

MWP – Young Researcher Abstract 2026

Project title: Wood as a Scaffold for Engineered Living Materials: Bacteria that Functionalize and Strengthen Wood	
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Abstract (approx. 200 words): Engineered Living Materials (ELMs) combine the responsiveness of living cells with a structural matrix, yet most rely on synthetic polymers or hydrogels. My research establishes wood as a natural, sustainable scaffold for ELMs, using bacteria not only to add new function to wood but also to enhance the wood's properties. We laid the groundwork by studying how bacteria explore wood. By comparing microfluidic wood-mimetic channels, with real early-wood lumen, we observed strain-specific motility and the influence of wood extractives, which are key to distributing bacteria through the scaffold. Building on this, we pursue two directions. To add function, we engineered an <i>Escherichia coli</i> strain carrying the laccase <i>CotA</i> gene, immobilized the cells within the wood lumina, and built a flow-through bioreactor that oxidatively degrades wastewater pollutants such as pharmaceuticals and dyes. To enhance durability, we use <i>Sporosarcina pasteurii</i> as urease-active factories that mineralize wood from within, overcoming the diffusion and clogging limits of conventional treatments to form tougher wood composites. These projects show that wood can be used as a programmable, living platform that bacteria can both functionalize and strengthen. My vision is to turn one of Earth's most abundant biomaterials into a new generation of engineered living wood.	
Key words:	