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EDITORIAL

BDM editors pick the most memorable moments of 2024

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As the Chinese Lunar New Year—Spring Festival 2025 begins, we take an opportunity to look back at the journal *Bio-Design and Manufacturing* (*BDM* for short). The journal *BDM*, first published in 2018, is related not only to human life and health but also to the frontier disciplines of global scientific and technological development. Today we highlight a few points of interest from the past year in order to encourage more readers to pay attention to this exciting field.

1 An article with a national BDM frontier

Since the end of 2023, *BDM* has opened a column, "BDM at the Frontiers: Geography and Science," to understand the latest disciplinary research and product technology of biodesign and manufacturing in a country and region through an article. So far, three papers have been published in this column.

1. Biomanufacturing in Japan: frontier research from 2018 to 2023 [1].

2. Innovation leading development: a glimpse into three-dimensional bioprinting in Israel [2].

3. Biofabrication and biomanufacturing in Ireland and the UK [3], which was also reported as titled "On a pathway to better healthcare – how biomanufacturing and biofabrication are leading the way in the UK and Ireland" by the University of Cambridge [4].

Another comprehensive review, "3D printing for tissue/organ regeneration in China," written by up to 27 institutes all over China, will soon be available online [5].

In 2025, "BDM at the Frontiers: Geography and Science" will continue to publish cutting-edge summaries of the United States, Singapore, the Netherlands, and other regions.

2 Problems, technologies, and advances in three special issues

BDM is an interdisciplinary academic journal with a scope that focuses mainly on advanced design, manufacturing, and applications in biomedical engineering. It addresses aspects such as bioinks and formulations, tissue and organ engineering, medical and diagnostic devices, and bioproduct design, as well as multidisciplinary studies associated with bio-design and manufacturing. To this end, we have recently published three special issues.

The first is *Physics Problems in Bio or Bioinspired Additive Manufacturing* [6]. This special issue specifically focuses on the mathematical description and physical processes involved in bioprinting, helping researchers better understand the physical and mechanical issues that support the printing process, such as laser printing of zinc implants [7] and electrohydrodynamic bioprinting for cell alignment [8]. This enables us to gain a better understanding of the bioprinting process and make precise adjustments. One example is the evaluation of different crosslinking methods for altering the properties of extrusion-printed chitosan-based multi-material hydrogel composites, which focuses on the high-fidelity printing ability of egg white functionalized chitosan gelatin composite hydrogels and their efficacy in supporting the growth of new blood vessels into scaffolds and promoting angiogenesis in engineered tissues [9].

The second issue is focused on the latest advances in *Biomaterials and Emerging Technologies for Tissue Engineering and In Vitro Models* in the field, which greatly contributed to the successful translation of tissue engineering products into the market/clinics [10]. This special issue focuses mainly on the design and functionalization of biomaterials, advanced manufacturing, and applications in tissue engineering and in vitro models. One special approach to the in vitro oxygen consumption process involves the design of oxygenating colloidal bioinks [11] and oxygen-sensing fibers [12] and the

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investigation of oxygen tension in a 3D glioblastoma tumor model [13].

The third special issue discusses a new topic in this field *Advances in Wearable and Implantable Bioelectronics for Precision Medicine*, which covers subjects ranging from functional nanomaterials and advanced manufacturing to the working principles of wearable and implantable sensors, as well as therapeutic strategies [14]. A special example is bioelectronics in brain disease, the design of a drug-loaded flexible substrate to enhance the performance of conformal cortical electrodes [15], deep brain implantable microelectrode arrays for the detection and functional localization of the subthalamic nucleus in rats with Parkinson's disease [16], and flexible, high-density, laminated ECoG electrode arrays for high spatiotemporal resolution foci diagnostic localization of refractory epilepsy [17]. This exhilarating progress revealed a bright future in which people can avoid suffering from brain disease.

3 BDMC2024 conference held in Japan: a major highlight of the year

International academic exchanges have always been a strategy of the *BDM* journal. The International Conference on Biomaterials, Bio-Design and Manufacturing (BDMC) has already been an academic brand of our *BDM* journal. After COVID-19, we held BDMC2023 at the National University of Singapore in 2023, and this year, we successfully held BDMC2024 at the University of Tokyo in Japan despite the typhoon and forecast of a major earthquake. The participants came from 8 countries, and more than 132 experts and scholars as well as young postdoctoral and doctoral students in the interdisciplinary field of biomanufacturing from 34 institutes attended this conference (Fig. 1).

During the BDMC2024 conference, coeditor-in-chief Prof. Zhanfeng Cui asked two sharp questions. (1) What is missing in the BDM related to research and the journal? (2) Can intelligent and distributed biomanufacturing be a part of advanced manufacturing? This is a pattern of scientists keeping up with the times and thinking in reverse, where the knowledge of artificial intelligence is gradually influenced by new evidence from the BDM. We need time and innovation to distinguish and try many things. We will hold the 5th BDMC International Conference at the University of Oxford on Aug. 9–10, 2025. The theme of this meeting will be to share ideas and explore interdisciplinary research and product technologies including bioprinting, biomaterials, and biomedical applications. We believe that many questions will be more clearly addressed during the BDMC2025.

What makes science so powerful is that instead of being dogmatic and rigid, it is always open to new ideas and new data. We don't know everything, but putting our heads together with an open mind can help us figure it out in the areas of bio-design and manufacturing.

Fig. 1 Group photograph from BDMC2024

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