DISTINGUISHED SEMINAR SERIES

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Geological Risk and Underground Construction

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12PM - 1PMEST

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ABSTRACT: Population increase means mega-cities will be growing very fast as "compact cities" for which surface space becomes a priority and for which underground space will become increasingly important. This creates a particular urgency to make the underground space of the future cheaper to construct and reliable in construction and operational performance.
The cost and performance of underground projects is intimately linked to the understanding and management of geologic risk for both construction and life-cycle performance of subsurface facilities. This includes "normal" uncertainties, but also the expectation that urban growth will extend into increasingly fragile and poor geotechnical environments, and that the projects will involve larger and deeper openings.
This paper develops a geologic framework to assess the state-of-practice and future possibilities for improved management of geologic risk, including risk avoidance, new materials and methods, ground improvement, life cycle engineering for sustainability, and better subsurface characterization. Some geologic risks have plagued for centuries, e.g., ground water, shallow cover and weathered rock, subsidence and impact on structures, stresses and stress relief, progressive deterioration.
And new risks have arisen associated with new technologies including unexpected stress-driven ground behavior, and design for higher water inflows and pressures, increased depth, and variety of excavated shapes. In addition, a better understanding of the spatial variability of rock structure is needed a priori, including application of geophysical and remote sensing techniques. Our site investigations of the future need to be increasingly confirmatory rather than exploratory.

Bio: Dr. Priscilla P. Nelson is Professor of Mining Engineering at the Colorado School of Mines. She previously was Provost at the New Jersey Institute of Technology (NJIT), program director and senior advisor at the US National Science Foundation (NSF), and Professor in Civil Engineering at The University of Texas at Austin. She has an international reputation in geological and rock engineering, and has been involved in the underground construction industry for over 35 years. She worked for the US DOE and the State of Texas on the Superconducting Super Collider project, and she has served two terms on the U. S. Nuclear Waste Technical Review Board, appointed by Presidents Clinton and Bush.

Dr. Nelson has published more than 150 technical and scientific publications, and she is a Distinguished Member of the American Society of Civil Engineers (ASCE), former president of the Geo-Institute of ASCE, a lifetime member and first president and Fellow of the American Rock Mechanics Association, and Fellow of American Association for the Advancement of Science (AAAS). Dr. Nelson has received many honors and awards, including election to The Moles (1995) and induction into Tau Beta Pi as an Eminent Engineer (2007). In 2008 she received the Kenneth Andrew Roe Award from the American Association of Engineering Societies (AAES), and she was the 2011 recipient of the ASCE Henry L. Michel Award. In 2015 she was identified as one of the 100 Global Inspirational Women in Mining (by WIM/UK), and also was appointed to the Committee on Geological and Geotechnical Engineering of the National Academies. In 2016 she was appointed Chair of the Mine Safety and Health Research Advisory Committee of NIOSH/CDC. In 2018 she received the Outstanding Educator award from Underground Construction Association of SME.

She received her BS degree in geology from the University of Rochester (1970) and two master's degrees in geology (Indiana University, 1976) and structural engineering (University of Oklahoma, 1979). In 1983, she received her PhD degree from Cornell University.