SC3DP
Singapore Centre for 3D Printing

JANUARY – APRIL 2026

# NEWSLETTER

**CHANGING THE WORLD THROUGH ADDITIVE MANUFACTURING**



**Professor Paulo Bartolo**
***Executive Director***

## MESSAGE

The first quarter of 2026 has been a period of remarkable momentum for the Singapore Centre for 3D Printing (SC3DP). We strengthen our global partnerships through high-level visits, including delegations from Innovate UK, SHOM group, and NTU Partners. We launched the Singapore Research Attachment Programme (SRAP), funded by A*STAR, to support the Faculty of Engineering of the University of Porto (FEUP) and NTU Advanced Doctoral Programme in Additive Manufacturing. This initiative, a collaboration between the FEUP and SC3DP, will host multiple PhD researchers from the University of Porto for extended research placements in Singapore, fostering talent development and cross-border innovation.

We also initiated new industrial projects with Boeing, Fehrman, and Malvern Panalytical. A major milestone was the media announcement of Singapore's first 3D printed concrete pedestrian bridge, a collaboration involving the Land Transport Authority, CES_Innovfab, Witteveen+Bos, and KW & Lee Consulting Engineers. Additionally, the recent Silver Safety & Health Award reflects our commitment to innovation, sustainability and operational excellence.

Over the next three months, we anticipate continued progress, through new research milestones and expanded industry engagements. We remain dedicated to translating cutting-edge research into impactful solutions for industry, healthcare, and society.

## HIGHLIGHTS

### NTU Safety & Health (S&H) Awards Ceremony 2025

SC3DP Received Silver Award

### TCT Award 2026 – LAPIS

Finalist - Hardware Award - Non Polymer Systems

### Singapore Research Attachment Programme (SRAP) Award

A Global Academia Collaboration

# NEWS



## NTU Safety & Health (S&H) Awards Ceremony 2025 – Silver

The Singapore Centre for 3D Printing (SC3DP) has been awarded the NTU Safety & Health (S&H) **Silver Award** after attaining the Bronze Award for two consecutive years. This milestone marks an important step forward, as attaining the Silver Award is a prerequisite for progressing to the next tier of safety recognition. The award reflects SC3DP's continued commitment to safety regulatory compliance, and responsible laboratory operations. It also highlights the collective efforts of the team in upholding high standards and fostering a proactive safety culture within the Centre.

SC3DP remains dedicated to continuously improve workplace safety and health, ensuring a safe and responsible environment for research and innovation.

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**LAPIS: Hybrid Metal AM**
**Nanyang Technological University**

**Description:** This sheet based LAPIS process creates fully dense metal parts by laser welding stacked sheets and cutting each layer, eliminating powder handling and specialised infrastructure. The powder free workflow improves stability, enables 50 µm internal features, and delivers high quality geometry without trapped material, reducing operational costs and complexity. Link

## TCT Award 2026 Finalist – LAPIS

The TCT Awards is an annual celebration recognising outstanding innovations and applications of 3D printing and additive manufacturing technologies from around the world. This year, "LAPIS: Hybrid Metal Additive Manufacturing" is one of the finalists. This technology, which enables the fabrication of high-precision multi-material metal components combining additive and subtractive processes has been developed by **Nanyang Assistant Professor Lai Changquan** and his team at the Singapore Centre for 3D Printing. The technology was also presented at Formnext 2025, drawing attention from both the public and industry professionals.

## Appointment to International Union of Theoretical and Applied Mechanics (IUTAM)

**Professor Zhou Kun** has been appointed Chair for Singapore in the International Union of Theoretical and Applied Mechanics, succeeding **Professor Gao Huajian**.

IUTAM is widely regarded as one of the most prestigious international organisations in theoretical and applied mechanics, shaping research directions and convening leading scholars through selective congresses and specialised symposia. The appointment reflects both Professor Zhou's standing in the field and Singapore's continued presence within the global mechanics research community.

Through this role, Professor Zhou Kun will represent Singapore in high-level scientific activities and international collaborations, strengthening SC3DP's visibility and engagement within the international mechanics network.

## 2026 JN Reddy Medal Recipient

**Professor Zhou Kun** was the recipient of the 2026 JN Reddy Medal in recognition of his pioneering research on contact mechanics of heterogeneous materials and outstanding contributions to improve the mechanical properties of materials at the intersection of mechanics and additive manufacturing.

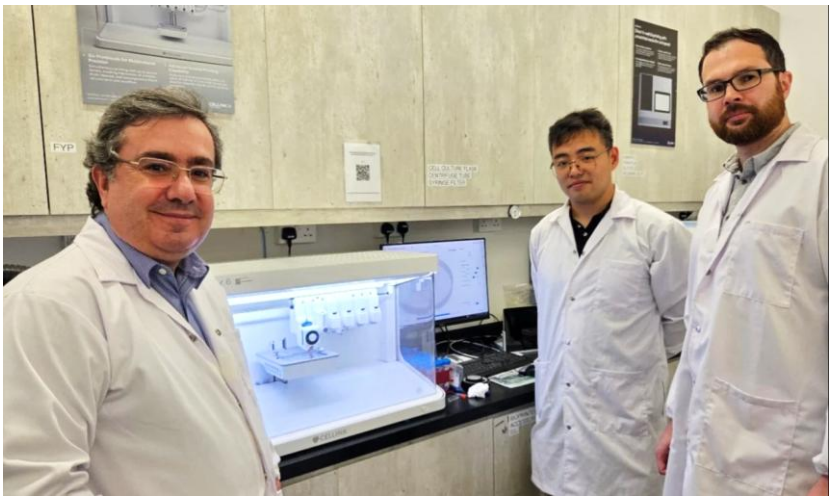

His research bridges mechanics and advanced manufacturing, establishing analytical frameworks to model failure in materials with subsurface heterogeneity and advancing high-performance alloys and multifunctional composites through powder bed fusion and directed energy deposition processes.

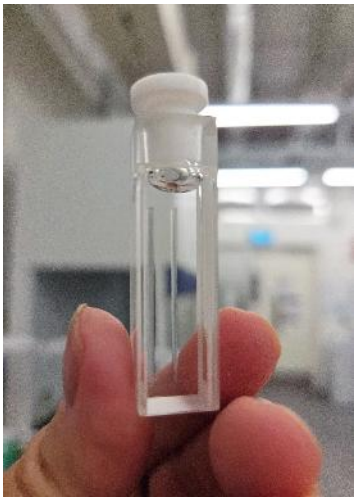
## CIRP Winter Meeting

Between 18 and 20 February, **Professor Paulo Bartolo,** Fellow, and **Associate Professor Moon Seung Ki**, Invited Guest, attended the CIRP (The International Academy for Production Engineering) Winter Meeting in Paris, France. During the meeting, they participated in several technical discussions under the different CIRP's Technical Committees and discussed potential collaborations. Professor Paulo Bartolo also participated in the CIRP Editorial Committee.


CIRP is the world leading organisation in production engineering research and is at the forefront of design, optimisation control and management of processes, machines and systems. The Academy maintains a highly selective membership based on demonstrated research excellence, comprising around 600 academic and industrial members worldwide. **Currently, only three Fellows represent Universities in Singapore.**

## Solving Bioprinting's Temperature Problem





Bioprinting aims to produce lab-grown human tissue on demand. However maintaining cell viability while printing complex structures remains a key challenge. SC3DP researchers **Dr Boyang Huang, Dr Cian Vyas and Professor Paulo Bartolo** have developed a breakthrough method to print bioink at body temperature and without compromising structural precision, bringing engineered organs one step closer to reality. This work was highlighted by the College of Engineering, Nanyang Technological University, Singapore. Link

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## SC3DP Welcomes Innovate UK

On 27 January, SC3DP hosted a delegation of 13 UK companies visiting Singapore under the Global Business Innovation Programme (GBIP), funded by Innovate UK, managed by Innovate UK Business Growth, and supported by the British High Commission Singapore. GBIP supports UK companies developing cutting-edge technologies in key industrial sectors to enter global markets and connect with international partners. During the visit, Professor Paulo Bartolo, Executive Director of SC3DP, delivered a presentation highlighting the Centre's research initiatives, key projects, industry partnerships, and collaborations with UK organisations. The UK delegates gained insights into SC3DP's research focus, capabilities, and strategic role in advancing additive manufacturing, including it's ongoing projects and innovations. The session also provided an opportunity to discuss potential cross-border collaboration and explore areas for future engagement.

Similarly, on 10 March SC3DP attended the UK Innovators Joint Reception for Agrifood, Semiconductors and Marketing Technology organised by Innovate UK and the British High Commission Singapore.

## Technical Reference on Concrete Printing


The Technical Reference TR 146:2025 on 3D Concrete Printing (3DCP) was officially launched at the Urban Solutions & Sustainability R&I Congress on 5 February, marking a key milestone in Singapore's journey towards digital and sustainable construction.

TR 146 provides practical guidance on materials, processes, quality assurance, and operational planning to support the safe, reliable, and scalable adoption of 3D concrete printing within Singapore's built environment. The publication represents a significant step in moving 3DCP beyond pilot projects towards structured industry deployment. By establishing clear technical guidelines and best practices, the Technical Reference strengthens industry confidence and lays the foundation for wider implementation across the construction value chain. The document was developed through the collective efforts of the Construction Additive Manufacturing Working Group (CAMWG), which brought together experts from academia, industry, and public agencies.

Notable contributions were made by **Professors Wong Teck Neng and Yi Wei Daniel Tay,** as well as **Dr Mingyang Li** from the Singapore Centre for 3D Printing (SC3DP), who were part of the core team that prepared the Technical Reference. These achievements underscore the strength of Singapore's collaborative innovation ecosystem, driven by close partnerships with Standards Development Organisations (SDOs), Enterprise Singapore, and the National Additive Manufacturing Innovation Cluster (NAMIC) to develop and promote the adoption of both Singapore and international standards. The launch of TR 146:2025 further highlights Singapore's continued commitment to innovation, productivity, and sustainability through the responsible integration of advanced construction technologies.

## Singapore's First 3D Printed Concrete Bridge

On 31 March, the pilot structural tests for the scale model of Singapore's first 3D-printed concrete bridge were successfully completed. The project is jointly developed by the Land Transport Authority (LTA), in collaboration with the Singapore Centre for 3D Printing (SC3DP), CES_Innovfab (a member of the Chip Eng Seng Group), Witteveen+Bos, and KW & Lee Consulting Engineers. The research team will evaluate the test results before moving on to the printing and construction of the full-scale bridge.

The prototype was developed following extensive research into advanced concrete materials and large-scale 3D printing techniques. It marks a significant step forward in applying additive manufacturing to infrastructure, demonstrating the potential of 3D concrete printing (3DCP) for structural applications in Singapore's built environment. The full scale bridge is expected to span 10 metres in length and 5 metres in width, and is targeted for completion by 2028. It will be installed across the Jurong River, connecting Jurong West and Tengah, and stands as a key milestone in Singapore's push towards more innovative and sustainable construction methods. This achievement marks an important milestone for SC3DP's Building & Construction team and for the broader adoption of 3D concrete printing in Singapore.

*Continue on next page*

Following on 2 April, the project was presented by Land Transport Authority (LTA) to the public and attracted significant media attentions, including coverage by

- **The Straits Times** - https://www.straitstimes.com/singapore/transport/spores-first-3d-printed-pedestrian-bridge-set-to-be-completed-in-jurong-west-in-2028
- **Channel NewsAsia (CNA)** - https://www.channelnewsasia.com/singapore/singapores-first-3d-concrete-printed-pedestrian-bridge-be-built-in-jurong-6033401
- **Lianhe Zaobao (联合早报)** - https://www.zaobao.com.sg/news/singapore/story20260406-8844872
- **狮城有约 | 从行人桥到婚戒 三维打印无所不能?** https://www.youtube.com/watch?v=sAOVyLtrDfQ

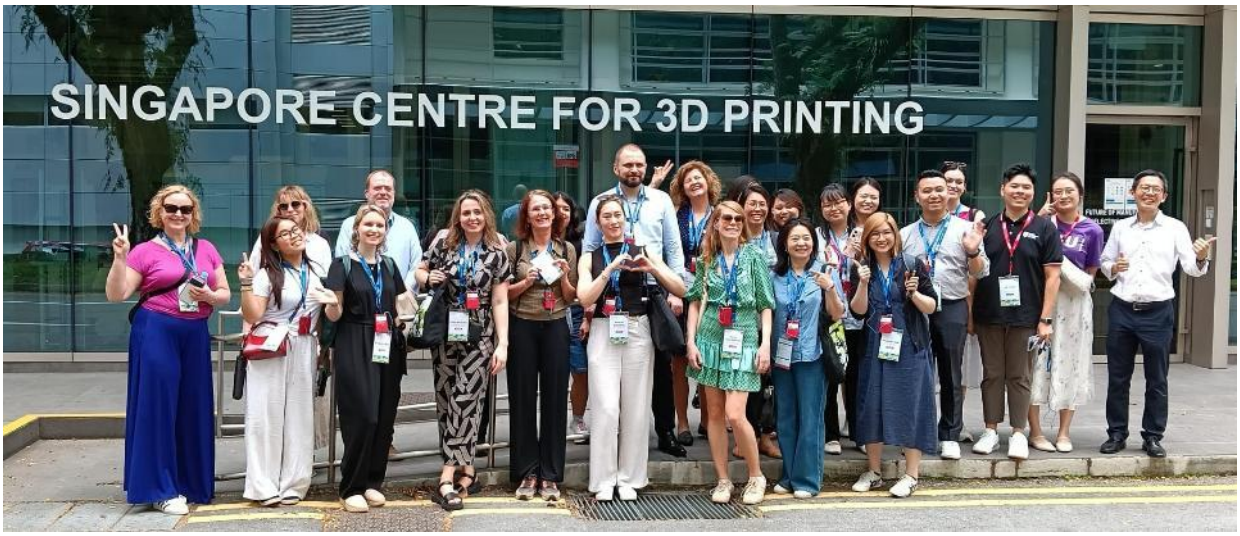
## SC3DP Welcomes SHOM Group

The Singapore Centre for 3D Printing (SC3DP) was honoured to host the Spouses of Heads of Mission (SHOM) Group on 27 January, welcoming a delegation of 18 members comprising spouses of ambassadors from various countries.

The visit began with a welcome and overview by Professor Paulo Bartolo, Executive Director of Singapore Centre for 3D Printing (SC3DP), who introduced the Centre's global research network, strategic objectives, core research areas, and key initiatives in additive manufacturing. Followed by a showcase of selected 3D printed components from SC3DP's 3D Printing Competition and Photography Competition, reflecting the breadth of innovation and creativity within the SC3DP community.

The programme concluded with a guided laboratory tour, during which the delegates were introduced to SC3DP's advanced facilities, research infrastructure, and technological capabilities, as well as practical applications of additive manufacturing across multiple sectors. The visit facilitated meaningful engagement and knowledge exchange, strengthening awareness of SC3DP's role in advancing research excellence, innovation, and international collaboration in 3D printing.

## NTU Partners Day




NTU Partners Day highlights Nanyang Technological University, Singapore's strong collaboration with industry leaders, global universities, and community partners to drive research, innovation, and meaningful societal impact. On 2 March, Singapore Centre for 3D Printing (SC3DP) welcomed an international delegation of university partners (e.g. Deakin University, Imperial College London, Copenhagen Business School) as part of the NTU Partners Day programme. The visit aimed to strengthen global collaboration while providing insights into SC3DP's research focus and key initiatives in additive manufacturing. This engagement provided a platform for knowledge exchange and establish stronger collaborative connections.

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## Celebrating the New Year with Lo Hei and Festive Lunch

The Singapore Centre for 3D Printing (SC3DP) ushered in the new year with a joyful and meaningful celebration, bringing together NTU professors, researchers, and staff for a lo hei (tossing for good fortune) and a festive lunch buffet on 5 February. The gathering provided an opportunity for the SC3DP community to reconnect, strengthen bonds, and look ahead to new opportunities and milestones. As SC3DP continued to advance research and innovation in additive manufacturing, the celebration highlighted the importance of collaboration, mutual support, and a shared sense of purpose remained at the heart of the Centre's journey. The Centre marked the start of the year with optimism and renewed energy, embracing wishes of prosperity, health, and abundance, while working collectively towards greater impact and excellence.

## NTU's Open House



On 28 February, during the NTU Open House, Singapore Centre for 3D Printing (SC3DP) welcomed members of the public to learn about the Centre's initiatives in additive manufacturing. Visitors toured SC3DP's facilities and interacted with our researchers experiencing some of the exciting research activities being conducted at the centre. A live demonstration on the use of metal powder bed fusion machine was an important activity of the day. Highlights featured multi-material printed components spanning a range of industries, such as aerospace, marine and offshore, construction, smart and sustainable manufacturing and electronics. The Open House allowed visitors to learn more about SC3DP's research development and our impact on both academic and industry.

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## Strengthening the Collaboration with CENTIMFE

To strengthen the collaboration between SC3DP and CENTIMFE in Portugal, a dedicated researcher, **Jose Silva**, was recruited to investigate High Speed Directed Energy Deposition in terms of materials, costs and relevance for the tooling industries. The researcher is supervised by **Eng. Nuno Fidelis** from Centimfe and Professor Paulo Bartolo from SC3DP. Results of this work will be presented in June during the 2nd Singapore-Portugal Research and Innovation Week. **Thereafter, Jose Silva will proceed with his research as a PhD student at NTU.**

CENTIMFE, the Portuguese Technological Center for the Mouldmaking, Special Tooling and Plastic Industries, comprises more than 200 organisations including industrial companies and research organisations. It coordinates a large number of major projects worth more than €100M, and international initiatives such as the European Tooling Platform (Manufuture sub-platform). The center has been actively involved in additive manufacturing research and industrial development since 1998, supporting the adoption of advanced manufacturing technologies in different industrial sectors. CENTIMFE is member of the European Manufuture High Level Group, supporting the European Commission in the definition of the European Industrial policies. In Portugal, CENTIMFE is member of the Board of the CTI Alliance - Network of Technology and Innovation Centres, and act as an industrial advisor for Innovation and Research to the Regional Authorities and Portuguese Government.

## Connecting with ExxonMobil – A Global Leader in Integrated Fuels, Lubricants, and Chemicals

On 26 February, SC3DP welcomed ExxonMobil for discussions on potential collaboration. The meeting facilitated a productive exchange on research strengths, industry challenges, and shared innovation priorities. Professor Paulo Bartolo shared SC3DP's initiatives in the field of additive manufacturing. The dialogue focused on aligning potential projects with ExxonMobil's initiatives. The meeting concluded with a tour of SC3DP's laboratories, providing further insight into its capabilities and potential areas for collaboration.

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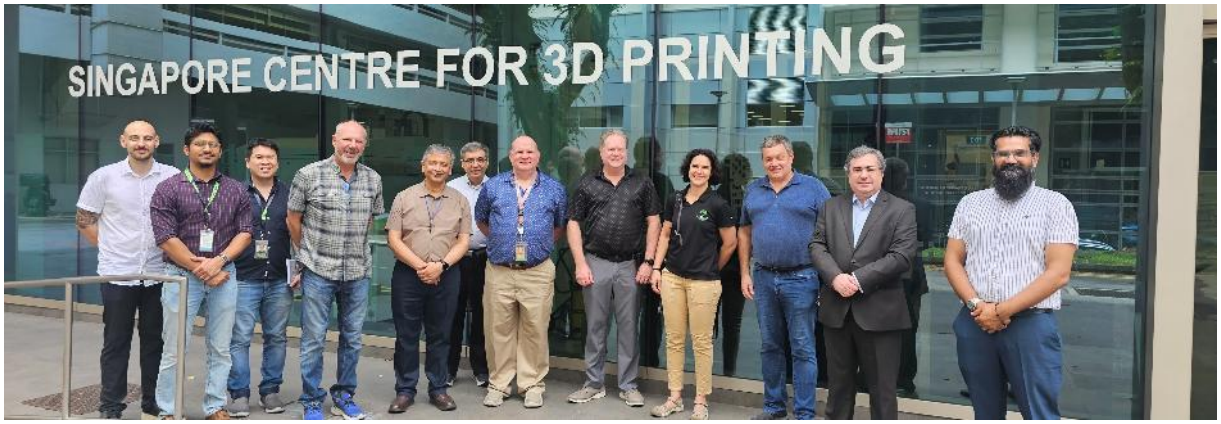
## Exploring Collaboration with Nestlé Innovation Team

On 2 March, SC3DP hosted the Nestlé Innovation Team **Dr. Allan Lim, Head of Open Innovation** and **Ms Tze Yu, R&D Designer** for an exploratory meeting to discuss potential research collaborations. Professor Paulo Bartolo shared insights into the Centre's initiatives and additive manufacturing capabilities. The discussions included potential knowledge sharing seminar with Nestlé staff, as well as collaborative initiatives supporting the FMCG (Fast-Moving Consumer Goods) industry. The session ended with a laboratory tour of SC3DP's facilities, further strengthening ongoing industry-academia engagement.

## Seagate Research Group Visits SC3DP to Explore Advanced Manufacturing Collaboration




SC3DP recently hosted a senior delegation led by **Ed Gage**, Vice President, Seagate Research Group at Seagate Technology during his visit to Singapore. The delegation included senior leaders across technology development, engineering, and corporate strategy, highlighting strong interest in SC3DP's advanced manufacturing capabilities.

During the visit, the team was introduced to SC3DP's expertise in metal additive manufacturing, multi-material processing, electrospinning, and additive electronics. The discussions focused on potential collaboration areas including lab-on-chip systems, functional coatings, and advanced thermal management solutions for high-density storage applications.

The visit facilitated in-depth technical exchanges and identified several promising directions for collaboration, enhancing SC3DP's role as a key partner in advancing the next-generation manufacturing solutions for the data storage industry.

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## Strengthening Digital Manufacturing with 3DMakerpro

Singapore Centre for 3D Printing (SC3DP) partnered with 3DMakerpro to integrate the Moose 3D Scanner and Moose Lite Scanner into its digital manufacturing workflow, further enhancing its capabilities in digital modelling for advanced additive manufacturing applications. Both scanners offers high-resolution structured-light scanning with strong accuracy and portability, enabling the rapid capture of complex geometries and fine surface details. Its intuitive interface and efficient data processing make it well suited for research, prototyping, and industrial applications, including component inspection, design validation, and consumer product development. This collaboration reflects SC3DP's continued interest in advancing digital manufacturing and additive manufacturing applications.

## Call for Papers - MRS Bulletin


Additive manufacturing has been identified as one key theme for the next 50 years of materials research in MRS Bulletin, the flagship journal of the Materials Research Society (MRS), USA (https://link.springer.com/article/10.1557/s43577-025-01036-0). The journal invites interested authors to submit research papers to its impact session, or to propose and guest edit thematic issues related to additive manufacturing. The guest themes typically consist of review articles. Further information for prospective authors and guest editors can be obtained by contacting the associate editor **Professor Hortense Le Ferrand.**

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## MSc and PhD Theses in Additive Manufacturing

We invite both local and international students with a strong interest in research to explore project opportunities at Singapore Centre for 3D Printing (SC3DP) by reaching out to our faculty members for Master's and PhD supervision. Engage in research activities and develop new ideas at SC3DP through a range of available programme options.

- Visiting Research Students (Non-Graduating Non-Exchange) for International Students (https://www.ntu.edu.sg/education/student-exchanges/visiting-research)
- Global Connect Fellowship for International Students (https://www.ntu.edu.sg/about-us/global/global-connect-fellowship).
- PhD Programmes for International/Local Students (https://www.ntu.edu.sg/engineering/programmes/graduate)

## Industrial-Based Final Year Projects

We would like to invite our industrial partners to submit Final Year Project proposals. This is a valuable opportunity to explore new ideas and research domains that may lead to future collaborative projects. SC3DP fully supports this initiative.

**INDUSTRY-ACADEMIA INNOVATION PARTNERSHIP**

**Industry-Sponsored Final Year Projects (IS-FYP)**

**Access Talent • Explore Ideas • Solve Problems**

Partner with NTU MAE to turn your engineering challenges into structured, student-led R&D projects - co-supervised by industry and academia, delivered with accountability and measurable outcomes.

**What You Gain:**

- **Tap into top engineering talent - early**
- **Evaluate future hires before you commit**
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- **Fresh eyes on your toughest challenges**
- **Academic-backed rigour on every project**
- **Deepen your NTU research partnership**

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**Upcoming Intakes:**

Semester 1: End February

Semester 2: Early September

**For More Information:**

IS-FYP

askmae@ntu.edu.sg

Scan to Submit Your Project

# RESEARCH PROJECTS

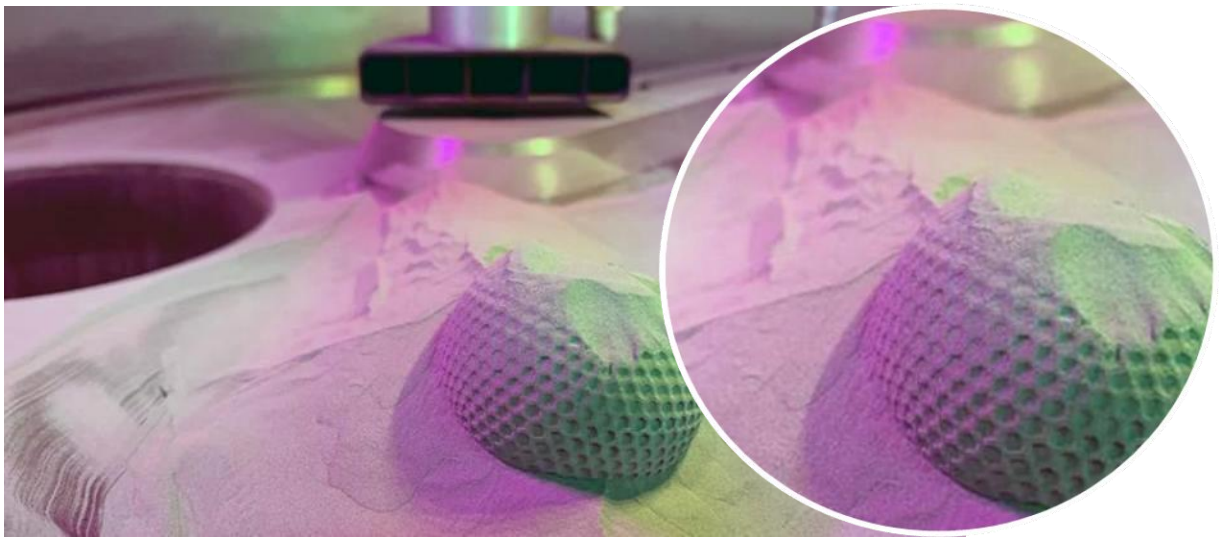
## Singapore Research Attachment Programme (SRAP) Award: Project on "FEUP and NTU Advanced Doctoral Programme in Additive Manufacturing Processes and Technologies"

**The Agency for Science, Technology and Research (A*STAR) has approved the project, "FEUP and SC3DP Advanced Doctoral Programme in Additive Manufacturing Processes and Technologies," under the Singapore Research Attachment Programme (SRAP).** This prestigious award supports international PhD students undertaking advanced research attachments in Singapore and recognises the scientific excellence and strategic relevance of the collaboration between the Faculty of Engineering of the University of Porto (FEUP) and the Singapore Centre for 3D Printing (SC3DP) at Nanyang Technological University (NTU).

Granted under the second cycle of FY2025, the SRAP award will support six FEUP doctoral students in undertaking research placements in Singapore lasting one to two years. Jointly supervised by academic teams from FEUP and SC3DP, the PhD candidates will engage in cutting-edge research within our world-class laboratories and contribute to high-impact projects in additive manufacturing. The award builds upon a strengthened institutional partnership formalised in December 2025 through a Collaboration Agreement between FEUP and NTU, following an earlier Memorandum of Understanding signed in Singapore.

The programme adopts an interdisciplinary approach addressing emerging challenges in additive manufacturing. It integrates advanced materials, process engineering, generative design, digital twins, sustainability, and explainable artificial intelligence, while fostering strong engagement with industrial partners in Portugal and Singapore. By combining advanced infrastructure, complementary expertise, and a dynamic innovation ecosystem, the partnership between FEUP and NTU strengthens international scientific collaboration and reinforces its shared commitment to shaping the future of additive manufacturing.

## New Research Project with Malvern Panalytical



Singapore Centre for 3D Printing (SC3DP) kickstart a new research project with Malvern Panalytical, funded by the National Additive Manufacturing Innovation Cluster (NAMIC), aimed at improving feedstock chemical qualification prior to Laser Powder Bed Fusion (LPBF) printing. Feedstock chemistry can evolve with powder reuse cycles and may also vary between new powders sourced from different suppliers, making accurate qualification of alloying elements critical due to its influence on the microstructure and resulting properties of LPBF-fabricated components. Chemical qualification therefore represents an important step in the powder lifecycle, as highlighted in standards such as ASTM F3592 and ASTM F3456. In this project, Energy Dispersive X-ray Fluorescence (EDXRF) is proposed to improve the accessibility, repeatability and reliability of powder characterisation in the metal additive manufacturing landscape.

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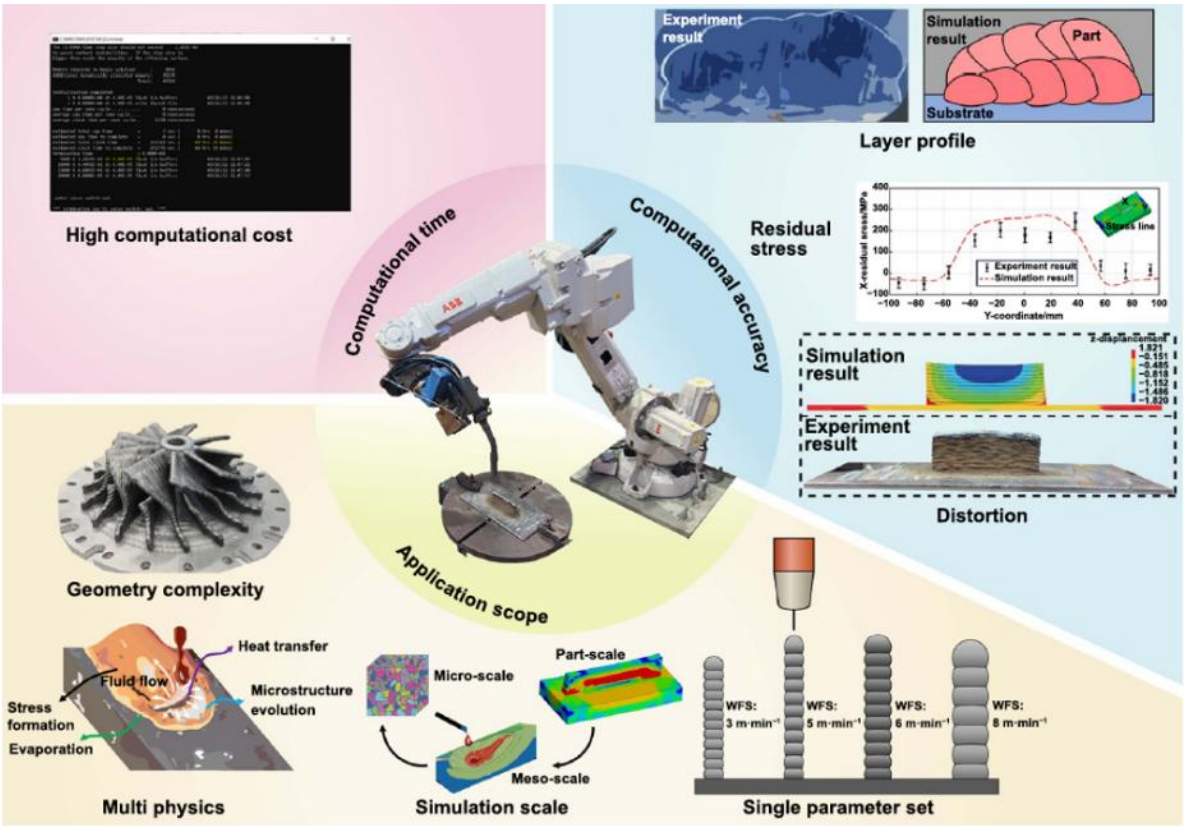
## Driving New Research Collaborations Across Europe


A new research project has commenced at the Singapore Centre for 3D Printing (SC3DP) in collaboration with FEHRMANN Materials APAC, with funding support from National Additive Manufacturing Innovation Cluster (NAMIC ), Singapore. The initiative aims to simplify laser powder bed fusion (LPBF) across the broader metal manufacturing value chain by addressing one of its most critical factors, processing parameter development. In LPBF, parameter development can account for up to 15% of overall production costs, presenting a significant barrier to industrial adoption and scale-up. This project seeks to address this challenge by developing a machine-agnostic, cloud-based AI platform capable of generating optimised parameter sets tailored to the intended end-use applications of LPBF components. Unlike conventional approaches, the platform will integrate thermodynamic and process variables that are often overlooked in standard parameter selection. By incorporating these deeper material-process relationships, the system aims to enhance print reliability and consistency across industrially relevant alloy classes. The project's objective is to reduce reliance on trial-and-error methods, lower development costs, improve the consistency and performance of LPBF parts and accelerate the transition of LPBF from a specialist capability to scalable industrial manufacturing.

# Singapore Aerospace Programme – Cycle 19 – SPARK




Singapore Centre for 3D Printing (SC3DP), in partnership with the Institute of High Performance Computing (IHPC), A*STAR, has been awarded a research grant under the Singapore Aerospace Programme. The project, titled SPARK (Sustainable Material Processing Enabled by Advanced Key Process Variables Control), aims to advance the state of the art in metal additive manufacturing by developing intelligent monitoring and control strategies for large-scale manufacturing processes.

Conducted at SC3DP in collaboration with Boeing, the SPARK project focuses on enhancing Wire-Arc Additive Manufacturing (WAAM) systems through the integration of advanced sensing technologies and data-driven process intelligence. WAAM is increasingly recognised as a promising approach for fabricating large metallic components with high material efficiency and reduced lead times compared with conventional manufacturing methods. However, achieving consistent build quality remains challenging due to the complex thermal cycles, melt-pool dynamics, and process variability inherent to arc-based deposition processes.

To address these challenges, the SPARK project integrates multi-sensor monitoring systems, including acoustic, thermal, and optical sensing technologies, to capture real-time process signatures during WAAM deposition. By correlating sensor signals with melt-pool behaviour, deposition stability, and resulting material characteristics, the project aims to establish data-driven frameworks for process monitoring and control. Ultimately, SPARK seeks to contribute to the development of the next-generation of intelligent WAAM systems, supporting a more reliable, sustainable, and industrial-scale titanium additive manufacturing for aerospace applications.

# INTELLECTUAL PROPERTY

## 3 New Patents

- Huang, X., Yeong, W.Y., Wong, Y.X., Lee, J.M., Goh, G.L., Gao, X. - "Systems and methods for monitoring curing progress of photocurable polymer during additive manufacturing", World Patent, WO2026/015083 A1, 15/01/2026
- Tay, B., Alagesan, A., Freitas, D., Le, T.P., Bartolo, P.J. - "Method for multi-material laser powder bed fusion using sacrificial adaptable platform", World Patent, WO2026/019371 A1, 22/01/2026
- Chandra, S., Bartolo, P.J. - "Open-top localized argon flooding chamber for directed energy deposition of reactive metals", Singapore Provisional Patent 10202503081T, 22/10/2025

## 3 New Technology Disclosure (TD)

- 2026-060: Optimisation of Aortic Valve Leaflet Geometry for Paediatric Patients. Tran Anh Tuan, Nakao Masakazu, Nguyen Thien Binh, Nguyen Ngoc Vu, Vu Hoai Lam
- 2026-044: 3D-Printed Modular Conveyor Belt With Embedded Wireless Sensors For Predictive Maintenance. New Tze How Daniel, Nguyen Ngoc Vu, Balamurugesan Senthil Kumar, Darrell Nathan Pathia Nathan
- 2026-016: 4D Printed Bone Implant For Osteomyelitis Treatment. Taehyub Lee, Chin Siang Ng, Pei-Chen Su, Michael Gui Jie Yam

# PUBLICATIONS

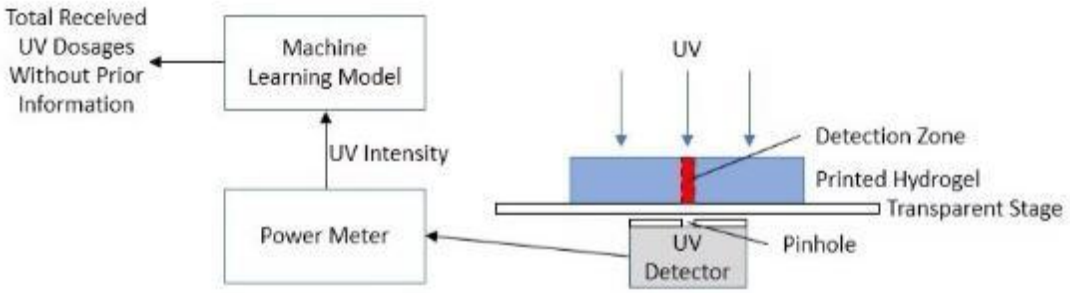
Since the beginning of the year **SC3DP's researchers published 56 papers** in leading journals such as **Materials Science and Engineering: R: Reports** (IF: 26.8), **Military Medical Research** (IF: 22.9), **International Journal of Extreme Manufacturing** (IF: 21.3), **Advanced Functional Materials** (IF: 19), **Advanced Science** (IF: 14.1), **Interdisciplinary Medicine** (IF: 13.6), **Chemical Engineering Journal** (IF: 13.2), **Cement and Concrete Composites** (IF: 13.1), **Additive Manufacturing** (IF: 11.1), **Journal of Cleaner Production** (IF: 10.0)

# RESEARCH HIGHLIGHTS

## World Patent: SYSTEMS AND METHODS FOR MONITORING CURING PROGRESS OF PHOTO-CURABLE POLYMER DURING ADDITIVE MANUFACTURING

**Dr Xi Huang, Professor Wai Yee Yeong, Dr Ye Xuan Wong, Dr Jia Min Lee, Dr Guo Liang Goh, Mr Xinchao Gao**

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)
(19) World Intellectual Property Organization
International Bureau
(43) International Publication Date
15 January 2026 (15.01.2026)
WIPO | PCT
(10) International Publication Number
WO 2026/015083 A1




A schematic view of a system for monitoring curing progress of a photocurable polymer during an additive manufacturing process according to an embodiment of the present invention;

**Background:**

In the field of tissue engineering, photocurable polymers including hydrogels such as Gelatin Methacryloyl (GelMA) have emerged as a critical component for bioprinting applications due to their inherent biocompatibility and tissue-like mechanical properties. Using GelMA to generate high fidelity 3D structures requires optimal application of ultraviolet light to fully crosslink and cure the structure. Yet, the optimization of hydrogel curing process presents a significant challenge. Traditional method for optimizing process parameters for GelMA curing requires iterative experimentations on interplaying parameters with strong correlations. Among these parameters, the regulation of UV light dose is crucial for photopolymerization. Curing of hydrogels by applying the UV light dynamically along specific trajectories or patterns rather than uniformly, which is often seen in bioprinter, adds to the complexity.

**Summary:**

According to a first aspect of the present disclosure, a system for monitoring progress of a photocurable polymer formation during an additive manufacturing process, the system comprising: a transparent stage configured to support the photocurable polymer formation; a source of ultra violet radiation configured to illuminate a target region of the photocurable polymer formation with incident ultra violet radiation; an ultra violet radiation detector arranged on an opposing side of the transparent stage from the source of ultra violet radiation, the ultra violet radiation detector configured to detect an intensity of transmitted ultra violet radiation transmitted through the target region of the photocurable polymer formation; and a data storage device storing a machine learning model trained to curing progress of a photocurable polymer from input data comprising an indication of ultraviolet transmission of the photocurable polymer.

**Source:** https://patentscope.wipo.int/search/en/WO2026015083
**Publication Number:** WO/2026/015083

# World Patent: METHOD FOR MULTI-MATERIAL LASER POWDER BED FUSION USING A SACRIFICIAL ADAPTABLE PLATFORM

**Mr Tay Aloysius, Mr Alagesan Alpravinosh, Dr Freitas Dino Miguel Fernandes, Dr Le Tan Phuc, Professor Bartolo Paulo Jorge Da Silva**

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)
(19) World Intellectual Property Organization
International Bureau
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22 January 2026 (22.01.2026)
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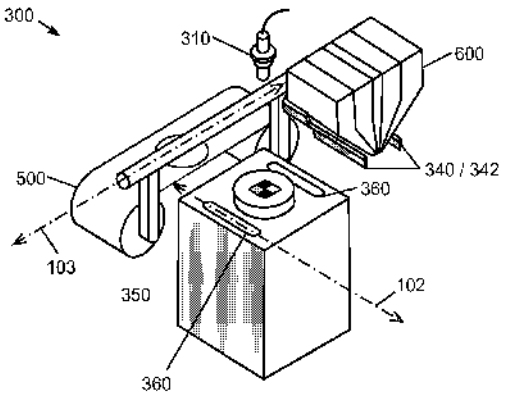
(10) International Publication Number
WO 2026/019371 A1




A laser powder bed fusion method of forming a layer includes dispensing a sacrificial layer in a build zone, on a substrate or a previous layer of a build.

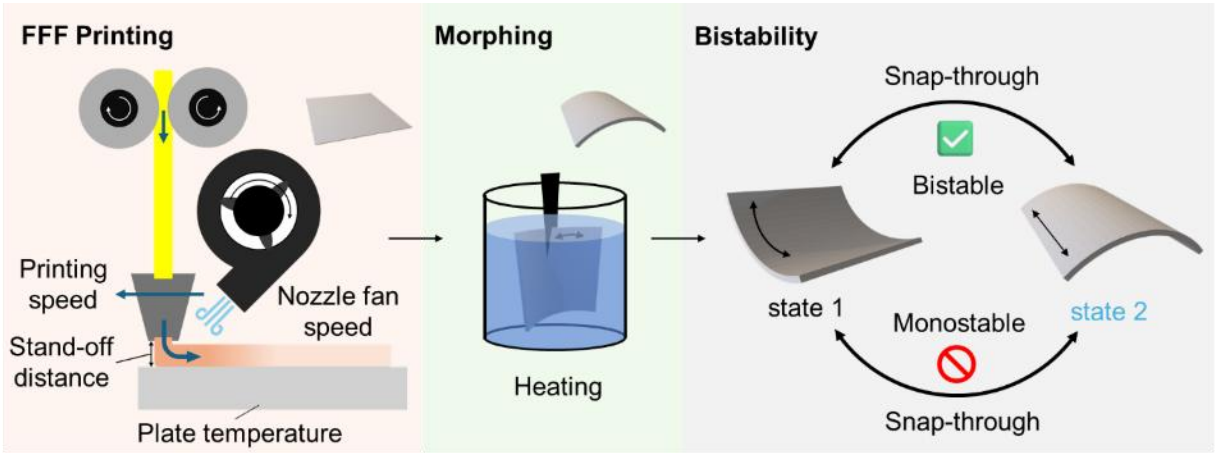
**Background:**
Conventional methods to produce a multi-material metal 3D-printed articles with LPBF often result in significant cross-contamination of the metal powder feedstock. The dispensed, unused powder feedstock of a metal material cannot typically be returned directly to the dispenser, as it may have been cross-contaminated by powders of other metal material. It is understandably costly and resource-intensive to purify the cross contaminated powder feedstock. Conventionally, such cross-contaminated powder feedstock cannot be recycled or reused as its material composition would be unpredictable and too inconsistent from batch to batch.

**Summary:**
A method is proposed herein, the method including: forming a layer, the forming of the layer including: dispensing a sacrificial layer in a build zone, the sacrificial layer being dispensed on a substrate or a previous layer of a build; using a laser to form one or more first cavities in the sacrificial layer, the one or more cavities being formed only when the sacrificial layer is in the build zone; depositing a first metal powder in the one or more first cavities; using the laser to fuse the first metal powder in the one or more first cavities; removing from the build zone any unmelted first metal powder that is outside the one or more first cavities; using the laser to form one or more second cavities in the sacrificial layer, the one or more second cavities being formed only when the sacrificial layer is in the build zone; depositing a second metal powder in the one or more second cavities; using the laser to fuse the second metal powder in the one or more second cavities; and removing from the build zone any of the second metal powder that is outside the one or more second cavities.

**Source:** https://patentscope.wipo.int/search/en/WO2026019371
**Publication Number:** WO/2026/019371

# Rationalising the Onset of Bistability in Polylactic Acid (PLA) Bilayer Laminates using Fused Filament Fabrication (FFF)

**Professor Eleonora Ferraris and Associate Professor Hortense Le Ferrand, Dr Hongyu Zhou, Dr Jie Zhang, Shi En Lim**




**Introduction:**
Whilst 4D printing via Fused Filament Fabrication (FFF) enables the creation of shape-morphing structures, programming advanced mechanical functionalities like bistability into the material is challenging. This study investigates the effects of *in-situ* printing parameters on PLA bilayer laminates by combining experimental characterisation with 3D transient thermal process simulations (T4F3). This combined approach systematically rationalises how printing parameters translate into the internal energetic landscape for bistability.

**Key Highlights:**
- Demonstrated that bistability is fundamentally governed by the energetic process where pre-strains are induced, stored and released, arising from the entropic elasticity of amorphous PLA polymer chains stretched during extrusion and post-heating treatment.
- Identified printing speed as the primary factor for inducing pre-strain (curvature ranging from 0.1 to 1.0 $cm^{-1}$). A bistability window was also mapped where the top layer printing speed is controlled between 20 and 65 $mm{\cdot}s^{-1}$ when the bottom layer printing speed fixed at 30 $mm{\cdot}s^{-1}$.
- Proved that rapid *in-situ* cooling (higher fan speed and lower plate temperatures) effectively freezes stretched polymer chains, storing pre-strain to enhance macroscopic curvature upon post-printing heating.
- Utilised 3D transient thermal simulations to quantify the cumulative thermal effect, revealing a 4-second inter-layer reheating peak above Tg. This successfully decoupled *in-situ* viscoelastic stress relaxation from shear-induced chain elongation.

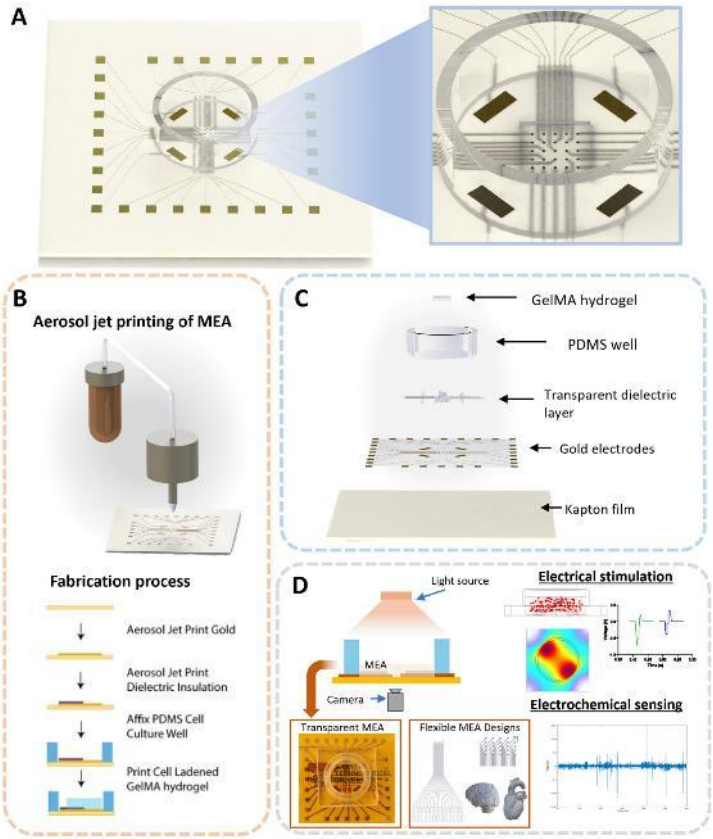
**Conclusion:**
This study establishes a comprehensive framework for programming bistability directly using PLA via FFF. By outlining the energetic principles of morphing controlled by printing parameters, this work paves the way for cost-effective, customisable deployable structures, such as smart packaging or aerospace components, where manufacturing simplicity and one-time shape changes are prioritised over infinite fatigue life.

**Source:** https://doi.org/10.1080/17452759.2026.2618395

# Customizable Fabrication of 2D and Conformal Multielectrode Arrays for 3D Printed Organotypic Bioelectronic Interfaces

**Professor Wai Yee Yeong, Professor Sing Yian Chew, Dr Guo Liang Goh, Dr Jia Min Lee, Chongquan Huang, Ernest Cheah, Wei Qi Jaw, Xinchao Gao**

**Introduction:**
Conventional multielectrode arrays (MEAs) are typically fabricated using photolithography-based micro-fabrication techniques, which are often costly, time-consuming, and limited in their ability to produce customised geometries that conform to complex 3D tissue structures. In this work, we present a customisable fabrication strategy for 2D and conformal multielectrode arrays using aerosol jet printing (AJP). This additive manufacturing technique enables the direct deposition of conductive materials onto flexible substrates with high precision and design flexibility. The printed MEAs are designed to integrate seamlessly with 3D printed tissue constructs, enabling conformal bioelectronic interfaces capable of recording and stimulating cellular activity.




**Key Highlights:**
- Direct printing of gold nanoparticle electrodes onto flexible polyimide substrates enables rapid fabrication and design flexibility compared with conventional photolithography.
- The AJP-based fabrication process significantly reduces processing time and material waste while maintaining high-resolution electrode patterning.
- Electrodes modified with PEDOT:PSS coatings exhibit low impedance and high charge injection capacity, enabling stable and efficient electrical stimulation.
- The printed MEAs support direct deposition of cell-laden hydrogels, demonstrating high cell viability and promoting organised cellular alignment under electrical stimulation.
- The system successfully records extracellular signals from primary neurons and cardiomyocytes, demonstrating its potential for functional bioelectronic interfaces.

**Conclusion:**
Aerosol jet printing enables rapid and customisable fabrication of multielectrode arrays compatible with 3D printed tissue constructs. The printed MEAs demonstrate strong electrochemical performance and reliable electrophysiological recording. This approach provides a versatile platform for future bioelectronic and tissue engineering applications.

**Source:** https://doi.org/10.1002/adhm.202502757

# Robotic Rebar Insertion and Grouting for Reinforcement of 3D Printed Concrete: Technique Development and Bond Behavior Characterization

**Professor Ming Jen Tan, Associate Professor Teck Neng Wong, Dr Xiangyu Wang, Dr Sizhe Wang, Dr Beifang Deng, Dr Zhenbang Liu, Dr Mingyang Li, Dr Kah Jun Yam, Dr Quoc Nghia Vuong, Dr Bak Koon Teoh**

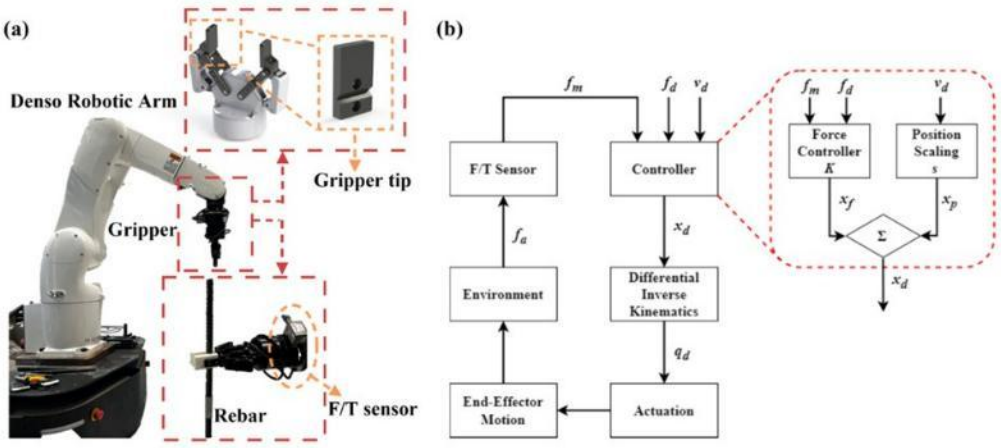



Fig. 1. (a) Automated robotic-controlled reinforcement insertion system, (b) Robotic-controlled rebar insertion framework.

**Introduction:**
This study explores vertical insertion of steel rebars into 3D printed concrete (3DPC) using a mobile robotic arm, enabling reinforcement during the printing process. A robotic system comprising a mobile base, a 6-axis robotic arm, a force/torque sensor, and a gripper was employed, alongside a dedicated algorithm for self-calibrating surface detection and force-controlled insertion. To enhance bond performance, grouting with epoxy or high-flowability cementitious materials was investigated- Existing bond-slip models were evaluated for robotically inserted rebars, showing reasonable predictions for splitting failure but limited accuracy for pull-out failure. An analytical model was developed based on thick-walled cylinder and fictitious crack models. Overall, robotic rebar insertion (combined with grouting) achieved an acceptable bond performance by observing rebar fracture during the pull-out test, demonstrating the feasibility and potential of this automated reinforcement strategy in 3D printed concrete structures.

**Key Highlights:**
- Robotic rebar insertion and grouting is proposed for vertical reinforcement of 3D printed concrete.
- A robotic arm with surface detection and force control is developed for automation.
- Pull-out tests show failures such as splitting, pull-out, and rebar fracture.
- Rebar insertion (with grouting) achieves bond strength comparable to conventional cast concrete.
- Bond-slip curves are analyzed and compared with existing models.

**Conclusion:**
This study investigates an automated reinforcement method for 3D printed concrete (3DPC). It is demonstrated that the bond between the inserted rebars and the printed concrete attains sufficient strength for effective anchorage, allowing rebar fracture to serve as the primary failure mode. The findings establish the feasibility of the robotic rebar insertion strategy and underscore its potential for engineering applications.

**Source:** https://doi.org/10.1016/j.addma.2026.105078

# FEATURED SC3DP'S FACULTY

## Assistant Professor Tay Yi Wei Daniel

School of Mechanical and Aerospace Engineering

**Assistant Professor Tay Yi Wei Daniel** obtained his PhD in Mechanical Engineering from NTU and was a Visiting Scholar at the Pacific Earthquake Engineering Research Center (PEER), University of California, Berkeley, where he worked on large-scale 3D printing applications and structural testing. His research focuses on advancing 3D concrete printing through materials engineering, intelligent deposition control, and process optimisation for large-scale digital construction. He has been recognised among the Top 2% Scientists worldwide (Stanford University, 2022-2025).

Assistant Professor Tay Yi Wei Daniel contributed to the development of Singapore's Technical Reference TR 146:2025 on 3D Concrete Printing and actively supports international standardisation efforts in construction additive manufacturing. His work aims to translate advanced material and process innovations into scalable, reliable, and environmentally responsible digital construction solutions.

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## Associate Professor Wong Teck Neng

- School of Mechanical and Aerospace Engineering
- Programme Director, Singapore Centre for 3D Printing (SC3DP)

**Associate Professor Wong Teck Neng** assumed the role of Programme Director for the Building and Construction Group at the Singapore Centre for 3D Printing (SC3DP) in December 2018, succeeding Professor Tan Ming Jen. He has since continued to expand the programme's research capabilities and strengthen collaborations with key industry partners such as Chip Eng Seng Group (CES_Innovfab), Witteveen+Bos, Housing & Development Board (HDB) and the Land Transport Authority (LTA).

His team is currently collaborating with the LTA on a project titled "Development and Performance Evaluation of Prestressed 3D Printed Bridges under Monotonic Loading" and with the HDB on Cities of Tomorrow (COT) project titled "Advancing Automation in Construction through 3D Concrete Printing."

# VISITOR

## Associate Professor Victor Neto

- Associate Professor in the Department of Mechanical Engineering at the University of Aveiro, Portugal
- Senior Researcher at the Centre for Mechanical Technology and Automation (TEMA) and at the Intelligent Systems Associate Laboratory (LASI)

**Victor Neto** is an Associate Professor in the Department of Mechanical Engineering at the University of Aveiro. His research focuses on product development, manufacturing technologies and eco-design, with particular interest in plastic-based metastructures and additive manufacturing of thermoplastics. His work combines materials processing, structural design and sustainability approaches, addressing topics such as circular economy, advanced manufacturing and engineering education.

During his one-month visit to the Singapore Centre for 3D Printing (SC3DP), he aimed to explore programmable morphing structures produced through additive manufacturing, investigating responsive behaviours in MEX-printed materials and photopolymerized hydrogels. The visit also provided an opportunity to observe leadership and governance practices at the centre.

# MOBILITY

## Aniol Bosch i Collell

- Eurecat - Technology Centre of Catalonia, the leading Research & Technology centre in Catalonia and the second largest private research organisation in Southern Europe.
- The GREP, Research Group on Product Engineering, Processes and Production at the University of Girona.

**Aniol** is an industrial engineer and predoctoral researcher. During his research stay at SC3DP, Aniol aims to leverage volumetric additive manufacturing and advanced photopolymers to develop next-generation vascular stents, bridging the gap between engineering innovation and life-saving medical applications. Thus, accelerating advance biomedical manufacturing solutions that combine advanced engineering with meaningful clinical impact.

**- Testimonial -**

SC3DP fosters global cross - fertilisation among researchers with advanced additive manufacturing technologies, and visionary leadership, SC3DP create a vibrant ecosystem that delivers a transformative environment for innovation - where ideas are translated into real-world applications that benefit both industry and society.

# WORKSHOPS AND SEMINARS

## Laser Based Additive Manufacturing (LAMM) – The Next Generation Materials Manipulation Technology

The seminar by **Professor Narendra B. Dahotre** of the University of North Texas (UNT), USA, offered valuable insights into Laser Assisted Additive Manufacturing (LAAM) and its technological evolution on 3 February. He shared the development of LAAM, highlighting key advancements in the technology over the years. The seminar covered fundamental laser–material interactions, their effects on component properties, the challenges of controlling these rapid processes, as well as potential applications of LAAM across diverse materials and industries.

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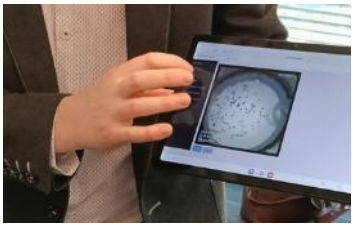
## Smart Textiles for Personalised Healthcare and Sustainability


On 4 March, **Assistant Professor Ronghui Wu** from NTU's School of Materials Science and Engineering shared the health impacts of global warming, focusing on heat-related illnesses and discussed innovative wearable textile technologies for diagnosis, treatment, and rehabilitation. She highlighted a multi-scale materials engineering approach from innovative fiber to fabric that integrates thermal management and sensing into textiles. Key innovations included advanced regenerated silk fibroin spinning, spectrum-selective fabrics for personalised radiative cooling, self-powered textile strain sensors for biomechanical and respiratory monitoring, and a smart wearable sign language translation system using yarn-based sensing and machine learning.

## The Next Evolution of 3D Cell Culture



On 10 March, **Dr. Krzysztof Wrzesinski,** Co-Founder and Chief Scientific Officer of Celvivo, presented a seminar titled "The Next Evolution of 3D Cell Culture."

During the session, he shared how their dynamic culture systems operate, showcasing the underlying principles and practical applications of the technology. The seminar focused on advancing research in NAMs (New Approach Methodologies), MPS (Microphysiological Systems), organoids, and spheroids.

Participants gained insights into how dynamic microenvironment control can enhance the physiological relevance of advanced 3D cell models. Dr. Wrzesinski also shared strategies to build more human-relevant NAMs and MPS models, improve robustness and reproducibility in complex 3D cultures, enhance tissue maturation and functional performance, and apply dynamic culture approaches to unlock deeper biological insights.

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## Reshaping the Future of Construction with Architected Structures

On 17 March, **Assistant Professor Wen Zhou** from NTU's School of Civil and Environmental Engineering shared her insights on the challenges that rapid urbanisation, expanding infrastructure, and climate change pose to modern cities. She introduced the concept of architected structural design as an emerging approach in the civil engineering field. By carefully designing the internal geometry of structures, engineers can tailor their mechanical behaviour and enhance performance. This approach enables structures to achieve improved strength, ductility, and energy absorption while using materials more efficiently. By integrating geometry, advanced materials, and digital fabrication, architected design opens new possibilities for developing high-performance and resource-efficient civil structures for future engineering needs.

## MAE Undergraduate Students Explore Additive Manufacturing Technologies


On 10 March, the School of Mechanical and Aerospace Engineering, NTU (MAE) brought undergraduate students to visit the Singapore Centre for 3D Printing (SC3DP). During the visit, the students were introduced to a wide range of additive manufacturing machines and 3D printed products, including multi-material parts, scan-printed components, smart components, and printed electronics. The visit provided valuable insight into additive manufacturing technologies, with several students expressing interest in exploring future projects with the Centre

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## Controlling Morphing Behaviour in PLA-Based 4D Printing: From Process Parameters to Machine Learning Prediction

On 19 March, **Associate Professor Victor Neto** delivered a seminar titled 'Controlling Morphing Behavior in PLA-Based 4D Printing: From Process Parameters to Machine Learning Prediction'. The presentation explored how 4D printed structures change shape under external stimuli and the challenges in controlling this behaviour due to processing-design interactions. It highlighted the role of printing parameters in governing key properties and morphing response in PLA-based parts. Raster angle and geometry were identified as key factors influencing bending behaviour. The use of machine learning models used to predict performance with high accuracy was also discussed, demonstrating the effectiveness of combining process optimisation, design, and data-driven methods.

# UPCOMING EVENTS & SEMINARS

- Seminar with HX Technology Pte Ltd - 12 May
- Seminar with HK Poly University - 3 Jun
- 2nd Singapore-Portugal Research and Innovation Week - 22-26 Jun
- 2nd International Conference on Future of AM - 4-6 Aug
  https://futuream.sg/
- Industrial Transformation Asia-Pacific (ITAP) - 21-23 Oct
  https://www.industrial-transformation.com/
- Formnext - 17-20 Nov
  https://formnext.mesago.com/frankfurt/en.html



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