

**Department of Structural Engineering  
University of California, San Diego  
SE 290 Seminar**



Dr. Matt Evans  
Associate Professor  
Oregon State University

**“Soil Mechanics at the Grain Scale with Applications to Bio-Cementation”**

Wednesday, May 16, 2018

12:00 pm - 12:50 pm, Center Hall, Room 214

<https://structures.ucsd.edu/seminars>

## **Abstract**

Particulate materials do not: have inherent strength and stiffness (like a solid); flow freely (like a liquid); or compress easily (like a gas). The unique combination of properties possessed by granular materials includes that they are: inherently multiphase, porous, and pervious; nonlinear and inelastic; their volume changes during shear; and strength and stiffness depend on confinement, strain rate, and stress path. Given these observations, particulate materials are effectively a separate phase of matter –neither solid, liquid, nor gas. Granular materials are not always amenable to continuum descriptions of behavior, so in some cases a discrete approach is adopted for modeling. Bio-cementation, a novel and promising approach for the stabilization of liquefiable sand deposits in-situ, will be used to motivate a broader discussion of grain-scale soil mechanics. The talk will begin by providing a survey of soils as assemblies of discrete particles and provide an introduction to the discrete element method (DEM) for the simulation of the mechanical behavior of granular materials. In DEM modeling,

every grain in an assembly is modeled individually and simulation involves solution of Newton's equations of motion for every particle at every time step. After an introduction of modeling basics and a brief discussion of particle-continuum duality, the mechanical behavior of bio-cemented sands will be explored.

## **Biography**

Matt is an Associate Professor in the School of Civil and Construction Engineering at Oregon State University. Prior to coming to OSU he spent six years as an Assistant Professor at North Carolina State University. His research interests include granular mechanics, multiphysics processes, quantitative stereology, image processing and morphology, soil mechanics, and geotechnical engineering. He serves on the editorial board of the *ASCE Journal of Geotechnical and Geoenvironmental Engineering and Soils and Foundations*. He is the chair of the Soil Properties and Modeling Committee of the ASCE Geo-Institute. He earned his M.S. and Ph.D. in civil engineering from the Georgia Institute of Technology, a B.S. in civil engineering from the University of New Mexico, and a B.A. in physics from the University of Virginia.

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*Sponsored by Professor John McCartney  
For more information on this seminar, contact Amber Samaniego,  
at 858-534-4282 or [a2samaniego@ucsd.edu](mailto:a2samaniego@ucsd.edu)*