

**ENGINEERING NATURE BUILDING BLOCKS TO BOOST PLANETARY HEALTH**  
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**Abstract:** New technologies that are economically sustainable, scalable, and rapidly deployable to market are needed to address the pressing need to improve planetary health and build an equitable society. With a focus on applications in plants and in the agri-food systems, we have recently shown how nanomanufacturing of natural polymers leads to the development of disruptive technologies that are scalable and can reach commercialization. In this presentation, we will present newly developed techniques to direct the assembly of structural proteins into nanostructured materials that can serve as: membranes with modular barrier properties that can prolong the shelf-life of perishable food, edible physically unclonable functions and microenvironments to boost plant health in marginal land. These examples will provide an opportunity to discuss disorder to order transitions in proteinaceous materials during condensation phenomena, assembly in nano and micro-confinement, and integration of bottom up and top down nanomanufacturing to form hierarchically mesostructured materials that are edible, non-toxic and biodegradable.

**Bio:** Benedetto Marelli is an Associate Professor in the Department of Civil and Environmental Engineering at the Massachusetts Institute of Technology. He received a B.Sc. and a M.Sc. in Biomedical Engineering from Politecnico di Milano in 2005 and 2008 and a PhD in Materials Science from McGill University in 2012. After a Postdoc in the Silklab at Tufts University, Benedetto joined the MIT Faculty in late 2015. At MIT, the Marelli group works on structural biopolymers and nanomanufacturing to design biomaterials with applications in precision agriculture, food security and food safety. Benedetto has received several awards, including PECASE, NSF CAREER, ONR Young Investigator Award and ONR DoRECA. Benedetto has also joined the 2021-2023 New Voices Program promoted by the National Academies of Sciences, Engineering and Medicine and received the 2022 BII&Science AAAS Prize for Innovation. Benedetto is the co-founder of Mori, a startup that employs >90 people and commercializes silk-based edible food coatings to extend shelf-life and reduce packaging.