THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT
SPRING COLLOQUIUM SERIES PRESENTS:

Goll Lecture: Joseph DeSimone

Professor of Translational Medicine and Chemical Engineering

Stanford University

The Delicate Interplay Between Light, Interfaces and Design: The Complex Dance that Allows 3D Printing to Scale to Manufacturing

The production of polymeric products relies largely on age-old molding techniques. In this talk, I will describe a breakthrough in additive manufacturing—3D printing—referred to as Continuous Liquid Interface Production (CLIP) technology (*Science* **2015**). CLIP, and its recently introduced cousin injection CLIP (iCLIP; *Science Advances* **2022**), embody a convergence of advances in software, hardware, and materials to bring the digital revolution to the design and manufacturing of polymeric products. CLIP uses software-controlled chemistry to produce commercial quality parts rapidly and at scale by capitalizing on the principle of oxygen-inhibited photopolymerization to generate a continual liquid interface of uncured resin between a forming part and a printer's exposure window. Instead of printing layer-by-layer, this allows layer less parts to 'grow' from a pool of resin, formed by light. Compatible with a wide range of polymers, CLIP opens major opportunities for innovative products across diverse industries. Previously unmakeable products are already manufactured at scale with CLIP, including the large-scale production of running shoes by Adidas (Futurecraft 4D); mass-customized football helmets by Riddell; the world's first FDA-approved 3D printed dentures; and numerous parts in automotive, consumer electronics, and medicine. At Stanford, we are pursuing new advances including digital therapeutic devices in pediatric medicine, new multi-materials printing approaches, recyclable materials, and the design of a high-resolution printer to advance technologies in the microelectronics and drug/vaccine delivery areas, including novel microneedle designs as a potent vaccine delivery platform and for the sampling of interstitial fluids for health monitoring and the early detection of disease.

Joseph M. DeSimone is the Sanjiv Sam Gambhir Professor of Translational Medicine and Chemical Engineering, Departments of Radiology and Chemical Engineering, Department of Chemistry (by Courtesy), Department of Materials Science & Engineering (by Courtesy), and Graduate School of Business (by Courtesy) at Stanford. Previously, DeSimone was a professor of chemistry at the University of North Carolina at Chapel Hill and of chemical engineering at North Carolina State University. He is also Co-founder and former CEO (2014 - 2019) of the 3D printing company, Carbon.
DeSimone is responsible for numerous breakthroughs in his career in areas including green chemistry, polymer synthesis, medical devices, nanomedicine, and 3D printing. He has published over 350 scientific articles and holds 240 patents. In 2016 DeSimone was recognized by President Barack Obama with the National Medal of Technology and Innovation. He is one of only 25 individuals elected to all three branches of the U.S. National Academies (Sciences, Medicine, Engineering). DeSimone received his B.S. in Chemistry in 1986 from Ursinus College and his Ph.D. in Chemistry in 1990 from Virginia Tech.

Tuesday, April 16 • 3 pm CT • Ford ITW

Reception preceding at 1pm in the Willens Wing Atrium

In person only; no Zoom

Host: Professor Ryan Truby

Questions? Contact allison.macknick@northwestern.edu