

## 17<sup>th</sup> C.W. Lovell Distinguished Lecture

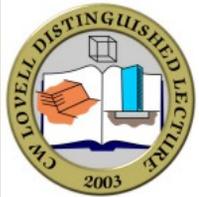
4:30 pm, Friday, November 1, 2019

Lawson Hall, Room 1142, Purdue University

### Professor Cino Viggiani

## 3D Experimental Geomechanics At The Grain Scale: What For?

With x-ray micro tomography it is now possible to acquire 3D full-field measurements of granular materials at suitable resolutions. Digital Image Correlation has been used to determine the distribution of strain in a specimen and/or individual grain kinematics, i.e., displacements and rotations of individual grains. These works have provided a deep insight into the micro-mechanics of the processes governing the behavior of granular materials. This lecture will present recent advances in experimental micro (geo)mechanics achieved thanks to x-ray tomography and digital image analysis. In particular, we will focus on some recent experimental measurements of a 3D fabric tensor and its evolution during shearing of granular materials. Triaxial compression experiments on natural sands are chosen to investigate the evolution of fabric. Two different subsets of the specimen are chosen for the contact fabric analysis: one inside and another one outside a shear band. Individual contact orientations are measured using advanced image analysis approaches within these subsets. Fabric is then statistically captured using a second order tensor and the evolution of its anisotropy is related to the macroscopic behaviour. Finally, some very recent results obtained on fabric evolution from triaxial compression of lentils (i.e., very anisotropic grains!) are also presented. More generally, the lecture will try to convey the following two messages: 1) to convince the audience that x-ray imaging is a measurement tool, not only a way to provide fancy images, and 2) to discuss what sort of modeling applications these rather exotic data can help to inform or inspire.



### C. W. LOVELL DISTINGUISHED LECTURE

Professor Emeritus C. W. "Bill" Lovell was a native of Louisville, Kentucky, and received his BCE from the University of Louisville. He served in the U.S. Navy Construction Battalions (SeaBees) during World War 2, and taught at the University of Louisville after the War. In 1948, he came to Purdue University, and he remained in that employment until 2012, receiving MSCE and Ph.D. degrees in the process. His service in Civil Engineering extended over 48 years, including major professorship for 60 theses and authorship for almost 200 papers. During his distinguished career at Purdue University, Prof. Lovell was major professor to 112 students, 60 of whom wrote research theses, and published in excess of 200 papers. His research interests were broad and varied including soft rocks (shales), compaction and compacted properties, soil fabric and pore size distribution, slope stability and erosion, cold regions, pavements, and uses of waste materials in geotechnical engineering. In 1994, Bill became a facilitator/coach in Human Resources Services at Purdue. He specialized in delivering a variety of FranklinCovey leadership/personal development seminars, and received a "Facilitator of the Year" award from FranklinCovey. Bill was active in community volunteer organizations, and continued to be an avid fly fisherman.



Detailed information on the 17th C. W. Lovell Distinguished Lecture can be found at the following website:  
<https://engineering.purdue.edu/CE/Academics/Groups/Geotechnical/Details/seminar/Lovell>



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**4:30 pm, Friday, November 1, 2019**  
**Lawson Hall, Room 1142, Purdue University**

**Professor Cino Viggiani**

**3D Experimental Geomechanics At The  
Grain Scale: What For?**



Cino Viggiani was born in Napoli (Italy) and is now Full Professor of Geomechanics and Civil Engineering at *Université Grenoble Alpes*, which he first joined back in 1995 as a Marie Curie Post-Doctoral Research Fellow. In 2012, he was been promoted to Professor of Outstanding Rank by the French National Council of Universities. He served as vice-president for research in Physics and Engineering at *Université Grenoble Alpes*, as well as head of the research unit *Laboratoire 3SR* in Grenoble. His research involves experimental investigations as well as theoretical and numerical modelling of the behavior of geomaterials, including localized failure and hydro-mechanical coupling. Applications are principally in geoenvironmental, petroleum, and civil engineering. On the experimental side, he has been developing and using quite a range of innovative soil and rock testing apparatus and experimental techniques – in particular, Digital Image Correlation, x-ray tomography, and neutrontomography. He has delivered about 30 Keynote lectures worldwide and he is author of over 200 scientific papers, including 90 peer-reviewed Journal papers and about 150 refereed publications in Books, International Workshops and Conferences. He was a founding editor of the International Journals *Acta Geotechnica* and *Open Geomechanics* and is currently President of ALERT-Geomaterials.

Beginning in 2003, the C. W. Lovell Distinguished Lecture series was established through the generosity of Professor Bill and Mary Ellen Lovell, who expressed an interest in creating a lecture series at Purdue that will have staying power - one in which a track record of scholarship is clearly established. Thus, each year, lecturers with outstanding accomplishments in geotechnical engineering research are invited to Purdue University. The lecture series creates an excellent opportunity for our graduate students to meet and interact with some of the most important names in geotechnical engineering in person at Purdue.

A dinner will be held at the Purdue Memorial Union. Reservations to attend the dinner are required by 3:00 pm on **October 25, 2019**. For more information, please contact Jo Ritchie; ph: 765-494-5025; [bjritchi@purdue.edu](mailto:bjritchi@purdue.edu)

