

OPPORTUNITIES FOR NANOTECHNOLOGY TO IMPROVE THE SUSTAINABILITY OF AGRICULTURE

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Abstract: Agriculture places extreme pressure on the environment and increasing the sustainability of agriculture is one of societies greatest challenges. The past 20 years of environmental nanotechnology has provided significant understanding of the environmental fate, behavior, and toxicity potential of both engineered and natural nanomaterials. This improved understanding is now enabling the development of safe and sustainable nano-enabled agritech approaches to improving the resilience and productivity of crop plants. These include the ability to precisely deliver nutrients and plant protection products to crops, approaches for delivering plant protection agents in response to environmental stressors like heat, making plants more resistant to disease through enhanced nutrition, and enabling plant to sense their environments and communicate their nutrition and stress status to growers. Design rules for delivering nanomaterials in plants and the mechanisms behind observed nano-specific behaviors are just beginning to emerge. Elucidating these behaviors will enable rational design of nano-enabled products to transform the way crops are cultivated and managed, vastly improving the sustainability of agriculture

Bio: Greg Lowry is the Walter J. Blenko, Sr. Professor of Civil and Environmental Engineering at Carnegie Mellon University. He was the Deputy Director of the NSF/EPA Center for Environmental Implications of Nanotechnology (CEINT), and is an Executive/Associate Editor of *Environmental Science & Technology*. His research aims to understand how the unique properties of engineered nanomaterials affect their transport and fate in environmentally relevant matrices including plants, soil, and groundwater. He uses this knowledge to help make crop agriculture, water treatment, and environmental remediation more sustainable. He has authored 197 peer-reviewed journal articles and one book. He is a Board-Certified Environmental Engineer (BCEEM), Fellow of the American Association for the Advancement of Science, Fellow of the AEESP, and was a member of the National Academy of Science Committee on *Science Breakthroughs 2030: A Strategy for Food and Agricultural Research*. Dr. Lowry holds a B.S. in Chemical Engineering from the University of California at Davis, an M.S. from the University of Wisconsin at Madison, and a Ph.D. in Civil & Environmental Engineering from Stanford University.