

**4D BIOPRINTING SMART AND NANOMATERIALS FOR COMPLEX TISSUE REGENERATION**  
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**Abstract:** 4D bioprinting is a highly innovative additive manufacturing process to fabricate pre-designed, self-assembly structures with the ability to transform from one state to another directly off the bioprinter. The term “4D” refers to the time-dependent dynamic process triggered by specific stimulation according to pre-designed requirements. The main objective of our research is to develop novel biologically inspired nano or smart inks and advanced 3D/4D bioprinting techniques to fabricate the next generation of complex tissue/organ constructs (such as vascularized tissue, cardiac tissue, and neural tissue). Our pioneering work in designing novel 4D bioprinting smart and nanomaterials has shown great promise for various biomedical applications. We have successfully designed a series of novel 4D bioprinted tissue structures with multi-responsive abilities, including internal stress-induced, solvent-responsive, thermo-responsive, and light-responsive tissue constructs. These smart constructs exhibit excellent biocompatibility and have significantly enhanced various stem cell functions when compared to traditional bioprinting constructs, thus promising for complex tissue/organ regeneration and various disease treatments.

**Bio:** Dr. Lijie Grace Zhang is a Professor and Associate Dean for Research in the School of Engineering and Applied Science at the George Washington University. She is the director of the Bioengineering Laboratory for Nanomedicine and Tissue Engineering at GW. Her lab is focused on applying advanced 3D/4D bioprinting, nanotechnology, and stem cells for complex tissue regeneration and various disease treatments. As a leader in the field of 3D/4D bioprinting, she has authored 156 publications including 115 peer-reviewed journal papers in top journals in her field, 22 conference proceedings, and 19 book chapters, and has published 12 patents/applications. Her lab has given over 370 presentations at various international/national conferences and universities. Dr. Zhang is an ASME Fellow and American Institute for Medical and Biological Engineering (AIMBE) Fellow. She has received many prestigious awards including the ASME Sia Nemat-Nasser Early Career Award, NIH Director’s New Innovator Award, Society of Engineering Science Young Investigator Medal, etc. She serves as the Editor-in-Chief of *Biomedical Engineering Advances* and Associate Editor for several high-impact international journals.