDEAS in 2016, is partnering up with advanced photocurable resin solutions provider Sartomer, a business line of Arkema, to develop custom materials for its WAV technology. Sartomer and Paxis will put together materials that are custom-made to work with the WAV process, in order to help customers find solutions for their specific applications. The companies will also search for market opportunities that could benefit from the materials they're developing for WAV 3D printing technology.

Ultimaker marketplace adds three ESTANE TPU grade materials for FFF 3D printing

Three Lubrizol ESTANE 3D thermoplastic polyurethane materials for fused filament fabrication 3D printing are available on the Ultimaker marketplace. Lubrizol's ESTANE 3D TPU F94A-055 OR HH PL, 3DP TPU 98A and 3DP TPU F70D thermoplastics were added to the free digital platform. The filaments are designed to address Ultimaker customers' demands for plastics that can be used in FFF applications for industrial jigs and fixtures, prototypes, end-use parts and flexible parts such as orthopaedic insoles.

LEHVOSS releases flame-retardant PA 3D printing material

Chemical company LEHVOSS introduced a high-temperature polyamide (PA) 3D printing material with flame-retardant properties. The material, LUVOCOM 3F PAHT KK 50056 BK FR, is a high-temperature filament with thermal stability and printability. The polyamide filament owes its high degree of thermal stability to the inclusion of ceramic fillers, which were added to improve the aforementioned property without affecting the material's printability. Otherwise, the material has similar mechanical properties to PA6, but has lower water absorption and higher temperature resistance. One of the filament's notable characteristics it that it is flame-retardant. LUVOCOM 3F PA KK 50056 BK FR has a halogen-free flame-retardant package, and 3D printed parts with thicknesses of at least 0.4 mm can achieve UL-94 V0, the standard for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances. This standard was achieved using the filament with an Ultimaker S5 system and CC 0.6 print core.

Montana researchers achieve breakthrough in 3D printed microfluidic chips

A team from Montana State University's Department of Mechanical and Industrial Engineering developed a technique for 3D printing microfluidic devices. The method can 3D print onto a glass substrate to create thin fluid channels measuring less than a millimeter in width. The process is reportedly faster and cheaper than more conventional microfluidic production methods. The research could have applications in producing cost-effective custom prototypes of microfluidic chips. The cost of the materials to make the chips is only about a dollar, while the turnaround time is about a day, from start of production to final testing. Traditionally, microfluidic chips are made using either an etching process or a process in which parts of the chip are masked and thin strips of material are chemically deposited. Glass remained the most beneficial material for microfluidic chips because of its transparency, making it possible to visualize the liquid clearly under the microscope. One of the challenges of 3D printing microfluidic channels has been the difficulty of printing onto glass without the channels becoming unbonded.

Researchers use machine learning to develop stronger 3D printed geopolymer cement

A researcher from the Swinburne University of Technology and the director of French construction company Bouygues Travaux Publics used machine learning techniques to better understand the compressive strength of 3D printed construction materials. Aiming to develop a process of classifying 3D printed geopolymer samples, the research team targeted specific variables, and optimized the makeup of the 3D printed materials using machine learning methods. The study could not only lead to the creation of construction composites exhibiting higher compressive strength, but also a roadmap for classifying the stability of other 3D printed compounds used in the construction industry.

3D printing cement developed by Taisei and Taiheiyo

Japanese companies Taisei and Taiheiyo Cement are collaboratingwith Actio and Ariake National College of Technology to develop premixed cement material for complex, "highly accurate" 3D printed structures that are stable, despite a range of outdoor temperatures. Advancing on the Digimix cement pre-mix, Taiheiyo is using a process to create stable molds meant to withstand the elements. The hardiness is due to fast-hardening additives, optimized for strength and security in construction. With the resulting T-3DP (Taisei-3D Printing) material, the collaborative group was able to 3D print a bridge that measured 1.2 meters wide, 1 meter high and 6 meters long.

VELO3D adds Hastelloy X to Sapphire 3D printer's qualified materials

Metal 3D printer manufacturer VELO3D qualified a material for its Sapphire system: Hastelloy X, a nickel-based alloy which is suited to produce combustion-zone components in gas turbine engines. The Hastelloy X metal powder has beneficial properties for gas turbine manufacturing, including corrosion cracking and oxidation resistance. The material also has a high-temperature strength, which is conducive to combustion-zone applications. The nickel-based alloy is the latest addition to the Sapphire 3D printer's qualified materials portfolio, joining Titanium64, INCONEL alloy 718 and Aluminum F357. Hastelloy X is being used by VELO3D partner Sierra Turbines, a specialist in air mobility and power generation. The companies are working to 3D print a prototype of Sierra Turbines' 20-kilowatt microturbine engine with a unicore made of Hastelloy X. The part will be 3D printed using the support-free Sapphire system, and Sierra Turbines aims to print 95% of its engine using the company's metal additive manufacturing technology.

Virginia Tech researchers discover a process to 3D print latex rubber

A method to 3D print latex and other rubbery materials called elastomers could be used for a variety of applications, including soft robotics, medical devices or shock absorbers. An interdisciplinary team affiliated with the Macromolecules Innovation Institute, the College of Science and the College of Engineering, through innovations in both the chemistry and mechanical engineering disciplines, chemically modified liquid latexes to make them printable and built a custom 3D printer with an embedded computer vision system to print accurate, high-resolution features of this high-performance material. This project is a collaboration between Virginia Tech and Michelin North America via a National Science Foundation award aligned with the Grant Opportunities for Academic Liaison with Industry program, which supports teamed research between academia and industry.

Polymaker and Covestro debut waste-free 3D printed fabrics

Polymer specialists Polymaker and Covestro released their jointly developed 3D printable fabrics. The duo sifted through multiple suitable materials for the job but settled on a TPU-based polymer, with two grades, 90A and 95A, being made available. The companies also had to develop a processing technology, in collaboration with two 3D printer manufacturers, to be able to accurately print the materials and eventually enable mass production. As a result, the fabric is optimized for printing with the INTAMSYS FLEX 510 and Raise3D E2 3D printers.

Texas A&M University 3D print programmable filament using multicolor, multimaterial method without hardware upgrades

A research team from the Computer Science and Engineering Department at Texas A&M University, working also with researchers from Japan, developed an interactive system for 3D printing with multiple colors and multiple materials using a single printhead, and without hardware updates necessary. Programmable Filament works with existing 3D printers, splicing multiple filament segments into a single thread. The process begins by printing a strand of filament made up of varying existing strands of filaments. This multicolored, multi-material wire of filament can then be used to print a multicolored, multi-material object. The technique is meant to work with less expensive FDM single-nozzle 3D printers, and is "built upon computational analysis and experiments."

3D printing aerogel microstructures for sensors and insulation

A team at EMPA in Switzerland developed a technique to 3D print microstructures using insulating silica aerogels. The team led succeeded in producing stable, well-shaped microstructures from silica aerogel by using a 3D printer. The printed structures can be as thin as a tenth of a millimetre. The aerogel can be used to insulate small electronic components and even build small pumps and sensors. The thermal conductivity of the silica aerogel is just under 16 mW/(m*K), half that of polystyrene and even less than that of a non-moving layer of air at 26 mW/(m*K). At the same time, the printed silica aerogel has even better mechanical properties and can even be drilled and milled. This opens possibilities for the post-processing of 3D printed aerogel mouldings.

Printing Techniques & Capabilities

Rice University lab creates temperature-controlled 4D printing method

Researchers from Rice University in Houston developed a method for enabling increased control over shape-shifting materials in 4D printing, thereby making the process more practical. The method allows 3D printed objects to be manipulated to take on alternate forms when exposed to changes in temperature, electric current or stress. The researchers suggest that soft robots and biomedical implants that reconfigure themselves upon demand are closer to reality with the technique, which they term as reactive 4D printing.

Spanish researchers 3D print resin parts capable of self-detecting structural damage

A team of researchers from Rey Juan Carlos University, Madrid 3D printed a set of self-sensing composite parts using DLP 3D printing technology. By reinforcing a commercially available photopolymer resin with carbon nanotubes, the scientists were able to further functionalize it with electrical conductivity, citing promising applications in structural health monitoring. The researchers note that "their addition in low contents into an insulator resin allows the formation of electrical percolating networks inside the material, leading to an increase in electrical conductivity of the material of several orders of magnitude."

MSU researchers use 3D printing to develop microfluidics

A Montana State University research team developed a method of using 3D printing to make devices for microfluidics, which involves manipulating very small volumes of liquid to measure water quality or study microorganisms, among other things. Using the new method, the team demonstrated that they could 3D print directly onto glass to form the thin channels that contain the liquid. The process reduces manufacturing time and could allow researchers to produce affordable, customized prototypes of the devices, called microfluidics chips, in their labs.

Czech researchers use ultrasonic waves, analyze residual stress in 3D printed metal parts

Researchers from the Czech Republic and Brazil partnered to highlight ultrasonic testing for residual stress analysis in the additive manufacturing of metallic parts. Residual stresses are a notorious problem in metal 3D printing, with the rapid heating and cooling resulting in potentially numerous defects, part failure and damage to an additive manufacturing machine. The researchers suggest a number of benefits to the technique, including accuracy, speed, repeatability, affordability, unlimited types of materials that can be tested, minimal influence from temperature and the fact that it is not destructive, so that it can even be incorporated into monitoring systems built into 3D printers. Its drawbacks, however, include limited spatial resolution, issues with differentiated multi-axial stresses. It is more suited to measuring RS in the entire part, rather than specific areas.

Advances in 3D printing tiny things: P*μ*SL for multi-scale, multi-material structures

Focusing in on more complex, high-resolution digital fabrication, a team of scientists partnered to review projection micro stereolithography (P*μ*SL) 3D printing technologies. Centered around photopolymerization, employing UV light to create structures, P*μ*SL offers a resolution of up to 0.6 *μ*m and allows for multiscale, multimaterial printing. P*μ*SL is unique as a method for printing at the microscale. The authors describe multifunctional capabilities that have been developed for P*μ*SL. Numerous (meth)acrylate-based UV curable polymers have been experimented with for use in applications that include 4D printing with shape memory polymers, which are able to morph for various uses.

Michigan Tech invents open-source grinding machine for compression screw 3D printing

Perennial 3D printing innovator and professor at Michigan Technological University (MTU) Joshua Pearce, teamed up with MTU colleague Jacob Franz, to create an open-source grinding machine for compression screw manufacturing. The project, which yielded a low-cost, easily replicable open-source machine. Costing less than $155 to build, the device proved capable of replicating commercial screws, while providing greater flexibility for users to make their own. The grinder could enable the manufacturing toolchain to become more self-sufficient, while reducing the costs and waste currently associated with prosumer 3D printing.

ETH Zurich develop "eggshell" concrete 3D printing method to fabricate "future tree"

Researchers from ETH Zurich, Switzerland fused 3D printing with casting methods to devise an "eggshell" concrete 3D printing process. Combining large-scale robotic Fused Deposition Modeling 3D printing with the simultaneous casting of a fast-hardening, set-on-demand concrete, enabled the team to produce complex structures in a more material-efficient way. Moreover, casting the fast-hardening concrete within a continuous process minimized the lateral pressure on the material, allowing for the creation of printed concrete sculptures with complex geometries. Using this technique, and working with German engineering firm Basler & Hofmann, the Zurich team "planted" a "future tree" in the courtyard of the company's headquarters. This concrete model could indicate the potential of the process for mass customization and structural optimization within concrete architecture. This fabrication process, known as "eggshell," allows for the fabrication of non-standard, structurally optimized concrete structures, whilst being able to integrate standard reinforcement and minimize formwork waste.

University of Dayton researchers create lower cost method of 3D printing nanoscale structures

Researchers from the University of Dayton published a study describing an enhanced and more cost-effective method of 3D printing nanoscale structures. The Opto-Thermo-Mechanical nano-printing technique was capable of printing on a nanoscale level of fewer than 100 nanometers, or a thousand times smaller than a human hair. Because it utilizes low-cost laser beams and doesn't take place in a vacuum, it's cheaper than current methods and allows manufacturers to correct any mistakes made during production. The process could be used to create products such as computer chips, where small errors can leave the product damaged beyond repair.

Using supraparticles to better control powders in SLS 3D printing

German researchers are studying how to make materials with stronger mechanical properties, and experimenting with techniques for improved fabrication of stable structures, utilizing powders with better composition and flowability. Supraparticles are material fragments formed by clusters of nanoparticles, which those in the field believe can be controlled in order to achieve various outcomes that enable greater management of the given application for which they're being used. In the case of selective laser sintering (SLS), these researchers suggest that supraparticles can be used to better control the flowability and composition of powders, key to achieving good 3D printing outcomes. In turn, the hope is that, by tightly managing SLS powders through controllable supraparticles, it will be possible to open up material options for technology beyond the standard polyamides typically seen in the industry.

Argonne scientists use machine learning to predict defects in 3D printed parts

A team of researchers from Argonne National Laboratory and Texas A&M University developed an approach to defect detection in 3D printed parts. Using real-time temperature data with machine learning algorithms, the scientists were able to make correlative links between thermal history and the formation of subsurface defects during the laser powder bed fusion process.

Korean researchers 3D print quantum dot pixels for "super-high-resolution" display devices

A team of researchers from the Korea Electrotechnology Research Institute used 3D printing to develop high-density quantum dot pixel arrays at the nanoscale. By embedding and solidifying liquid inks in polymer nanowires, the scientists were able to fabricate vertically freestanding pillars capable of emitting light. The printed structures are characterized by their long length and high brightness, and can be used to "achieve super-high-resolution display devices."

Researchers 3D print a modern Damascus steel

Swords made of Damascus steel were renowned in medieval times not only for their distinctive wavy bands on their surfaces, but also for their sharpness and toughness. Inspired by this ancient metal, researchers used lasers to create an even stronger alloy. Scientists created a modern alloy like Damascus steel with lasers to precisely control the properties of their alloy on a microscopic scale. The researchers created their steel in cycles by repeatedly spraying a powder made of iron, nickel and titanium onto a surface and then blasting it with an infrared laser. After every fourth layer was produced, the molten alloy received a two-minute respite in which it cooled rapidly before it was coated with a fresh sheet of powder and lit up with the laser. All this work took place in a chamber filled with argon. The cooling triggered grains of nickel-titanium only nanometers, or billionths of a meter, wide to form within the steel. These particles hardened the steel by preventing any defects from moving around within the alloy.

Manufacturing & Construction

Affordable aluminum 3D printing with ValCUN's molten metal deposition

Belgium based ValCUN is among a wave of firms that are trying to make metal 3D printing more affordable. Rather than producing thousands of parts for aircraft, spacecraft and orthopedics, these firms are hoping to fabricate millions of parts for industry. ValCUN is focused on aluminum. The company has even touted being able to use scrap metal and even cans. It also says that it is an "order of magnitude less capital intensive than existing powder technologies" and has "high build rates: comparable to welding or WAAM."

Nanyang University researchers use 3D printing robots to accelerate concrete production

Singapore's Nanyang Technological University scientists developed a single-robot industrial platform that uses additive manufacturing to create concrete structures. Adopting a print-while-moving approach, the team's robotic arm can 3D print different sized single-piece structures, and completing large-scale construction printing, by itself. The bot's development could lead to the more effective application of 3D printing in the construction sector, in addition to increasing the scale and structural properties of concrete formations that it's possible to 3D print.

Sustainable 3D printed footbridge to be built in Rotterdam using DSM thermoplastics

Global nutritional science firm and materials producer DSM is working with Netherlands-based engineering consultancy firm Royal HaskoningDHV and Rotterdam City to 3D print a footbridge from recyclable source materials. Scheduled to be installed in the green heart of Rotterdam's bustling Kralingse Bos park district, the bridge will be the first to utilize fiber-reinforced thermoplastics for this purpose. Set to be opened by the end of 2020, the structure is reportedly as the first in a line of "next generation" 3D printed sustainable footbridges.

MX3D uses robot arm to make 3D printed robot arm, installs on robot

Dutch firm MX3D released a 3D printed robot arm component made with its metal additive manufacturing system. Made together with industrial automation company ABB and software simulation firm Altair, the arm was optimized by the Altair team working in conjunction with MX3D. Altair's generative algorithms were not only used to cut part weight in half, but also to improve toolpath planning on the printer to increase the print speed. The total print time was four days and connecting surfaces were finished on a three-axis milling machine.

Thinking Huts launches pilot project to 3D print school in Madagascar

Charitable startups Thinking Huts aims to use 3D printing to make education more accessible in Madagascar. The organization is developing plans for a 3D printed school in the African nation, where 60% of primary-school-aged children are not enrolled. It plans to build more schools in developing regions where access to education is limited. The startup's pilot project will construct a school building in the Southeastern Anosy region of Madagascar. In partnership with SEED Madagascar, the project has a five-year roadmap that consists of building the Hut v1.0, a prototype structure that will be used to test the portability, cost and effectiveness of the school design. 3D printing will enable the team to build the school from locally sourced materials and to minimize its overall environmental impact in the local community. The roadmap also addresses the integration of solar power and internet into the school building, as well as desks, chairs and tables. The school design also includes a secure door and operating windows. The construction 3D printing element will be undertaken in partnership with Finland-based Hyperion Robotics.

Startup Mighty Buildings aims to 3D print entire houses within a year

Mighty Buildings, which launched from stealth mode in August 2020, builds houses rapidly using a giant 3D printer and proprietary 3D printing material that, unlike concrete, hardens almost immediately due to a UV light curing process. This technique allows it to create houses with 95% fewer labor hours and less waste than traditional construction techniques, which could be a game-changer in the construction field. Mighty Buildings will be producing fully printed structures for customers within a year. Initially, these units will be created using a hybrid approach that is part 3D printed and part traditional construction. As a demonstration, it printed a 350-square-foot studio unit in less than 24 hours. It also installed its first two "accessory dwelling units" in San Ramon, California, and San Diego, and additional units are awaiting delivery. Prices for the units start at $115,000 for a Mighty Studio and go up to $285,000 for a three-bedroom, two-bath Mighty House.

Texas A&M researchers develop technique to 3D print buildings out of any soil

A team of researchers at Texas A&M University demonstrated a way to print a load-bearing structure out of soil, which is combined with a binding additive to make it cohesive and allow it to be extruded by the printer into small clay cubes. It is also strengthened and made waterproof by process known as "zippering," which is the formation of microscopic layers on the surface of the clay that means it can bear twice as much weight as the unmodified mixture. If used at a larger scale, the process would have a smaller carbon footprint than concrete, and the use of local soil would avoid the need to transport building materials to site.

M&A and Investments

VELO3D raises additional $12M in funding, bringing total to $150M

Californian metal 3D printer manufacturer VELO3D raised $12 million. The news follows the company's announcement in April that it raised $28 million in a Series D funding round. Total funding for VELO3D stands at $150 million.

Research into 3D printing of skin awarded medical funding

Curtin University researchers were awarded $737,690 in funding to develop a safe, effective and affordable treatment for severe and chronic skin wounds. The Curtin research project received funding in the latest round of grants for the Medical Research Future Fund Stem Cell Therapies 2020. The project, led by Associate Professor Pritinder Kaur from Curtin's School of Pharmacy and Biomedical Sciences and the Curtin Health Innovation Research Institute, will establish and optimize 3D technologies for bio-printing skin tissue directly onto model wounds, as a precursor to skin repair in humans.

Made In Space acquired by Redwire

Made In Space (MIS), the company that brought 3D printing to the International Space Station, was acquired by Redwire, a specialist in mission critical space solutions and a producer of space components. The terms of the acquisition were not disclosed, but the acquisition comprised of MIS and Made In Space Europe, the company's sister company based in Luxembourg. Redwire was launched in June 2020 by AE Industrial Partners (AEI), a private equity firm specializing in aerospace, defense and government services and industrial markets.

Stanley Black & Decker invests in Evolve Additive at $19M valuation

Evolve Additive Solutions, the developer of a mass 3D printing technology, announced investment support by Stanley Black & Decker through a round of investment funding as it looks to accelerate its growth and market opportunities. This second stage of undisclosed funding revealed supports Evolve's vision of expansion into new markets, applications and opportunities.

Mondragon Group bets on 3D printing, invests in BCN3D with Spanish government

Spanish manufacturer of desktop 3D printers BCN3D announced a funding round totaling €2.8 million. The round was led by Spain's national innovation agency, CDTI and the Mondragon Group, an industrial business conglomerate. Though one Mondragon company was involved in manufacturing filament at one point, this is the first time that the company invested in a 3D printer manufacturer. BCN3D utilizes IDEX technology, which makes it possible to 3D print with two print heads independently.

Raytheon awarded $841K to advance 3D printed military optics

America Makes, an additive manufacturing innovation organization managed by the U.S. Department of Defense, announced aerospace firm Raytheon Technologies as the awardee of its Additive for eXtreme Improvement in Optical Mounts Project Call. The Raytheon team will receive a total of $841,000 in funding. The goal of the project is to "support the continued technological advantage of the U.S. Air Force" through the development of advanced, additively manufactured optical systems. Once all the contractual details are finalized, the project was set to begin in August 2020.

Lubrizol buys into 3D printing parts and services via Avid acquisition

The Lubrizol Corporation bought Avid Product Development, a 3D printing and engineering services company, marking a development for additive materials. Lubrizol is a $6.5 billion chemical company owned by Berkshire Hathaway. The company is among multiple chemical producers increasing stakes in the 3D printing materials space. Lubrizol appears to be expanding from a material manufacturer to an engineering, 3D printing and post-processing service provider. Based in Loveland, CO, Avid offers design for additive manufacturing, as well as prototyping and production using selective laser sintering, Multi Jet Fusion, fused filament fabrication and stereolithography. The company provides post-processing for 3D printed parts in addition to footwear, consumer goods, industrial and medical segments.

DyeMansion raises $14M in Series B funding round

Germany-based polymer additive manufacturing post-processing specialist DyeMansion raised $14 million in a Series B funding round led by Nordic Alpha Partners and existing investors UVC Partners, btov Partners, KGAL and AM Ventures. The investment brings the company's total funding to $24 million. The $14 million will enable DyeMansion to accelerate its transition to digital manufacturing. The company plans to increase automation, digital connectivity and integration across its products and process chains. The investment will also enable DyeMansion to strengthen its global presence through the creation of demonstration facilities, regional application consultants and commercial business infrastructures. The company's goal is to provide its polymer 3D printing finishing solution to as many global customers as possible and contribute to the broader adoption of additive manufacturing for serial production.

Nexa3D acquires NXT Factory, introduces eco-friendly 3D printing washing solvent

Nexa3D announced that xCLEAN, its eco-friendly washing solvent for resin and photopolymer 3D printers, is commercially available. xCLEAN, compatible with most photopolymeric resin printers, including close loop systems, automated cleaners and washing units, and is reportedly safer to handle than other cleaning solvents, though it's not been cleared to use in the cleaning of parts 3D printed out of biocompatible resins. The company also acquired NXT Factory, which manufactures ultra-fast selective laser sintering production systems powered by its Quantum Laser Sintering technology. The two companies entered into an agreement that states Nexa3D will acquire all the outstanding shares of NXT Factory, a deal in which the stockholders and boards of directors of both companies approved, the details of which weren't disclosed.

Sumitomo Corporation invests in Sintavia metal 3D printing

Sumitomo Corporation of Americas (SCOA) will increase investment in metal additive manufacturing company Sintavia. The transaction, which is expected to close in the second half of 2020, will help fund Sintavia's rapidly growing business of providing additively manufactured parts to the world's largest aerospace and space companies. The investment follows an initial investment by SCOA in 2018 and will serve Sintavia to scale its production capacity for flight-critical components that are produced via additive manufacturing while continuing to advance its technical capabilities. In addition to the financial investment, SCOA and Sintavia will continue to identify opportunities to apply Sintavia's design capabilities for the global industrial activities of SCOA's parent company Sumitomo Corporation Group.

Arevo announces Aqua 2 carbon fiber 3D printer, $25M in Series B funding

Arevo announced the Aqua 2 3D printing system, which is reportedly the first high-speed 3D printer for large continuous carbon fiber composite structures. The Aqua 2 printer is of higher quality, can achieve rapid, on-demand fabrication of custom composite parts up to one cubic meter in size, and can also print four times faster than its predecessor. The company also closed its Series B financing round after raising an additional $25 million, bringing the total amount raised to $60 million. Leaders of this round were GGV Capital and Defy Partners, and support came from Alabaster and previous investor Khosla Ventures, among others.

Munich Re and Fraunhofer award €1M in 3D printed COVID-19 ventilator contest

Global reinsurance business Munich Re and technology research firm Fraunhofer awarded €1 million as part of a competition to 3D print medical devices for COVID-19 sufferers. The Give a Breath Challenge tasked contestants with developing low-cost ventilator parts that could be 3D printed anywhere in the world. The firms provided a contest prize money and budget of €1 million, while making blueprints and training apps available to those countries with high demand. Leveraging their expertise, networks and financial resources, the sponsor companies aim to advance the decentralized treatment of COVID-19 patients in regions that are hardest-hit.

Icon announces $35M funding round for house 3D printing

Icon Technology, headquartered in Texas, announced a $35 million Series A funding round. The company plans to develop 3D printing homes for sale in Texas in 2021, and hardware that will be marketed to builders for 3D printing homes. The next-generation printer will be an updated version of the Vulcan II, a second-generation machine that the Icon team claims already prints homes 2.5 times as fast as the original Vulcan 3D printer. The funding round was led by Moderne Ventures, with additional investors including Bjarje Ingels Group, CAZ Investments, CITI Impact Fund, Crosstimbers Ventures, Ironspring Ventures, Next Coast Ventures, Oakhouse Partners, Trust Ventures, Vulcan Capital and Wavemaker Partners.

Auburn University to research 3D printing commercial aircraft components with $3M FAA grant

Funded by a $3 million grant from the FAA, Auburn University's National Center for Additive Manufacturing Excellence (NCAME) will commence a two-year project to improve air travel. The NCAME engineers will use the grant to enable the production of metal components for commercial aircraft. The team will delve deeper into the 3D printing process and materials to fine-tune the parameters required to print end-use components.

Azul 3D raises another $4.6M in seed funding, bringing total to $12.5M

Startup 3D printer manufacturer Azul 3D raised $4.6 million in its latest round of seed funding, bringing its total financing to date to around $12.5 million. The Illinois-headquartered start up plans to use the funds to develop its proprietary high-area rapid printing technology and launch its first set of commercially available machines. This round's investors included former Berkshire Hathaway manager Louis A. Simpson, former 3D Systems chairperson Wally Loewenbaum, and former Stratasys Direct Manufacturing CEO Joe Allison. Azul also accredits Hugh Evans, former SVP of corporate development at 3D Systems, with a portion of the funding.

3D printing unicorn Desktop Metal to go public after reverse merger deal

After becoming one of the fastest-growing 3D printing startups, Desktop Metal plans to go public following a reverse merger deal with blank check company Trine Acquisitions. The Boston-based metal 3D printing systems manufacturer revealed that the combined companies will be listed on the NYSE under the ticker symbol "DM" and are expected to have an estimated post-transaction equity value of up to $2.5 billion. Since coming out of stealth mode in 2017, Desktop Metal raised over $438 million in funding, becoming one of the fastest companies in U.S. history to achieve unicorn status. Claiming to reinvent the way design and manufacturing teams 3D print metal and continuous carbon fiber parts, the company aims to create the world's fastest metal 3D printers. Its broad product portfolio includes an office-friendly metal 3D printing system for low volume production, as well as mid-volume manufacturing and continuous fiber composite printers, both of which are expected to ship in Q4 2020.

Partnerships

Customized production in the packaging industry with Stratasys 3D printing

Marchesini Group, an Italian manufacturer of automated packaging machinery, adopted a customized production business model using Stratasys 3D printing technology. Marchesini is using 10 Stratasys FDM 3D printers, as well as two PolyJet multi-material 3D printers, to design, develop and manufacture its carton machines, as well as several other packaging lines. With 3D printing, all of Marchesini's machines are tailored to a specific industry or customer's production process, in order to meet the needs of the international packaging sector.

Ramaco Carbon and ORNL explore coal-based materials

Carbon tech company Ramaco Carbon partnered with the U.S. DOE's Oak Ridge National Laboratory to explore innovations that can convert coal into advanced, high-value carbon products and materials. Funded by DOE's Office of Fossil Energy and Ramaco Carbon, this five-year umbrella cooperative R&D agreement will allow the national lab and the company to work together on projects that use coal as a manufacturing feedstock for carbon fibers, building products and composites, as well as electrodes for energy storage devices and materials for additive manufacturing, including large-scale 3D printing.

DyeMansion launches global post-processing partner network for 3D printing

German post-processing equipment manufacturer DyeMansion created a global partner network, made up of 46 of DyeMasion's sales and service partners across 19 different nations worldwide. The alliance unites companies such as 3DPrintUK, Materialise, FKM and Jabil on the service side and resellers such as MasterGraphics and CIMQuest. DyeMansion makes post-processing systems such as the Powershot C parts cleaning system, for Multi Jet Fusion and selective laser sintering, and DM60 unit for dyeing and coloring parts.

Shapeways launches 3D printing service with BASF subsidiary Forward AM

3D printing marketplace Shapeways and global chemical producer BASF partnered to allow customers to access Forward AM's materials via a co-branded website. Shapeways will use its proprietary technology to introduce clients to Forward AM's materials, in addition to integrating BASF's production partners and service bureaus into its order fulfilment process. The online platform will also provide 3D modelling, instant quoting and manufacturing services, aiming to offer quicker and easier access for customers to 3D print functional parts.

ORNL licenses ExOne to 3D print parts for neutron scattering

The latest deal between The Department of Energy's Oak Ridge National Laboratory (ORNL) and ExOne, allows the Pennsylvania-headquartered leader in metal 3D binder jet printing technology to use one of the lab's methods. Equipped with the license to use ORNL's technique for 3D printing parts for neutron instruments, ExOne plans to fabricate a light, metal composite developed for neutron scattering. This type of exercise allows the user to collect data on atoms and structures, offering accurate measurements and definition of neutron beams.

Fictiv announces agile 3D printing collaboration with Jabil

Digital manufacturing ecosystem company Fictiv announced an industry-first collaboration that makes Jabil Inc. a key part of its global manufacturing network to connect and streamline 3D print prototyping through to mass-scale production using a digital thread. Designed to de-risk and streamline the supply chain through quality, speed, transparency and flexibility, the thread ensures a supported customer experience from quote to completion. The collaboration enables customers to accelerate time-to-market and realize cost savings, providing seamless handoff from prototype and low-volume production orders with Fictiv to full-scale mass production with Jabil. Through this unified lifecycle, products reach consumers more efficiently and quickly.

BASF subsidiary Forward AM extends 3D printing partnership with Prismlab

Global chemical production company BASF's 3D printing arm Forward AM reached an agreement to strengthen its partnership with 3D printing process and hardware provider Prismlab. The deal, signed at Prismlab's Shanghai base, will see some of its 3D printing photopolymer products integrated into Forward AM's Ultracur3D photopolymer portfolio. Closer cooperation with Prismlab not only strengthens Forward AM's position within Asian markets, but also enables it to drive its large-scale 3D printing solutions around the world, within a range of industries. Through adding selected photopolymer products from Prismlab to BASF's portfolio, the company is broadening its product offering to the rapidly developing Asian market. BASF believes the partnership strengthens the company's market position, especially in the orthodontic industry, and will enable BASF to engage deeper with downstream customers

Burloak Technologies and MDA sign five-year deal to 3D print satellite components

Canadian manufacturing service bureau Burloak Technologies and communications company MacDonald, Dettwiler and Associates agreed to collaborate to develop 3D printed satellite parts. The deal will see the companies continue their ongoing partnership for another five years, using additive manufacturing to optimize the design and manufacturability of a range of antenna technologies. The aim of the project is to prove the viability of 3D printed parts for applications in the harsh environment of space.

HP and Dyndrite partner to create next generation 3D printing solutions

Seattle startup Dyndrite entered a partnership with Hewlett Packard to license Dyndrite's geometric kernel technology and power the next generation cloud and edge-based digital manufacturing solutions. By combining HP's end-to-end manufacturing management expertise with Dyndrite's cutting edge additive technology, HP is hoping to deliver a software platform capable of powering the additive manufacturing factories of the future.

MasterGraphics expands in Midwest with D3 Technologies 3D print business acquisition

MasterGraphics entered a partnership with D3 Technologies. MasterGraphics will merge D3's 3D Systems and 3D Platform Printer business into its existing HP 3D print portfolio. D3 will take a significant stake in MasterGraphics as a minority shareholder. MasterGraphics will continue their focus on 3D print with an exclusive partnership with D3 Technologies to provide their clients with 3D print solutions.

Renishaw collaborates with Additive Automations on 3D print post-processing project

Renishaw will collaborate with Sheffield-based start-up Additive Automations to automate the post-processing step for metal 3D printing and deliver a more cost-effective solution for large volume production lines. The project, named Separation of Additive-Layer Supports by Automation, aims to reduce cost per part by 25% by using collaborative robots (cobots) and digital twin technology. The process works using the cobot's integrated force sensors which collect data to determine part geometry. This data is then analyzed by software to determine the location of support structures which are removed using an end-effector tool.

CELLINK acquires precision dispensing Scienion in €80M agreement

Swedish 3D bioprinter and materials developer CELLINK agreed to acquire precision dispensing 3D printing firm Scienion in a deal worth €80 million. The takeover, which is expected to take place by the end of August 2020, will see CELLINK pay €40 million in newly-issued shares, plus €40 million for control of Scienion. Through the acquisition, CELLINK aims to scale its business in order to increase its market penetration in the pharmaceutical field and expand into the diagnostics sector.

Essentium introduces 3D printing adhesives in collaboration with Magigoo

Essentium released a line of all-in-one 3D printing adhesives for its portfolio of High-Speed Extrusion 3D printing materials. Essentium developed the adhesives in collaboration with Malta-based Thought3D, the company behind the Magigoo, a 3D printing bed adhesive brand. The product line, Essentium 3D Printing Bed Adhesives – Powered by Magigoo, was engineered for heated print beds, helping to keep the first layer of the print secure on the build platform until the print is complete. When the build platform cools, the adhesive releases, eliminating the need for other adhesive products like tapes and harsh chemicals.

3D Systems partnering with Link3D to transform on-demand operations

Colorado-based additive manufacturer Link3D will partner with 3D Systems so that it can complete a digital transformation of its On Demand manufacturing operations. As part of this partnership, Link3D will be providing 3D Systems with its main software offerings, in addition to several newly released features, such as its International Traffic in Arms Regulations and Export Controlled Deployment. The U.S. regulates the manufacture, sale and distribution of the space and defense-related articles and services which were defined in the U.S. Munitions List.

Xometry to include ExOne metal binder jetting in its additive manufacturing service capabilities

The ExOne Company and Xometry will partner to provide metal 3D printing services. Binder jetting offers Xometry customers a fast and cost-effective way to 3D print metal prototypes and production parts. With binder jetting, an inkjet printhead deposits a bonding agent onto a thin layer of powdered particles, with either metal, sand, ceramics or composites. This process is repeated, layer-by-layer, using a map from a digital design file, until the object is complete. ExOne will be the exclusive provider of binder jetting services in Xometry's Digital RFQ Marketplace. ExOne 3D prints over 20 materials, including 316L and 17-4PH stainless steels, Inconel 718 and M2 Tool Steel.

Regulatory

EU to regulate 3D printed toys and supply chain

The EU took an interest in regulating 3D printed toys. Not all 3D printing materials are safe to use, or that structures and wiring may not cause a potential hazard. Concern over toy safety encompasses the entire industry with basic measures in place regarding "general risks" for children and anyone who may be exposed to toys, along with "particular risks" surrounding fire, chemicals, radioactivity and electrical issues. The EU offers recommendations to 27 countries, and also oversees the Innovation Radar Platform naming WAZP as a key innovator. While safety is a major focus, the goal is to create a strong supply chain and quality products in development. The platform is used to highlight concepts and their inventors and is funded by the EU as well as other framework programs centered around research and innovation, including applications like consumer goods, manufacturing, distribution of products, and retail goods. WAZP acts as a global supply chain company for additive manufacturing and will offer their experience in creating models for 3D printing supply chains, including "value" for stakeholders like the suppliers of toys, manufacturers, distribution companies and consumers too.

Automotive & Transportation

Functional airbag housing container produced via 3D printing with CRP Technology

Michigan-based mobility safety specialists Joyson Safety Systems (JSS) used SLS 3D printing with CRP Technology's carbon reinforced composite material Windform SP to manufacture a functional airbag housing prototype. Seeking to explore the potential of additive manufacturing in its production processes, the JSS Core innovations team sought to manufacture a functional Driver Airbag (DAB) housing part prototype in a matter of days, instead of months. It is important for JSS that the prototype was made from composite materials which were almost similar in mechanical, thermal properties and performance to the original DAB housing materials, and thus opted to use the Windform SP carbon reinforced composite material.

ABcar Oldtimers deploys Zortrax 3D printing technology to replace parts of vintage vehicles

Vintage car restoration company ABcar Oldtimers is using Zortrax 3D printing technology to manufacture spare parts for classic automobiles no longer available for purchase on the market. The company deployed Zortrax's Inkspire resin-based 3D printing platform to additively manufacture replacement automotive components, which resemble the originally designed parts, within days rather than months. Zortrax's Inspire machine is supplemented by a wide range of resins and finds its application in the dental and jewelry markets.

Sandvik 3D prints lightweight titanium motor node for e-bikes

GSD Global, an engineering and design consultancy specializing in e-bikes, teamed up with Swedish engineering company Sandvik to improve e-bike production using titanium additive manufacturing. Together, the companies developed a 3D printed motor node, which is lighter and cheaper to produce compared to the traditional manufactured parts. The current e-bike market is niche, despite the transportation mode's growing popularity. One of the roadblocks to ramping up e-bike production is associated with the production of certain critical components, such as the motor nodes for premium e-bikes. The titanium components, which hold the electric motor onto the bike frame, are difficult and costly to manufacture using CNC machining.

Sandia using Markforged technology to 3D print diesel fuel injector adapter

Funded through the U.S. DOE, national science laboratory Sandia National Labs has been working with 3D printing to create solutions for applications in the robotics, wind power and nuclear energy fields, among others. Headed by a research group within Sandia, one project aims to improve the efficiency of internal combustion engines by fabricating scenario simulations for diesel fuel flows. This group specializes in coming up with methods for designing fuel nozzles that make it possible to offer internal combustion engines with the proper flow. These nozzles feature complex, intricate internal geometries, which makes the part production longer and more expensive. To fabricate these internal nozzle geometries for functional prototyping purposes, Sandia works with third parties to access their CNC machining and laser sintering systems. However, the lab is partnering with Markforged to use its metal additive manufacturing platform to create the internal nozzle geometries for next-generation engines.

BMW opens $17M additive manufacturing facility

The center brings together production of prototype and series parts under one roof, along with research into 3D printing technologies, and associate training for the global rollout of toolless production. The facility will likely 3D print parts for the Rolls-Royce Phantom, BMW i8 Roadster and MINI John Cooper Works GP, which contains no less than four 3D printed components as standard. BMW says the campus, which came at an investment of €15 million, will allow the company to develop its position as technology leader in the utilization of additive manufacturing in the automotive industry.

Czinger unveils 1,232-HP Hypercar with 3D printed parts

Startup Divergent 3D is 3D printing parts for high performance vehicles but seems to be doing so under a separate subsidiary. Its latest project is a vehicle boasting a 1,232-horsepower engine. Divergent 3D's Blade super car features a modular design made up of 3D printed metal nodes that connect various parts of the car's chassis, including carbon fiber rods. With a power-to-weight ratio twice that of a Bugatti Veyron, the Blade was able to achieve 0 to 60 mph acceleration in just 2.2 seconds, faster than a McLaren P1. Partnering with SLM Solutions, Divergent 3D used the firm's metal powder bed fusion technology to 3D print the metal nodes. With the PSA Group, makers of the Peugeot brand of luxury vehicles, the startup aimed to make between 10,000 and 20,000 vehicles per year.

Spanish researchers 3D print "the next generation" of enhanced eco-friendly fuel cells

Researchers from the Spanish Catalonia Institute for Energy Research and Catalan Institution for Research and Advanced Studies used ceramic 3D printing to fabricate electrolyte-supported Solid Oxide Fuel Cells. Utilizing SLA 3D printing, the research team developed an approach to fuel cell production, which yielded a direct increase in capacity over those conventionally used to generate power. The "new generation" of green energy cells, which emit no environmentally harmful gasses, could now be used in end-use electricity generation applications, or to create enhanced energy storage devices.

Porsche 3D prints lightweight pistons with enhanced horsepower

Porsche is 3D printing entire pistons for its 991-gen 911, the GT2 RS. The pistons will weigh 10% less than their forged equivalents and feature an integrated and closed cooling duct in the piston crown that's unable to be reproduced using traditional manufacturing methods. The decrease in weight and temperature results in an extra 30 horsepower on top of the vehicle's already mighty 700. Thanks to the lighter pistons, the company can increase the engine speed, lower the temperature load on the pistons and optimize combustion. Produced in partnership with German auto part maker Mahle and industrial machine manufacturer Trumpf, the pistons are made out of a high-purity metal powder developed in-house by the former using the laser metal fusion process, essentially a laser beam that heats and melts the metal powder into the desired shape. The result is then validated using measurement technology from Zeiss, the German optics company best known for camera lenses.

AREVO and Superstrata reveal custom 3D printed unibody carbon fiber e-bikes

AREVO, a Silicon Valley specializing in direct digital additive manufacturing of composite materials, worked with California-based start-up Superstrata to 3D print the unified carbon composite frames for its upcoming e-bikes. By producing the frame in a single piece using AREVO's continuous carbon fiber 3D printing technology, Superstrata eliminated the need for glues or welding to hold its individual components together. This makes the bike frame "extremely impact-resistant," and constructing the bikes using carbon fiber reinforced thermoplastics allowed them to be lightweight, weighing less than 1.3kg or two bottles of water.

3D printing design for automotive to be supported by Lehvoss & FENA

3D printing materials provider Lehvoss North Americais partnering with Forward Engineering North America (FENA for the purposes of supporting the automotive industry through Design for Additive Manufacturing (DfAM), translating the performance characteristics of both 3D printed and injection molded components. Forward Engineering's specialty helps to include cost-effective parts, made from fiber-reinforced polymer composite materials, in serial mass-produced automotive structures. As Lehvoss is something of a materials expert, it makes sense for FENA to partner with the group to teach how DfAM can benefit automotive components.

Navy, Military, Aviation & Aerospace

Ozark Integrated Circuits 3D prints extreme environment technology for exploring Venus

Among future NASA plans are explorations into the extreme environment of Venus' surface, where the thick atmosphere traps the Sun's heat, resulting in surface temperatures higher than 880 degrees Fahrenheit (470°C), requiring complex electronic systems that can operate at high temperatures. Creating extreme environments technology is among the top priorities of Ozark Integrated Circuits, which was selected by NASA as one of 139 proposals for follow-on funding through the agency's Small Business Innovation Research program to develop a prototype multi-chip package for high-temperature, high-density electronic systems. Furthermore, Ozark will be working with nScrypt's research arm, Sciperio and an nScrypt 3D manufacturing system, to create high-temperature electronic systems, specifically, a RISC-V processor that would operate for extended times on the surface of Venus. The company's proposal aims to create a 500°C RISC-V multi-chip system as a vehicle to illustrate the design procedures the multi-chip package and the components that create a high-temperature electronic system.

3DOPTIC demonstrates ceramic 3D printed optic applications for satellites and UAVs

To prove the feasibility of its ceramic 3DOPTIC service, 3DCeram produced a plane mirror for front-end laser engine (galvo-mirror for high-energy laser application) and optical applications, applying additive manufacturing to the design and manufacturing of the optical substrate. 3DCERAM's process allows the production of custom made ceramic optical substrates, resulting in decreased risk during the manufacturing process. The process, developed by 3DCERAM, relies on the ability to directly 3D print the 10% of material that is required to make the part, rather than milling away 90% of the ceramic to create a net-shape mirror.

Relativity Space to 3D print rocket parts using sustainable materials with 6K

Relativity Space and 6K will partner to turn scrap materials into powder that will be used to additively manufacture rocket components. This closed loop process will be powered by 6K's UniMelt microwave plasma technology, which received its first two commissions, and help to enhance Relativity's sustainability. The partners will also focus on the development of materials designed for rocket manufacturing and space travel. Relativity and 6K's agreement will work through three phases, going from a proof of concept through to a Relativity-printed part. Their collaboration will prove out the process of taking Relativity's scrap material and creating premium and certified powder with 6K's UniMelt process; give Relativity complete line of sight and control over the supply chain to ensure the quality of the powder is sufficient for space travel; and with parts being printed from what was scrap material, become leaders of sustainability in additive manufacturing production.

French Army deploys massive military print farm for spare parts

The French Army recently partnered with HAVA3D, a distributor and integrator of additive manufacturing solutions based out of Le Mans, France, to deploy one of the largest 3D printing military farms in Europe, for the purpose of part production. A fleet of 50 3D desktop printers were setup at Bourges for the Ecole Militaires de Bourges, a military unit which specializes in materials and logistics training. The printer farm was installed in April 2020 as part of the COVID-19 crisis and was tested for reliability and efficiency for military production requirements. The pandemic shut down or strained normal supply routes in international military operations, so active duty parts were the focus for development for field repair and servicing of systems or vehicles. Explaining their approach, French Army General Philippe Baldi mentioned how production had shifted to make parts to repair systems or vehicles on external operations, which is why the army decided to acquire the capability to mass produce parts for the maintenance of these vehicles. This shift was accelerated by the impact of the pandemic, with suppliers to the army shutdown or running at reduced capacity, forcing the army to adapt, in part by training its personnel in applying 3D printing for on-going operations in Mali and Lebanon, where equipment or materials are impacted by extreme environmental conditions. This not only provides the army with flexibility to manage blocks in their supply chain, especially to remote locations, and reduce costs in development or transportation.

NASA funds 3D printing projects for upcoming era of space exploration

NASA will support 27 3D printing technology proposals as part of its Small Business Innovation Research and Small Business Technology Transfer programs. The selected projects are among 409 technology proposals for the program's first phase of funding that will provide $51 million to 312 small businesses in 44 states and Washington, D.C. To extend human presence beyond Earth's orbit, NASA is looking to small businesses and research institutions to ensure long-term, innovative and sustainable technologies that could have potential for a transition into its main mission programs and other commercial markets.

Farsoon releases Flight 252 High Temperature 3D printing platform

China's Farsoon Technologies, with headquarters also in the U.S. and Germany, moved further forward with its Flight Technology for the compact Flight 252P platform, continuing to serve customers with printers, platforms and materials within the additive manufacturing space. Two plastic powders are also being released. Farsoon claims they will not only improve performance in parts, but also cost efficiency.

Scientists 3D print gunpowder substitute, achieve 420m/s bullet velocity

Researchers from the Xi'an Modern Chemistry Research Institute in China 3D printed a functional gun propellant using SLA technology. The gunpowder-esque substance is a blend of photopolymer resin, high explosive RDX and other reactive additives. Initial gun testing of the 3D printed propellant garnered some promising results, as the scientists managed to achieve a more-than-lethal muzzle velocity of 420m/s.

BAE Systems installs fourth Stratasys F900 3D printer to support factory of the future initiative

In an effort to reduce costs and improve production agility, BAE Systems added a fourth F900 3D Printer from Stratasys to its manufacturing site in Samlesbury, UK. Along with its existing F900 line-up, the latest installation from Stratasys will operate around the clock as a part of BAE's transformative "Factory of the Future" initiative, a facility in Lancashire which brings together the advances in technology and manufacturing to work with human operators in a first-of-its-kind method. Stratasys industrial-grade FDM additive manufacturing is used across aircraft ground equipment operations for a variety of applications spanning space models and design verification prototypes, manufacturing tools such as jigs and fixtures, and end-use parts.

3D printed CubeSats to be launched from ISS in 2021

Negotiations are underway to launch the first round of satellites from the International Space Station in 2021. As part of an interdisciplinary project dubbed Swarm of Small Spacecraft, engineers from the Tomsk Polytechnic University (TPU) in Russia will 3D print CubeSat enclosures for at least five satellites that will be released into orbit. The main goal of the experiment is to test the possibility of automated interaction of space objects, particularly in navigation and communication tasks. TPU's Student Mission Control Center (MCC) will track and oversee the equipment from Earth using a satellite control system and making sure that the miniature spacecraft responds to all requests.

U.S. Air Force set to fit B-2 Stealth Bomber with its first 3D printed part

The Air Force Life Cycle Management Center's B-2 Program Office decided to 3D print protective components for the B-2 Spirit, better known as the Stealth Bomber. The part in question is a permanent protective cover for the airframe mounted accessory drive (AMAD) decouple switch located in the cockpit of the aircraft. 3D printing will ensure the aircraft stays airborne in the coming years via low-cost, timely component production. Reportedly, there has never been a commercial equivalent to the cover.

DOD and ICON print buildings for hiding U.S. military vehicles in 36 hours

Texas-headquartered ICON, the manufacturer of large-scale 3D printers, partnered with the DOD Innovation Unit to fabricate four 15-foot-tall buildings meant to hide military vehicles at California's Camp Pendleton. The ICON team claims that the project team was slated to print the buildings within 48 hours; however, in working with eight Marines knowledgeable about the Vulcan 3D printer, as well as the accompanying software and building methods, they printed all four "vehicle hide structures" within 36 hours. 3D printed structures could also be used in other applications, especially in times of disaster when shelters are needed quickly.

AMRC engineers 3D print 500 precision parts for Airbus project using Formlabs technology

Researchers from the University of Sheffield's Advanced Manufacturing Research Centre (AMRC) used 3D printing to aid a large-scale manufacturing project for aerospace manufacturer Airbus. With 10 days to produce 500 drilling caps, which would normally take weeks, the engineers turned to Formlabs' 3D printing technology, which ensured the project remained on schedule and within budget. The AMRC engineers were commissioned to work on a high-precision drilling operation involving carbon fiber, aluminum and titanium aerospace parts. With aerospace-grade tolerance requirements, cross-contamination couldn't occur between the holes during the project. The team needed drilling caps to cover up the holes but couldn't opt for traditional machining or injection molding as this would cause weeks of delays.

Honeywell's first flight-critical 3D printed engine part Honeywell earns FAA certification

Honeywell achieved a major milestone for additive manufacturing and aviation, creating the first 3D printed, FAA-certified, flight-critical engine part. The 3D printed part is called the #4/5 bearing housing and is a structural component in the ATF3-6 turbofan engine, which was designed in the 1960s. There are only about a dozen of these engines in active use in the air. Honeywell and the FAA have been working together to develop and certify multiple 3D printed aviation components, such as the #4/5 bearing housing, which allowed the company to offer the first component approved under the normal FAA delegated authority. This will help progress future aviation component certification, as well as boost supply chain shortages for the complex engine part. By the end of 2020, Honeywell expects to print dozens more of the component.

NASA, KULR Technology Group partner to build space-optimized battery pack systems in-orbit

NASA's Marshall Space Flight Center (MSFC) awarded KULR Technology Group a dual-use technology agreement which could see future space missions 3D print spare battery packs on-demand and en-route. KULR will build 3D printed battery systems for crewed and autonomous space applications using its passive propagation resistant (PPR) and internal short circuit technologies. The battery systems will be designed to meet the JSC 20793 Revision D safety standard created by NASA for crewed space missions. NASA's MSFC is at the forefront of several groups working to adapt 3D printing for space applications. KULR's PPR solution was put to the test by NASA in 2019 and used to transport and store batteries aboard the ISS via its Thermal Runaway Shield storage solution.

U.S. Air Force 3D printed runway project receives Phase II SBIR funding

After winning funding for Phase I of the competitive Small Business Innovation Research program, Indiana Technology and Manufacturing Companies (ITAMCO) and researchers from Purdue University were able to compete for Phase II project funding for the 3D printed runway mat, and was awarded funding. In 2019, ITAMCO, which focuses on exploring alternatives to traditional production processes, teamed up with researchers from Purdue University in order to create a 3D printed version of an airport runway mat for the U.S. Air Force to use in temporary or expeditionary flight operations. ITAMCO and its partners confirmed the commercial potential, feasibility and technical merit of the 3D printed runway mat for Phase I, but Phase II will see the team moving on to the prototype and testing processes.

Navy develops biodegrading material for use in oceanic sensors, underwater vehicles

Scientists at the Naval Surface Warfare Center in Panama City, FL, were issued a 20-year patent for a 3D printable material made of a marine-biodegradable base polymer that it says is easy to build from and breaks down over time. The use of autonomous underwater vehicles to house and deploy oceanic sensors may be made to be single-use or to last a certain amount of time before ceasing to function. Retrieval from the ocean floor can be costly or impossible, so in some cases they may be abandoned. By tweaking a combination of polymers including polycaprolactone, polyhydroxyalkanoate or polybutylene succinate, along with an agar gelling agent, the material can be 3D printed into any size or shape and made to last a specific amount of time before degrading.

General Life Sciences

Axial3D, Fast Radius offer DICOM-to-print anatomical model 3D printing service for surgical planning

Fast Radius and Axial3D partnered to create improved 3D printed anatomical models for surgical planning, as hospitals are reimplementing surgical procedures amidst COVID-19 measures. The two companies developed a high-volume, quality DICOM-to-print service that will allow hospitals and surgeons in Canada, Mexico and the U.S. to fabricate patient-specific 3D anatomical models, at high speeds, with an accuracy of micro-millimeters. They'll use patient 2D scans to create the models, and once they're 3D printed, they will be shipped to the hospitals within a minimum of 48 hours. When it comes to surgery, using 3D printing in the pre-planning process can help save on costs, as well as decrease the amount of time a patient is on the operating table. It can help make the process more efficient, and the surgeon more confident, especially when dealing with complex cases.

University of Colorado develops 3D printable material mimicking biological tissues

Researchers from the University of Colorado Denver and the Southern University of Science and Technology in China created a 3D printing material that's able to imitate the behaviors of biological tissues. Using the Digital Light Processing 3D printing process, the research team developed a honey-like Liquid Crystal Elastomer resin. When hit with ultraviolet light, the material cures, and forms bonds in a succession of thin photopolymer layers, and after being 3D printed into lattice structures, the resin begins to mimic cartilage. The resulting material's shock-absorbent behaviors open potential applications in surgical and protective equipment.

Cellink partners with Lonza to advance bioprinting cell cultures

Cellink will partner with Lonza, a supplier to the pharmaceutical, biotech and specialty ingredients markets, to provide researchers and scientists with more options to enhance bioprinting of complex 3D human tissue constructs. The companies joined forces to offer a comprehensive 3D bioprinting solution designed to optimize and increase access to complete 3D cell culture workflows. The solution integrates Cellink's 3D bioprinting instruments and pioneering commercial bionics with Lonza's broad selection of human-derived primary cells and supporting culture media.

University researchers use near-infrared light 3D printing to create an ear inside the body

Researchers from China's Sichuan University, Belgium's Ghent University and The University of California San Diego, developed a method of 3D printing a human ear inside of the body. The research team's Digital Light Processing-based technique uses a near-infrared light beam to enable the non-invasive in situ 3D bioprinting of a human ear. This method could allow doctors to repair human ears that were damaged by multiple sporting injuries or accidents and open an avenue of 3D printing research in non-invasive medicine.

Bioresorbable ceramics allow Admatec to make 3D printed bone implants

Focused on advanced ceramics and metal 3D printing, Dutch company Admatec is introducing bioresorbable ceramics to its portfolio. CAM Bioceramics is supporting Admatec in its endeavor to introduce 3D printing opportunities for the material via its Admaflex printers in the medical and dental fields. CAM Bioceramics acknowledges that 3D printing will play a significant role in numerous patient treatment plans. Calcium phosphate-based bone reconstructions will play an important part in next generation medical device solutions due to its proven biocompatibility.

South African researchers identify solutions using bioinks to 3D print tissue constructs

Researchers from the University of Witwatersrand assessed the challenges of using hydrogel-based bio-inks for 3D printing tissues, and made recommendations to enhance the applications of the technology. The scientists found that although it's safe to 3D print tissues, bioprinting has limitations based on the cost, integrity and strength of biomaterials used in the process. According to the research team, the development of a bio-ink will enable the larger-scale production and adoption of multicellular and multimaterial bioprinting.

3D printing liquid crystal elastomers to mimic human tissue

Scientists from University of Colorado Denver (CU Denver) created a 3D printing material that can replicate the properties of human tissue. For this research, which was supported by the Laboratory Directed Research and Development program at Sandia National Laboratories, the U.S. Army Research Laboratory and U.S. Army Research Office, the CU Denver team used digital light processing (DLP) technology. They created a liquid crystal resin, similar to honey, that generates bonds in the form of photopolymer layers when cured with ultraviolet light. The cured resin creates a compliant elastomer that's soft and strong, mimicking cartilage when it's 3D printed in a lattice structure. Using their resin and a custom DLP printer, the team 3D printed multiple structures. Combining DLP printing and the resin resulted in a rate-dependence that was 12 times greater, and a strain-energy dissipation up to 27 times greater, in comparison to structures 3D printed out of Tango Black Plus, a commercially available photocurable elastomer resin. In addition to shock-absorbing football helmets, these DLP printed LCE structures could have many applications, such as small biomedical implants for toes and spinal devices.

Improving forensic analysis of skull fragments with 3D imaging and FDM

A study conducted by researchers at Teeside University in the UK, analyzed the suitability of specific 3D scanning and modeling techniques in a key aspect of forensic investigation: physical fit analysis (PFA). PFA determines if two pieces of evidence fit together, their shared origin, the links between crime scenes and suspects, as well as allowing for object reconstruction for interpretation or presentation, to experts or jurors. Forensic investigation can be challenging, especially when the evidence is damaged, fragmented, fragile, embedded or hazardous. In PFA, where human bone fragments are handled, difficulties arise in matching, reconstructing, interpreting and presenting the evidence or results of the PFA. The bone fragments may be too small, complex or biologically hazardous. 3D imaging, modeling and printing has been used to improve or assist in forensics. Whether through physical reconstruction or virtual 360 models, the use of non-contact 3D technologies allowed forensics to address issues in visualization, virtual and physical bone reconstruction, matching wounds to weapons and dismemberment. With burned skull bone fragments as evidence, researchers studied and compared the effectiveness of two imaging techniques to study and 3D print models for use in PFA.

Using symmetry and 3D printed medical models to repair bone fractures

A team of researchers from China compared the clinical outcomes of treating isolated acetabular fractures with traditional 3D printed planning models and using an approach that mirrors the affected area following the bilaterally symmetric nature of human anatomy. While 3D printed models help when fixing hip fractures, mirroring hip bone models to gain a more accurate reconstruction of the pre-damaged bone might be more effective in its repair. Acetabular fractures and associated mortality have been on the rise in China for several years.

Straumann Group 3D printing ceramic end-use dental parts with XJet tech

Israeli additive manufacturing solutions provider XJet announced a partnership with Straumann Group, a dentistry company based in Switzerland. Straumann creates, fabricates and supplies a variety of products using ceramic materials for orthodontic, preventive, replacement and restorative dental applications, including biomaterials, CAD/CAM prosthetics, clear aligners, dental implants, digital equipment, instruments and software. Straumann will employ the Carmel 1400 ceramics 3D printing system at its Basel headquarters, and work to move from concept to end-use parts.

Turkish researchers 3D print artificial cornea for transplantation

Researchers from Marmara University in Turkey 3D printed an artificial cornea suitable for transplantation. With the help of an aluminum mold, an FFF 3D printer was used to fabricate a PVA-chitosan corneal construct with the light bending properties of the real thing. Preliminary biostability studies revealed that the composite structures were compatible with human stem cells, encouraging them to differentiate into stromal cells. The results of the study indicate great potential for the rapid and custom fabrication of cornea constructs for clinical applications.

Rice researchers 3D print blood vessels using sugar and laser

Rice University researchers are using powdered sugar to mimic the body's intricate, branching blood vessels in lab-grown tissues. Sugar has been used in experiments with selective laser sintering and in bioprinting. Rice bioengineers showed they could keep densely packed cells alive for two weeks in large constructs by creating complex blood vessel networks from templates of 3D printed sugar. One of the biggest hurdles to engineering clinically relevant tissues is packing a tissue structure with hundreds of millions of living cells. Delivering enough oxygen and nutrients to all the cells across that large volume of tissue becomes a substantial challenge. The sugar templates were 3D printed with an open-source, modified laser cutter.

Dutch researchers 3D print type of antibacterial bone implant

Researchers from the Delft University of Technology designed and printed a porous titanium bone implant with antibacterial properties. Leveraging a biofunctionalization method called plasma electrolytic oxidation, the team was able to load the implant with strontium and silver nanoparticles, eradicating the resistant Staphylococcus aureus bacteria within 24 hours. The researchers believe the synergistic antibacterial behavior they discovered between the strontium and silver could give rise to a type of implant that outlives patients with minimal maintenance. The team printed a sample Ti-6Al-4V implant using SLM technology. Plasma electrolytic oxidation was used to biofunctionalize the surface of the implant with strontium and silver. The strontium served to encourage bone growth while the silver provided the antibacterial properties. The team found that both active agents were continually released for up to 28 days, and the Staphylococcus aureus strain was virtually non-existent after a day of surface contact.

GoProto ANZ and Sentient Bionics 3D print prosthetic hand

Australian 3D printing service GoProto ANZ is working on a project for Sentient Bionics, a company that develops anthropomorphic robotic grippers for a range of industries, including healthcare. Through the partnership, GoProto is leveraging its HP Multi Jet Fusion 3D printing technology to produce functional parts for Sentient Bionics' body-powered Sentient Prosthetic Hand. The Sentient Prosthetic Hand is an anthropomorphic robotic hand which features multi-articulated fingers and a rotatable thumb, The human-like robot is capable of adaptive grasping. The 3D printed components produced by GoProto, which make up major parts of the bionic prosthetic device, are more durable, higher performing and more cost effective than more traditional components. Multi Jet Fusion was the 3D printing technology of choice because it reportedly enabled GoProto to deliver parts with superior performance and a lower cost compared to other 3D printing processes.

University of Minnesota 3D prints a working heart pump with human cells

University of Minnesota researchers 3D printed a functioning centimeter-scale human heart pump in the lab. The discovery could have major implications studying heart disease. In the past, researchers tried to 3D print heart muscle cells that were derived from what are called pluripotent human stem cells. Pluripotent stem cells are cells with the potential to develop into any type of cell in the body. Researchers would reprogram these stem cells to heart muscle cells and then use specialized 3D printers to print them within a three-dimensional structure, called an extracellular matrix. The problem was that scientists could never reach critical cell density for the heart muscle cells to function. The heart muscle model is about 1.5 centimeters long and was designed to fit into the abdominal cavity of a mouse for further study.

Ghent university spin-off develops bio-ink to 3D print human tissue

Xpect-INX, a spin-off from the university of Ghent, developed a technique for using a 3D printer to print human tissue using what it calls bio-ink. 3D printers in the medical field have been restricted to the construction of medical apparatuses such as implants, as well as models such as those used in facial reconstruction. Xpect-INX developed a type of bio-ink which when used with a special 3D printer, can create workable substitutes for human tissue. That would allow for a cornea to be replaced on a patient's eye without the need for a donor. The same principle would apply to many other organ tissues, such as for breast reconstruction after mastectomy, for repairs to the kneecap or for replacement of a faulty heart valve. In the longer term, the techniques could even be capable of creating a human heart or liver for immediate transplant.

Russia's Rosatom to 3D print spinal cage implants

Russia's nuclear technology corporation Rosatom plans to start 3D printing spinal cages, a prosthesis that helps restore the normal function of the spine. Documents posted to Rosatom's procurement website show that its scientific division has put out to tender a kit that would include the production of implants and instruments needed for the surgery. The interbody fusion cages are inserted in between vertebrae to restore the normal spacing. They are made of porous alloys to allow bone tissue to grow through them. The 3D printing technology uses a laser to melt and fuse metallic powders together, producing lighter implants in shorter times. Russia's state scientific research program considers this trend a priority in the next five years.

Cellink partners with Kugelmeiers for 3D cell culture spheroid kits

Cellink partnered with Swiss medical technology manufacturer Kugelmeiers to offer a solution for more convenient and effective 3D cell culturing. The Cellink Spheroid Kits combine Kugelmeiers' Sphericalplate 5D patented platform technology for creating highly standardized cell spheroids with Cellink's vast portfolio of bioinks. Through this distribution partnership, the kits will be available worldwide, except in Japan and Switzerland, through Cellink's existing marketing and distribution network.

Linde partners with 3D Medlab to optimize 3D printed lattice structures for medical devices

Munich-based chemical company Linde Group partnered with clinical printing specialist 3D Medlab, to research optimizing atmospheric conditions within the 3D printing process. Gases often play a fundamental role in additive manufacturing, as any impurities that remain in the print chamber, even once purged, can have a detrimental effect on the part being produced. In a new research project, the companies will conduct a series of atmospheric trials, with the aim of developing a smoother, cleaner method of recycling gases during production. Streamlining manufacturing in this way could enable the creation of complex lattice structures with wide-ranging medical applications.

Purdue University researchers 3D print bacteria grabbing colonoscopy capsules

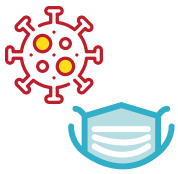
Researchers from Purdue University developed a 3D printed capsule that's capable of sampling bacteria inside the human stomach. Designed to perform the role of a colonoscopy, the printed pill can capture bacteria, not just in the colon, but the entire gastrointestinal tract. The "gut-oscopy" technique could be deployed alongside existing colonoscopy processes to better understand intestinal diseases.

3D printing, virtual surgery help repair damage to patient's face

University of Michigan researchers published a paper about their work utilizing VSP and 3D printed guides to help a patient suffering complex soft tissue damage from a gunshot wound. Ballistic facial injuries are challenging to reconstruct, as both bony and soft tissue are damaged, and often there are tissue burns and contamination, as well. The researchers presented a case that integrated VSP, 3D printed surgical guides, and anaplastology, which is a branch of medicine dealing with the prosthetic rehabilitation of an absent, disfigured or malformed anatomically critical location of the face or body, to provide a 19-year-old female patient with "improved facial symmetry and orbital prosthesis accommodation." The patient approved virtual images for her planned reconstruction, and a custom guide was 3D printed for the "left orbital debulking portion of the surgery," and another was made for the "left malar recontouring and suspension surgery." This second 3D printed surgical guide resembles the mask that the Phantom of the "Phantom of the Opera" musical wears.

Wisconsin-Madison scientists 3D print arteries to enable real-time blood pressure monitoring

Researchers from the University of Wisconsin-Madison University 3D printed blood vessels that enable cardiac patients to monitor their blood pressure remotely. The research team's implantable tubular structures emit piezoelectric pulses which act to alert patients when their blood pressure is either getting too high or too low. Leveraging the Wisconsin team's pressure-powered devices, medical staff could be able to diagnose potentially fatal heart diseases and intervene at an earlier stage.



COVID-19 Support and Personal Protective Equipment

CraftBot opens Rapid Local Manufacturing Center in Cornwall to support PPE production

Hungarian 3D printer manufacturer CraftBot launched a Rapid Local Manufacturing Center (RLM) located in Cornwall, UK, to support the national effort in producing PPE for key workers amid the ongoing COVID-19 pandemic. As well as 3D printing PPE, the center will also serve as an information hub for hobbyists across the UK looking for support and guidance in using their own 3D printers to produce PPE for the national effort. To launch the RLM, CraftBot donated 15 3D printers, equal to £35,000 in value.

Photocentric earns UK government contract to 3D print millions of PPE parts for NHS

The UK government awarded 3D printer and materials manufacturer Photocentric a contract to manufacture over 7.6 million 3D printed protective face shields over the next six months. The Peterborough-based company will use its patented 3D printing technology to produce millions of items of PPE every month, with the aim of supporting frontline NHS health workers during the COVID-19 pandemic.

BONE 3D delivers open-source swab training model for COVID-19

3D printing not only has a role to play in the production of medical-grade swabs for COVID-19 diagnostics, but it can also help train non-medical workers to administer the tests, so they can be scaled up. Singapore-based Creatz3D unveiled a 3D printed manikin designed specifically for COVID-19 swab training and French company BONE 3D is also stepping up with its own testing model. The idea behind BONE 3D's project was conceived by Axel, the 12-year-old son of gynecologist Professor Sananes from the Strasbourg University Hospital. Axel was concerned about the lack of testing solutions in France and wanted to find a way to enable more people to conduct swabbing tests, so the brunt of the work was not only on medical professionals. Professor Sananes saw the potential and reached out to Professor Debry, head of the ENT and cervico-facial surgery department at the Strasbourg University Hospital, as well as with Dianosic, a company specializing in nasal fossa pathologies, and BONE 3D.

SLM Solutions partners with MAGNET to produce molds for face shields

As part of its Additive Alliance Against Corona initiative, SLM Solutions used its metal 3D printing technology to produce plastic injection tooling molds to mass manufacture face shield headbands for the Manufacturing & Advocacy Growth Network (MAGNET), a manufacturing consulting firm in Ohio. SLM Solutions 3D printed the molds in its Wixom, Mich., facility, enabling MAGNET to save time and money in additively manufacturing the tooling needed to produce the face shields quickly.

India's biggest 3D printing firm Divide By Zero increases in efforts fighting COVID-19

Divide By Zero (DBZ), one of India's largest homegrown 3D printing companies, stepped up its support to the fight against COVID-19. Since the announcement of lockdown, DBZ initiated the manufacturing of 3D printed PPEs for frontline workers and significantly ramped-up production. The company supplied more than 1.5 lakh 3D printed PPEs to 28 hospitals in Mumbai, Pune and Delhi, including Mumbai's Nair Hospital, Sion Hospital, Kasturba Hospital and MGM Hospital, among others. Even the Indian army was supplied with 25,000 face shields. DBZ is also catering to the mounting need for ventilators and UV sterilization robots. In the last two months, DBZ manufactured over 350 ventilator component sets and over 650 UVC disinfection boxes, which can be widely used by individuals, as well as at an organizational level, especially by banks. These boxes are useful for disinfecting cash, incoming courier parcels, reusable masks, wallets, mobile phones and other objects.

Singapore researchers to 3D print bulk of 40M low-cost COVID-19 swabs in following months

National University of Singapore (NUS) researchers found a low-cost way of producing 40 million nasopharyngeal COVID-19 testing swabs. This method would make use of both 3D printing and injection moulding, a manufacturing process. Singapore is relying on suppliers from the U.S., Italy and other parts of Europe for its swabs. Two teams from NUS partnered with Temasek Foundation to develop three different swab designs. The Python swab uses a double helix structure for the tip. Trials showed this design has good fluid adsorption and causes minimal discomfort to the patient. NUS said Python demonstrated comparable accuracy and performance compared to an industry standard swab when tested on patients with COVID-19. The swab's design is free for use in Singapore.

NIST grants $1.4M to America Makes for 3D printed PPE

With a $1.4-million grant from the U.S. Department of Commerce's National Institute for Standards and Technology (NIST), America Makes will help businesses prepare for crises like the current viral pandemic, as well as others in the future. America Makes previously worked with the FDA, the Department of Veterans Affairs and the National Institutes of Health (NIH). Along with offering important advice and guidelines to the 3D printing community, the organization created a program for reviewing 3D printable PPE designs. Over 31 designs were created for use by clinicians and 28 have been optimized for the community. America Makes previously stated that 499,166 units of additive manufacturing products have also been matched, and that includes 229,995 non-N95 masks and 272,607 face shields. The NIH 3D Print Exchange logged over 95,000 file downloads and over 1.1 million views.

Canadian Shield donating 750K face shields to schools across Canada

Waterloo-based PPE manufacturer The Canadian Shield is donating 750,000 reusable face shields to provincial and territorial governments across Canada to protect teachers and students when they head back to class this fall. When the founders were first getting The Canadian Shield started, they put a call out to the community to help them by making 3D face shield components. The organization's goal is to have the face shields ready by September. The company is working with education ministries across Canada in order to coordinate distribution details. Ontario Education Minister Stephen Lecce was at the Waterloo facility to accept the first donation of approximately $7.5 million.

PrintPlace partners with Sinterit to 3D print "Maggy" social distancing device

3D printing startup PrintPlace and Selective Laser Sintering printer manufacturer Sinterit collaborated to 3D print an electronic social distancing device. "Maggy" is a small wearable gadget that's designed to help people uphold the social distancing guidelines introduced in response to the ongoing COVID-19 pandemic. Working alongside a companion app, the device creates a sound and vibration notification whenever the distance between its users becomes too small, alerting them to return to a safe distance. Following a surge in orders, Maggy's creators, Gumption Group, turned to PrintPlace and Sinterit to enable it to meet the increased demand.

Belfast doctors study COVID-19 effects with 3D printed lung model

As part of ongoing research into how the virus will impact patients who recover from it in the long term, Axial3D and the respiratory team at the Belfast Health and Social Care Trust used 3D printing to reproduce a scale 3D lung model of a COVID-19 patient. The 3D printed model is based on CT scans taken on the 14th day of a patient's infection and demonstrates how their lungs have been affected. The 3D model visualizes the inflammatory pus and scarred tissue that formed in the lungs' airways, preventing the normal flow of oxygen to the lungs.

Wearables

VBN Components demonstrates Vibenite material with 3D printed ice hockey skate blade

Sweden-based VBN Components is a pioneer in 3D printing metal alloys with extreme abrasion and heat resistance under the Vibenite brand. To display the capabilities of the latest materials in the family, Fe/Cr based Vibenite 350, the company produced the first-ever 3D printed ice hockey skate blade, which promises increased corrosion protection and hardness. VBN Components also uses Vibenite to offer parts manufactured according to customer drawing and completed through a patented 3D printing process. The company claims its customers see material savings of up to 87%, while many products can provide improved properties with integrated cooling channels, increased service life and lower weight. VBN Components is the only company offering high-carbide 3D printed steel (Vibenite 480) and the ability to 3D print industrial carbide components. The company is part of the Swedish Scaleups program, which helps innovative companies in eastern Central Sweden to grow faster.

Waterproof 3D printed shoe made using LEAP 3D printing

LuxCreo, a provider of ultra-fast 3D printing at-scale solutions based out of Silicon Valley and Beijing, launched what it claims to be the "world's first waterproof 3D printed sneaker," the Bisca360, on Kickstarter. With the Bisca360, the company innovated in not only 3D printing complete midsoles with what is meant to be improved performance and resilience, but also in 3D printing an upper that the maker claims to be 100% waterproof and windproof. The Bisco360's midsole is said to offer far greater resilience relative to other 3D printed midsoles, showing no compression loss over time, even after 1 million steps.

3D printed orthotics for kids reduce production times by 40%

A study released by Moscow-headquartered Thor3D shows its Calibry 3D scanner made a difference in the production of foot orthotics for children in Germany. Phoenix GmbH & Co., an engineering company specializing in product development with 3D printing technology, was tasked with improving the creation of orthotics for a German clinic. Employing Calibry Nest software, the Calibry 3D scanner, Geomagic Wrap software with algorithms created by Phoenix and the Tractus 3D printer, Phoenix developed a reproducible solution. The process, which can save doctors up to 40% in production time, can be used by orthopedists with no previous experience in wielding 3D tools.

Food and Agriculture

Scientists develop polymer formulation for 3D printing to tackle harmful fungi

Scientists from the University of Nottingham developed a way to control harmful fungi that can be applied via 3D printing. The innovative solution involves passively blocking fungal attachment to surfaces using a coating of (meth)acrylate polymers, negating the need to use harmful antifungals or other bioactive chemicals. The polymer solution can be administered as a spray for crops to prevent fungal infection or as a material formulation for inkjet-based 3D printing. This can then be used to 3D print medical devices to prevent fungi from forming on surfaces.

Scientists 3D print electrodes capable of detecting mycotoxins in food

Researchers from Nanyang Technological University, University of Chemistry and Technology Prague and the King Saud University 3D printed electrodes capable of detecting mycotoxins in food. The scientists believe their study could lead to a method of food safety assurance. Mycotoxin zearalenone (ZEA), a poisonous secondary metabolite, is produced by the *Fusarium* species of fungi and can be found in maize products containing wheat such as cereal. Under certain conditions, ZEA can cause food products to turn moldy, making them dangerous to consume. Contaminated products can reportedly lead to cancer or even death in humans. Timely and reliable methods of detecting ZEA are crucial for food inspectors to mitigate the spread and keep the products in food storage facilities safe until they reach the shelf.

Researchers in India 3D print extruding nutritious, fiber-rich snacks from composite flour

Researchers from the Computational Modeling and Nanoscale Processing Unit, Indian Institute of Food Processing Technology released details from a recent study, focusing on the potential for 3D printing healthy snacks from high-fiber, high-protein flour made from a variety of ingredients, including millet and seeds. 3D printed food can offer personalized nutrition, flexibility in choices, affordability in production and less waste. The researchers conducted numerous studies, from printing egg whites with additives like gelatin, starch and sucrose, to pureeing potatoes and fabricating brown rice, among others.

Israeli startup wants to 3D print meatless steaks

Redefine Meat reportedly released the world's first Alt-Steak plant-based products, which aim to replicate the properties of actual beef. Created using its patent-pending 3D meat printing technology, the Israel-based startup claims its meatless steaks have the flavor, texture and appearance of a "real" beef steak. Redefine Meat collaborated with butchers and technologists to map more than 70 types of sensorial parameters suitable for mimicking the ideal steak. These include texture, fat, juiciness and tenderness. Using plant-based ingredients, Redefine Meat prints each layer using a proprietary industrial-scale 3D food printer.

Scheurer partners with ETH Zurich students to 3D print "Rowesys" weeding robot

Engineering company Scheurer Swiss used its 3D printing expertise to help a group of ETH Zurich students develop their "Rowesys" automated robotic weeding system. Working with the Zurich team, Scheurer Swiss supplied and produced several 3D printed carbon-reinforced components, which enabled the robot's construction and enhanced its performance. The compact weed killing bot, which is entering final testing, was designed as a sustainable alternative to the use of environmentally damaging herbicides in agricultural farming.

Mike Tyson has hopes for 3D printed cannabis drink

Former professional boxer Mike Tyson's business, The Ranch Companies, obtained a global license for 3D printing edible cannabis products. In partnership with beverage manufacturer Smart Cups, Tyson's company is developing a 3D printed plastic cup with added, high-grade cannabis extracts that are activated with the addition of water. The 3D printing approach could lead to a more consistent dosing of the drug, which is being legalized for medical applications around the world. Based in Mission Viejo, Calif., Smart Cups developed 3D printing technology it claims enables it to "print any type of beverage on any surface." The company aims to use additive manufacturing to "revolutionize" the beverage industry by enabling customers to enjoy any flavor of drink by adding water. Consumers can add different ingredients to their customizable beverages, offering the opportunity to experiment with unusual combinations.

KFC to 3D print lab-grown "meat of the future" chicken

KFC partnered with 3D Bioprinting Solutions in Russia to develop the world's first laboratory-produced chicken nuggets. Inspired by the growing demand for animal alternatives, KFC wants to craft the "meat of the future." The project aims to forge something "as close as possible in both taste and appearance" to the restaurant chain's original product, while remaining environmentally friendly. A final product should be ready for testing this fall in Moscow, where researchers are working on additive bioprinting technology that uses chicken cells and plant material to reproduce the taste and texture of meat, "almost" without involving animals. Biomeat has the same microelements of the original product without any additives that are typically used in production, processing, treatment, packaging, transportation or storage, making it cleaner and more ethical, considering the process doesn't harm animals.

3D printed vegan salmon to be commercialized with help of FELIXprinters

Plant-based seafood startup Legendary Vish is commercializing 3D printed vegan salmon fillets with the goal of providing a healthier and tastier alternative to existing fish substitutes. The company will be teaming up with Dutch 3D printer manufacturer FELIXprinters to produce the complex appearance, texture and color distribution that are characteristic of salmon fillets. This could be a big step forward for such a niche segment, especially at a time when many of the world's fisheries are operating at unsustainable levels as they struggle to keep up with the increase in seafood consumption.

Students to market vegan 3D printed fish

Students from EU-led research project Training4CRM and University of Denmark (DTU) developed a technique for 3D printing fish such as salmon and tuna. The Legendary Vish project is still under development and the students are applying for funding prior to starting a company. In April, the project was selected as one of 10 innovation projects, which received €6,000 in funding from Austrian funding program Greenstar for startups with environmentally-friendly projects. The project's first products, which are based on proteins from mushrooms and peas, are expected to be marketed to sushi restaurants by 2022.

Education

MakerBot joins Google for Education Integrated Solutions Initiative

MakerBot, a subsidiary of Stratasys, joined the Google for Education Integrated Solutions Initiative to deliver a better 3D printing experience for teachers and students. The MakerBot Cloud platform, MakerBot's print preparation and management solution, has been integrated with Google for Education to provide educators and students with an easy 3D printing workflow. Through the integration, educators and students can connect to MakerBot Cloud by using their Google credentials. Educators can share their printer queue to Google Classroom and students can submit their 3D print projects to MakerBot Cloud to be approved by their teachers for printing. Teachers can also save and organize their students' design files to Google Drive.

Facilitate efficient 3D print management in schools with GrabCAD Shop software

Since being purchased by Stratasys in 2014, GrabCAD has grown into more than a file sharing service for CAD models. The free platform now features forums and challenges and has been made into an app. The community has over four million CAD files that can be exchanged between users. The GrabCAD Shop tool is a solution for centralized or distributed 3D printing in offices and classrooms, helping users queue, print and track work orders. GrabCAD Shop also offers lab management software, which can make the 3D printing workflow between students, teachers and lab operators a much smoother process.

PrintLab and Autodesk launch "Make:able" engineering design challenge for students

3D printing education provider PrintLab partnered with engineering software developer Autodesk to launch a 3D printing design challenge for schools. The Make:able challenge asks competitors to use Autodesk software, together with 3D printing technology, to design and manufacture a prototype product for individuals with mobility issues in their hands.

Environmental Efforts, Energy and Waste Management

ORNL 3D prints device for improving carbon capture technology

To limit greenhouse gas (GHG) emissions, some researchers are betting on a technology called carbon capture and storage. This includes a team at the U.S. Department of Energy's Oak Ridge National Laboratory (ORNL), which 3D printed an aluminum device for improving carbon capture at fossil fuel plants and other industrial sites. While carbon capture can be performed in several different ways, the most common method involves attempting to filter CO2 from a smokestack using a solvent that separates the GHG from the flue gasses. As the CO2 meets the solvent, heat that is produced can reduce the ability of the solvent to react with the CO2, limiting its efficiency. ORNL improved the efficiency of this process by creating a device that integrates with a heat exchanger with a mass-exchanging contactor to remove excess heat. The item was tested within a circular device measuring one meter high by eight inches wide and made up of seven stainless-steel packing pieces. Installed in the top half of the column between packing elements, the 3D printed part allowed for the integration of a heat exchanger. The group was able to reduce temperatures and, therefore, improve CO2 capture.

Dynamical 3D and TRF 3D print sensors for radioactive labs

Carbon's digital fabrication technology enabled Spanish 3D printing service provider Dynamical 3D to collaborate with medical physics consultancy firm Técnicas Radio Físicas (TRF) to design and produce radioactivity sensors. TRF produces parts used in nuclear medicine applications, as well as for decay tank systems for liquid radioactive waste management and cyclotron projects that support the production of radiopharmaceuticals and radiotracers. One of TRF's projects was centered on the production of a radioactivity sensor that could be brought to market quickly and produced in low volumes. To accelerate the development time for the part, the Spanish firm turned to Dynamical 3D for its expertise in additive manufacturing. As a member of the Certified Carbon Production Network, Dynamical 3D demonstrated how Carbon's Digital Light Synthesis process was well-suited for the development of TRF's radioactivity sensor. The flexible 3D printing platform enabled the partners to iterate several designs for the probe and quickly make necessary design modifications at no additional cost.

COBOD joins GE Renewable Energy, LafargeHolcim to 3D print bases for 200-meter wind turbines

A partnership forged between GE Renewable Energy, COBOD International and building materials company LafargeHolcim seeks to develop optimized 3D printed concrete bases for wind turbines to make them taller and more cost effective. The turbines, which are expected to reach 200 meters, will be co-developed through a multi-year collaboration that seeks to increase renewable energy production while lowering the Levelized Cost of Energy. The collaboration follows an early 3D printed prototype for the wind turbine base, which was manufactured in October 2019 using COBOD's large-scale construction 3D printing technology. The prototype measures 10 meters in height and was produced in Copenhagen, where COBOD is based. The partners will work towards building the full wind turbine prototype with the printed pedestal, as well as towards introducing the production-ready 3D printing tech and materials needed to scale up production.

History, Arts & Entertainment

Digital survey technology and 3D printing used to create model of ancient Mayan Acropolis

3D technology is changing how scientists document and preserve cultural heritage sites. A trio of researchers from the Universitat Politècnica de València published a case study about how they documented an ancient Mayan settlement using digital survey technology "to obtain a high-fidelity model of the Acropolis' buildings." (One of the main archaeological focal points of La Blanca is the Acropolis, which was built as a residence for the city's rulers during the Late Classical Period. It consists of three buildings, two with thatched roofs and one with a soil layer, on a platform reached by a large staircase. Research into the settlement has been frequent over the years, which is why a Visitor's Center was built there in 2010 as part of the La Blanca Project framework. One thing it was lacking, however, was a scale replica of the Acropolis to use as a tool for the dissemination of Mayan architectural heritage.

Renishaw replicates 12th Century Gloucester Candlestick using 3D printing

Global engineering company Renishaw produced a replica of a 12th Century Gloucester Candlestick using additive manufacturing technology. Each aspect of the object was disassembled to reconfigure a copy of the ancient artifact resembling the original. In order to capture the fine details of the candlestick, Renishaw used a high-precision laser scanner to reconstruct an exact digital replica. The company was then able to 3D print the model with aluminum powder using its multi-laser RenAM 500Q PBF system. The operation was made possible through a collaboration between Renishaw, Gloucester Cathedral and London's Victoria and Albert (V&A) Museum. The candlestick, a rare product of early-12th century English metalworkers, was commissioned by Abbot Peter for the Church of St. Peter of Gloucester. Through the years, it was relocated several times until it reached the V&A Museum in Central London in 1861. With the help of Renishaw, Gloucester Cathedral sees the possibility of displaying it once again.

Home & Safety

U.S. researchers 3D print working carbon monoxide detector

A team of researchers from the University of Washington and Sandia National Laboratories 3D printed a working carbon monoxide detector. By decorating a reduced graphene oxide sensor medium with a printed tin dioxide semiconductor catalyst, the team was able to produce a detector that functioned at room temperature with a fast response time. The researchers started by using a modified solvothermal aerogel process to decorate reduced graphene oxide sheets with tin dioxide at the nanoscale. The resulting purified aerogel was re-dispersed and ground using a pestle and mortar. It was mixed with a final solvent to produce a tin dioxide-graphene nanoink. To fabricate the sensors, the team inkjet printed silver electrodes on polymer substrates with linewidths in the 100 micron region. The tin dioxide-graphene nanoink was inkjet printed on top of the silver electrodes to coat them. The whole structure was then heat treated to anneal it and further reduce the graphene so it would be more effective at room temperature.

Emerging Objects vets launch 3D printed wood startup

Wood technology company FORUST is pushing the limits further in materials science, created by 3D printing pioneers Figulo, Boston Ceramics and Emerging Objects, which used a variety of experimental materials, including rubber, salt, wood, paper and clay. The mission in creating FORUST was to combine design progressive manufacturing for “healthy forests and sustainable interiors.” It created structures with 3D printed wood, including with color. Its designs include porous walnut-based Sawdust Screen, recycled agricultural waste-based Wood Block, tree knot or fungus-like Burl and layered wood composite Poroso.