COLLOQUIUM

3D Printing Functional Materials & Devices

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The ability to three-dimensionally interweave biological and functional materials could enable the creation of devices possessing unique and compelling geometries, properties, and functionalities. Indeed, interfacing active devices with biology in 3D could impact a variety of fields, including regenerative bioelectronics, smart prosthetics, biomedical devices, and human-machine interfaces. Our approach is to use extrusion-based multi-material 3D printing, which is an additive manufacturing technology that offers freeform, autonomous fabrication. This approach addresses the dichotomies presented above by (1) using 3D printing and imaging for personalized, multifunctional device architectures; (2) employing 'nano-inks' as an enabling route for introducing diverse material functionality; and (3) 3D printing a range of functional inks to enable the interweaving of a diverse palette of materials, from biological to electronic. 3D printing is a multiscale platform, allowing for the incorporation of functional nanoscale inks, the printing of microscale features, and ultimately the creation of macroscale devices. This blending of 3D printing, functional materials, and 'living' platforms may enable next-generation 3D printed devices, from a one-pot printer.