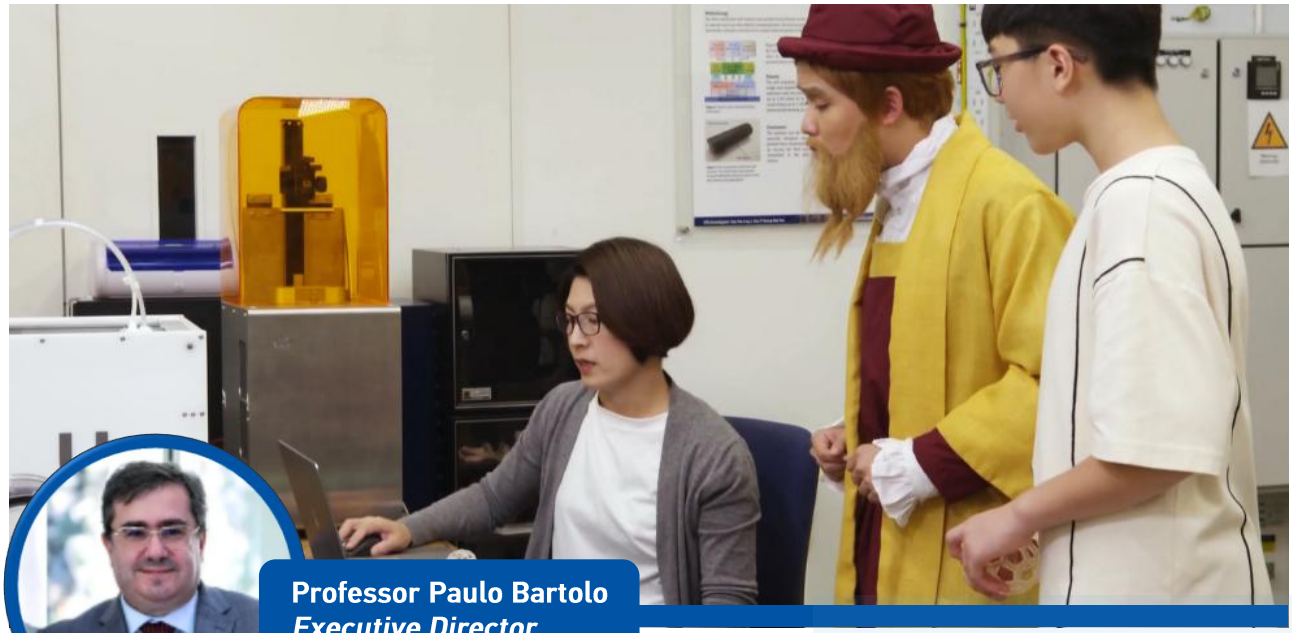
SC3DP
Singapore Centre for 3D Printing

JANUARY – APRIL 2025

NEWSLETTER

CHANGING THE WORLD THROUGH ADDITIVE MANUFACTURING



Professor Paulo Bartolo
Executive Director

MESSAGE

It is with great pleasure that we share in this issue of our newsletter some of the key achievements, awards, projects, seminars and other activities that demonstrate the dynamism and prestige of our researchers and important contributions to the advancement of science and solutions of industrial challenges.

Particularly relevant is the strategic research collaboration with MAKINO Asia, which will allow us to work together to further develop the cutting-edge high-speed Directed Energy Deposition (DED) technology, developing new materials and exploring a range of industrial projects in the fields of aerospace and defence, marine & offshore and tooling.

Moreover, the number of new projects, top quality publications and TDs clearly demonstrate the excellence of our research and technical capabilities. Finally, we are happy to share our latest state-of-the-art additive manufacturing systems, which will open new research opportunities and collaborations with industry. These accomplishments were made possible through the collective efforts and sustained support of our industry partners, faculty, researchers, and staff.

HIGHLIGHTS

SC3DP and Makino Asia Collaboration

A signing agreement with Mr William Goh Wei Lin, Head of Additive Manufacturing of Makino Asia

SC3DP World's Top 2% Scientists 2024

Recognition of faculty and researchers from the Singapore Centre for 3D Printing (SC3DP)

NTU Safety & Health Award

A recognition programme for institutions that demonstrate excellent WSH performance and practices.

New State of Art Equipment

Readily3D Printer | Nobula 3D-Glass 3D Printing | BMF Microarch S240

RESEARCH COLLABORATION

SC3DP and Makino Asia collaborate to advance High-Speed Laser Metal Deposition Technology

The Singapore Centre for 3D Printing (SC3DP) and Makino Asia signed a collaboration agreement on 2 April under the Joint Research Innovation Partnership framework. The collaboration marks a pivotal step in pushing the boundaries of high-speed Laser Metal Deposition (LMD) technology, powered by Makino's AML500 5-Axis Additive Manufacturing machine. This initiative seeks to explore new industrial use cases, advance solutions in component repair and surface coating, and foster the development of novel materials.

(from left) Mr Shum Chee Wai (Assistant Director, SC3DP), Professor Paulo Bartolo (Executive Director, SC3DP), Mr William Goh Wei Lin (Head of Additive Manufacturing, Makino Asia), Mr Hu Shan (Business Development Manager, Makino Asia

SC3DP's Professor Paulo Bartolo said: **"This milestone reflects Makino Asia's trust in SC3DP. I am confident that our collaboration will grow, driving innovation and advancing metal AM technology"**. Makino Asia's Mr William Goh Wei Lin said: **"Our long-standing partnership with SC3DP continues to grow, and with the Makino AML500 machine now onsite, we are poised to drive metal AM technology forward. Together, we aim to expand its impact beyond Singapore and onto the global stage".**

By uniting SC3DP's advanced research capabilities with Makino's strengths in precision engineering, the partnership reflects a mutual commitment to accelerating the industrial adoption of additive manufacturing technologies. The agreement was signed by Professor Paulo Bartolo, Executive Director of SC3DP and Mr William Goh Wei Lin, Head of Additive Manufacturing of Makino Asia.

FEATURED SC3DP'S FACULTY

Professor Yeong Wai Yee

- Professor and Chair, School of Mechanical and Aerospace Engineering, NTU
- Programme Director (3DP), HP-NTU Digital Manufacturing Corp Lab

Professor Yeong Wai Yee, former Programme Director for Aerospace and Defence has been responsible for a large number of project in the field of aerospace, biomanufacturing, and bioelectronics. She received numerous awards including the first TCT Women in 3D Printing Innovation Award 2019. She is ranked among the top 1% highly cited researchers and recently she was recognised as a Highly Ranked Scholar™, attaining the **No. 1 global position in 3D printing research over the past five years in 2024.** This prestigious distinction was awarded by ScholarGPS™. Over the years Professor Yeong Wai Yee supervised a large number of PhD students in different fields of addictive manufacturing which occupied relevant positions in the industry and academia, both in Singapore and overseas.

NEWS AND EVENTS

SC3DP World's Top 2% Scientists 2024

We are delighted to share that faculty and researchers from the Singapore Centre for 3D Printing (SC3DP) have been recognised in the World's Top 2% Scientists 2024 list* by Stanford University and Elsevier. This outstanding achievement highlights the exceptional quality of research conducted at SC3DP.

We extend our heartfelt congratulations to our esteemed members for their remarkable achievements, which further consolidate SC3DP's reputation as a global hub of scientific excellence and innovation.

Source: https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/7

NTU's 3D printed cube part of Singapore-Japan world's deepest ocean art installation

Singapore is now the first country to have an art installation 7,000 metres beneath the ocean. It comprises three metal cubes designed by Singaporean artist Ms Lakshmi Mohanbabu, the first Singaporean to send her artwork into space on the International Space Station in 2022. A tribute to all those impacted by natural disasters, these artworks were installed near the Mariana Trench off the coast of Japan by NuStar Technologies in December last year.

They were deployed as part of a specially designed early warning seismic sensor for undersea earthquakes, in collaboration with Japan's Agency for Marine-Earth Science and Technology (JAMSTEC). One of the cubes was made using a new hybrid manufacturing process developed by SC3DP's faculty, Prof. Lai Changquan. The historic milestone in conjunction with Singapore's SG60 celebrations was presented at Gallery ART NOW, officiated by Guest-of-Honour, NTU Board Chair Ms Goh Swee Chen, who is also Chairman of the National Arts Council.

YouTube Link

One Page At A Time 伟人不见了

It was a privilege to host Mediacorp artistes to the Singapore Centre for 3D Printing (SC3DP). The episode titled "One Page At A Time" showcased the evolution of printing technology - from conventional 2D paper printing to advanced digital 3D modelling.

SC3DP entrance with MediaCorp Artistes and Associate Professor Su Pei Chen sharing on the lab technology and facilities.

This episode explores how 3D printing technology is revolutionising various industries by enabling rapid prototyping and customised manufacturing. We are honoured to have Associate Professor Su Pei Chen to share insights into the versatility and efficiency of this additive manufacturing technique - including what a 3D printer is, its core principles, material selection and mixing, and its applications in everyday items such as jewellery, spectacles, stools, and latrines.

MeWatch link
Time: 10.00

Singapore Maritime Week

The Singapore Maritime Week, organised by the Maritime and Port Authority of Singapore (MPA), brought together industry partners to explore emerging trends, cutting-edge technologies, and future opportunities in the maritime sector.

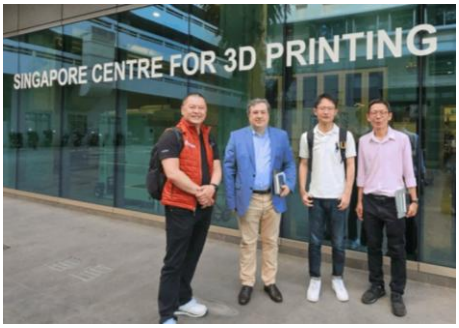
The Singapore Centre for 3D Printing (SC3DP) participated in the five-day event, which was held from 24 to 28 March, at the Singapore Maritime Institute (SMI) booth. SC3DP showcased its latest advancements in additive manufacturing, with a focus on multi-material 3D printing, repair solutions, and topology optimisation – technologies tailored for maritime applications. The showcase attracted strong industry interest and sparked meaningful discussions on the practical adoption of these innovations.

SC3DP staff shared their valuable insights with the participants.

WORKSHOPS AND SEMINAR

Seminar on Anisoprinting & Latest Trends and Technologies

On 12 March, SC3DP hosted an engaging seminar on Anisoprinting and the latest trends and technologies in 3D printing. The event featured Mr. Tuan Tran Pham, President of Anisoprint for the Americas and Asia regions, who shared valuable insights on cutting-edge developments in the field. Industry partners and researchers from various sectors attended to explore applications, challenges, and opportunities in 3D printing and its emerging technologies.



(Left) Mr. Tuan Tran Pham, President of Anisoprint sharing his valuable insights with the participants.

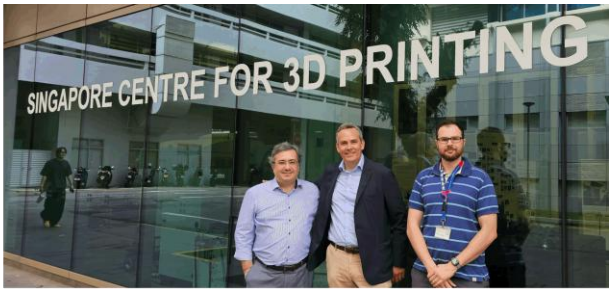
Glass 3D Printing at NTU powered by Nobula3D

On 12 February, SC3DP hosted an engaging seminar led by Dr Taras Oriekhov, Chief Technical Officer of Nobula3D, a Swedish startup that specialised in glass 3D printing.

Nobula3D led the industry with its innovative Direct Glass Laser Deposition (DGLD®) technology, providing fully integrated hardware and software solutions for customised glass printing. The seminar brought together professionals from both industry and academia, offered attendees the chance to experience a live demonstration, engaged them in meaningful discussions, and provided insights into the latest advancements in glass 3D printing.

We were delighted to have Dr Taras Oriekhov, Chief Technical Officer of Nobula3D to share his insights with our participants.

A Seminar Discussion on the Unmet Challenges in Orthopaedic Surgery with Professor Chris Peach



We were delighted to welcome Professor Chris Peach (Consultant Trauma and Orthopaedic Surgeon, Manchester University NHS Foundation Trust, UK), who delivered a seminar titled 'Current Unmet Need in Orthopaedic Surgery' on 9 April. He provided an overview of key gaps and challenges in orthopaedic surgery and shared valuable insights into how the medical community has been working to address these issues and improve patient care.

Introduction to ToffeeX: Generative Design software for Thermofluid

On 6 March, Mr Senthan Baskaralingam (Global Sales Executive) and Mr Thomas Rees (Engineering Leader) from ToffeeX shared their insights with our participants.

ToffeeX, a pioneer in physics-driven generative design, uses AI-powered software to help engineers create optimised, sustainable products. ToffeeX highlighted the value of combining advanced engineering tools with technologies like 3D printing, shared customer success stories, and provided a live demonstration of their thermofluid topology optimisation capabilities and user interface.

First Workshop on Research Activities at CDRSP and SC3DP

The "First Workshop on Research Activities at CDRSP (Centre for Rapid and Sustainable Product Development) and SC3DP" was held on 18 March. Speakers included Professor Rui Ruben from CDRSP and Professor Paulo Bartolo from SC3DP. The workshop featured presentations on a range of topics, including bioprinting, a novel radiotherapy approach for gastric cancer, and metal 3D printing research. Additionally, there were discussions on computational geometry and the application of machine learning to mechanics. The workshop aimed to foster collaboration and outline future research directions.

Seminar: Synthesis of Sustainable Polymers for Additive Manufacturing

On 5 March, SC3DP hosted an engaging seminar led by Professor Jorge Coelho, a full professor in the Department of Chemical Engineering at the University of Coimbra, Portugal. His insightful presentation explored the synthesis of sustainable polymers design for additive manufacturing. Professor Jorge highlighted various applications in tissue engineering and sensing. Additionally, he provided a comprehensive discussion on the limitations and potential of different polymer synthesis strategies, offering valuable perspectives for future research and development.

UPCOMING EVENT/SEMINARS

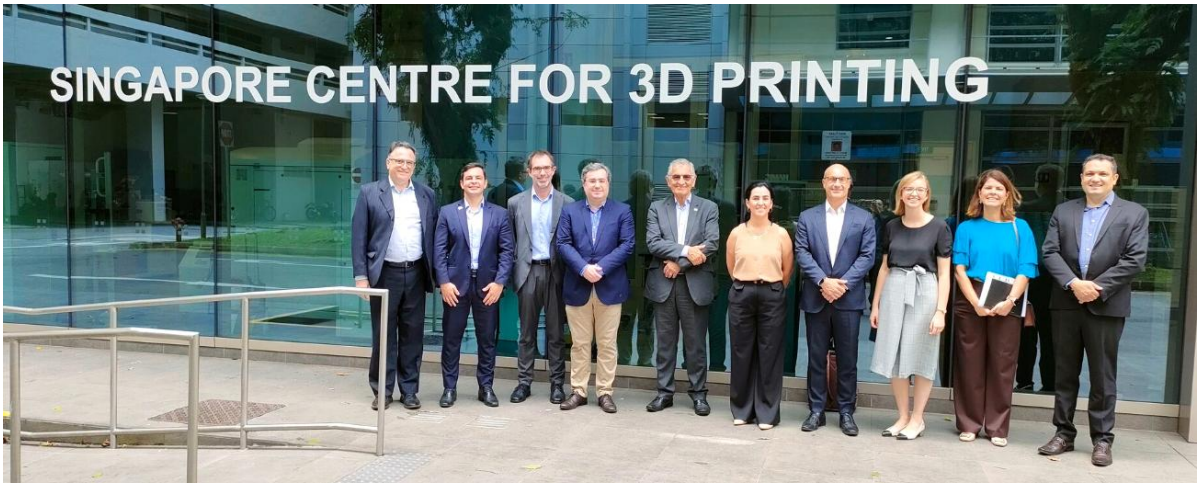
- Seminar by Professor Eleonora Ferraris - June 2025
- Industrial Transformation ASIA-PACIFIC (ITAP) - Oct 2025
- 3D Printing Competition – July 2025
- National Additive Manufacturing Innovation Cluster (NAMIC) AM Week – Oct 2025
- Formnext (The industry hub for Additive Manufacturing) – Nov 2025
- SC3DP Open House – Nov 2025

ENGAGEMENT

Visit by University Hospital Basel, Switzerland

Dr. Neha Sharma, Deputy Head of the Medical Advanced Manufacturing (Swiss MAM) Research Group and the 3D Print Lab at University Hospital Basel, together with Dr. Mark Tan and Mr. Nisar Ahmed from Singapore General Hospital, visited SC3DP on 10 April. This visit provided an excellent opportunity to gain deeper insights into the outstanding work conducted at University Hospital Basel and to discuss common research interests and potential future collaborations.

Visit by the Ambassador of Brazil



On 25 February, SC3DP hosted a delegation from Brazil, led by His Excellency Luciano Mazza de Andrade, Ambassador of the Federative Republic of Brazil to Singapore. This was an excellent opportunity for mutual introductions and exploratory discussions on multiple areas of common interest.

RESEARCH HIGHLIGHTS

Research Projects

We started eight projects:

- One **MOE Tier 2** project entitled "Voxel-like integration of bioprinting and engineering spheroids (VIBES) for the fabrication of pancreatic islet model",
- Two projects funded by NRF titled "3D bioprinting biodegradable skin regenerative wound dressing " and "Recycling wood and parts for sustainable powder and extrusion-based additive manufacturing";
- One project titled "Additive manufacturing of copper–graphene composites for high-performance motor windings" funded by **Panasonic;** and
- Four **NAMIC funded projects**, the project "Fabrication of YAG ceramics with high relative density by vat photopolymerization assisted with vacuum sintering" with Creatz3D, the "Clinical LAPIS Additive Manufacturing Technique for Personalized Dental Applications" with the National Dental Centre, the "Complex structural spatial joint facilitated by wire arc additive manufacturing" with China Jingye Engineering Corporation, and the "Feasibility Study of 3D Print Modular Conveyor Belt with Embedded Sensors for Predictive Maintenance" with Liang Eng.

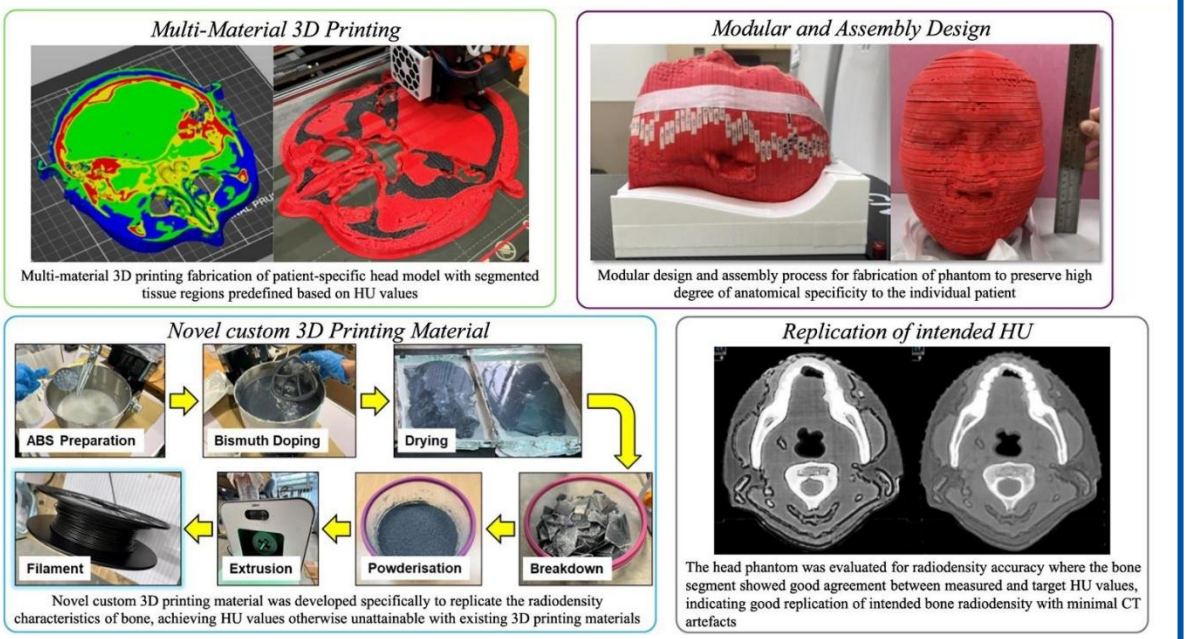
Publication Highlights

During this period, SC3DP's researchers published a total **of 56 papers in leading journals** such as Progress in Materials Science (Impact Factor: 33.6), Materials Science and Engineering R (IF: 31.6), Advanced Materials (IF: 27.4), Materials Today (IF: 21.1), Applied Catalysis & Environmental (IF: 20.3), Advanced Functional Materials (IF: 18.5), International Journal of Extreme Manufacturing (IF: 16.1). Advanced Science (IF: 14.3), Chemical Engineering Journal (IF: 13.4), Journal of Materials Science and Technology (IF: 11.2), Additive Manufacturing (IF: 10.3), and Virtual and Physical Prototyping), **confirming the excellence of the research being conducted at the Centre.**

Advancing Radiotherapy Through 3D Printing Innovation

Publication Highlight | April 2025 | Associate Professor Ng Bing Feng

Design and Additive Manufacture of Patient-Specific Head Phantom for Radiotherapy



Overview:
A pioneering study led by Associate Professor Ng Bing Feng (School of Mechanical and Aerospace Engineering) introduced a patient-specific, modular 3D-printed head phantom designed to improve accuracy in cancer radiotherapy. This innovative work showcased a novel custom material engineered to mimic bone radiodensity using a blend of ABS and bismuth, alongside polylactic acid for soft tissue simulation.

Key breakthroughs included:
- Development of a bone-mimicking material tailored for accurate CT imaging.
- Modular phantom design for efficient fabrication with anatomical fidelity.
- Use of multi-material 3D printing to replicate segmented tissues based on HU values.
- Successful validation of radiodensity accuracy, even in complex regions.

The study highlighted the transformative role of 3D printing in personalized cancer treatment, offering enhanced dosimetry quality assurance and setting a new standard in radiotherapy planning.

This publication presented the results of the research collaboration with the National Cancer Centre Singapore (NCCS), the national specialty centre for tertiary cancer care.

Source: https://doi.org/10.1016/j.matdes.2025.113719

INTELLECTUAL PROPERTY

6 New Technology Disclosure (TD) Submitted

- Multi-legged insect-like robotic swarm for dynamic environment mobile 3D printing,
- System and method of configuring multiple manipulators for hybrid large-scale 3D Construction Printing,
- Design for Additive Manufacturing (DfAM) of the lattice structure-based interface between metal and polymer in the hybrid structure,
- Bone replacement scaffold design chart,
- AI assisted height measurement of printed hydrogel without height image, and
- Self-calibrating bioprinter system for accurate line dimension.

1 Submission for Singapore Provisional Patent:

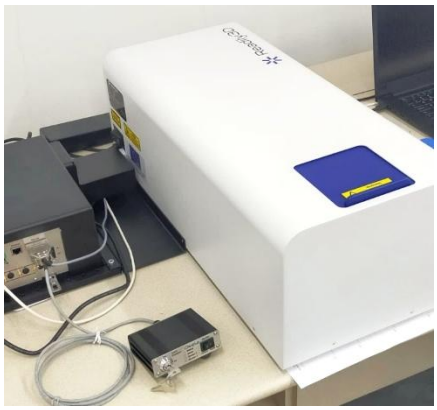
Design for Additive Manufacturing (DfAM) of the lattice structure-based interface between metal and polymer in the hybrid structure.

1 Conversion to Patent Cooperation Treaty (PCT) Application:

System and method for multi-material laser powder bed fusion using an adaptable build platform synthesized by sacrificial material - AMMLP (Adaptable Multi-Material Laser Printing)

NEW EQUIPMENT

We have a unique range of 3D printing systems, which allows us to conduct groundbreaking research and support industrial demands. One of our key aims is to continuously update our equipment portfolio with state-of-the-art technology.



Readily 3D Bioprinter

Description: Readily3D is a bioprinter that uses volumetric 3D printing technology to create complex biological structures rapidly and without layers. Unlike traditional layer-by-layer printing, it solidifies photosensitive bio-resins using light projections from multiple angles, forming entire 3D shapes in seconds. This makes it ideal for applications like tissue engineering, organoids, and customized cell scaffolds.

Nobula3D – Glass 3D Printing

Description: Nobula3D is a Swedish startup pioneering glass 3D printing using its patented Direct Glass Laser Deposition (DGLD®) technology. This method enables the precise, layer-by-layer deposition of glass using a laser-based process, allowing for the creation of complex, customized glass structures. Nobula3D provides an integrated solution combining hardware and software, making glass 3D printing more accessible for research, industrial, and design applications.

BMF MicroArch S240

Description: The BMF microArch S240 is a high-precision 3D printer designed for micro-scale printing, using Projection Micro Stereolithography (PμSL) technology. It enables the production of complex parts with ultra-fine resolution down to 10 microns, ideal for applications in electronics, medical devices, and microfluidics. The S240 supports engineering-grade materials, making it suitable for both prototyping and functional end-use parts.

SAFETY AND HEALTH

NTU Safety & Health Award

On 6 March, the Singapore Centre for 3D Printing (SC3DP) received **the NTU Safety & Health Bronze Award for the second consecutive year,** recognising our dedication to maintaining a safe and healthy workplace. SC3DP demonstrated strong leadership through active participation in safety initiatives, resource allocation for safety programs, and proactive compliance reviews. These efforts reflect SC3DP's commitment to maintaining a safe, healthy, and conducive environment.

The Workplace Safety and Health (WSH) Performance Awards in Singapore are a recognition program for institutions that **demonstrate excellent WSH performance and practices.** These awards acknowledge institutions that have implemented robust safety and health management systems to safeguard their employees and contractors, with the goal of promoting a culture of workplace safety and health.