

The 8th Annual Pedro de Alba Lecture In Geotechnical Engineering

Thursday, April 29th

6:30 pm (EST)

Webinar : <https://unh.zoom.us/j/94958559393>



UNH CEE Geotechnical Professor

Jean Benoît, Ph.D.

Presents 'Smart Rock Technology'

Uncertainty related to rockfall behavior in mountainous regions is increasingly relevant as climatic changes lead to further erosion of slopes, cliffs, and rocky terrains. Rock slopes pose a significant safety hazard to the traveling public, to infrastructure and other assets located near slopes. Current design of protective structures relies on design criteria developed decades ago that were based on semi-quantitative measurements. Both the design of new rock slopes and the hazard assessment of existing rock slopes need improvement to increase safety against rockfall, construct better engineered slopes and reduce short and long-term maintenance costs. Research conducted at the University of New Hampshire over the last decade developed four generations of Smart

Rock (SR) sensors, the latest being capable of instrumenting field and laboratory rockfall experiments from the perspective of the falling rock. The latest SRs consist of 3D printed capsules, 50.8 mm in length and 25.4 mm in diameter, equipped with 3-axis accelerometers, a 3-axis high-rate gyroscope and an altimeter, sampling data at high frequency while embedded in natural rocks. The analysis of these field experiments will be used to calibrate models for rockfall simulation software packages, thus contributing to a safer design of catchment geometries and protection barriers. This research will help refine hazard ratings of rock slopes and prioritize remediation efforts, assisting designers in developing a more realistic model to refine catchment geometries and rockfall protection systems. The lecture will present the historical development of the smart rock with its initial applications to granular slopes with full scale experiments in Oregon, model scale testing at Queens University in Canada and the more recent projects involving rock slopes in NH, Vermont. Future work with Gustave Eiffel University in France using the smart rock on test sites near the Alps will highlight the potential of this technology.

Professor Pedro de Alba

Born in Chihuahua, Mexico on April 2, 1939, Pedro de Alba obtained his BSCE in 1964 from the National University of Mexico (UNAM). He then worked as a design engineer for public and private sector, before obtaining his MS in 1969 from the University of California Berkeley. He obtained his PhD working on liquefaction of sands during earthquakes under the supervision of his advisor, Dr. H. Bolton Seed. After his PhD in 1974, he worked as a senior engineer for Shannon and Wilson in Burlingame, CA (1974-1976) and then as a research engineer at Berkeley (1976-1977) before joining the Department of Civil Engineering at UNH in 1977. In his 33 years at UNH he taught over twelve different courses in geotechnical engineering at both undergraduate and graduate levels. Professor de Alba was an outstanding teacher, a scholar and, above all, a gentleman. He was a mentor and a role model to his students and colleagues. In his numerous service roles, he always showed great compassion and support for students and the university. His professional interests were in experimental techniques for measuring the dynamic response of soils, especially, residual strength of liquefied sand. Professionally he was involved with several major research projects. He was a member of ASCE, EERI, and ASTM, and also co-editor and founder of the earthquake engineering journal, *Sismodinamica*. His dedication to the engineering profession was truly exemplary.

