Stanford

Marshall Scott Padilla

Affiliate, Materials Science and Engineering

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Marshall Scott Padilla will begin as an Assistant Professor of Materials Science and Engineering and a Sarafan ChEM-H Institute Scholar at Stanford in September 2026. His research takes a rational-design approach to RNA medicine, engineering lipids and lipid nanoparticles (LNPs) that deliver RNA and proteins to specific cells. Rather than relying on empirical, large-scale screening, he couples the synthesis of structurally defined lipid libraries with multimodal biophysical characterization and in vivo screening to extract the structure–activity relationships that govern delivery.

His research group aims to move beyond the field's default of hepatic delivery toward LNPs that direct RNA and protein cargoes to defined cell types, enabling durable and precise therapies. Group interests span ionizable lipid synthesis, gene editing, cancer immunotherapy, ionic liquids, mapping endosomal escape, and the analytical and biophysical methods needed to relate nanoparticle structure to function. He is broadly interested in establishing generalizable chemical and structural principles for the next generation of delivery vehicles.

Prior to joining Stanford, Marshall was an NIH postdoctoral fellow in the Department of Bioengineering at the University of Pennsylvania with Prof. Michael J. Mitchell, where he developed the Branched ENdosomal Disruptor (BEND) lipid architecture for mRNA and CRISPR-Cas9 delivery (Nature Communications, 2025), advanced solution-based biophysical methods for characterizing LNP structure (Nature Biotechnology, 2025), and engineered LNPs co-delivering mRNA and small-molecule drugs for oral cancer chemoimmunotherapy (Advanced Materials, accepted). He completed his PhD in Chemistry (Chemical Biology) at the University of Wisconsin–Madison and his B.S. in Chemistry at the College of William & Mary. His work has been recognized by the Society for Biomaterials (Burroughs Wellcome Fund BioInterfaces Rising Star Award), the American Association for Dental, Oral, and Craniofacial Research (Hatton Award, postdoctoral first place), and an NIH/NIDCR T90 fellowship.