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LUCAS MUSEUM DESIGN BENEFITS FROM ADVANCED EARTHQUAKE GROUND MOTION SCIENCE

by Pedro Espinosa, GE; Bahareh Heidarzadeh, PhD; David Teague, PhD; Gilead Wurman, PhD
San Ramon, California

Designed by the award-winning architect Ma Yansong of MAD Architects and world-renowned structural engineering firm Leslie E. Robertson Associates (LERA), the Lucas Museum of Narrative Art will exhibit works from around the world, digital technologies, daily film screenings and educational opportunities for all ages. The non-profit museum features an ethereal, almost floating design that was preserved due to an advanced method for accurate prediction of earthquake ground motions.

The museum will house the private art and memorabilia collections of famed filmmaker George Lucas and his wife, Mellody Hobson, and will be constructed on two state-owned parking lots on Vermont Avenue south of Exposition Boulevard in Los Angeles. Construction of the museum is expected to take approximately three years, beginning in early 2018 and finishing in 2021. The Museum of Narrative Art will be a five-story, 115-foot-tall building. Nearly one-third of the proposed building's 290,000 square feet will be dedicated to gallery space, with other program elements including a movie theater, a lecture hall, a library, a restaurant and several digital classrooms. A publicly accessible green roof terrace will cap the building, while a 2,425-space parking complex will be located underneath. The new museum and surrounding 11-acre public space is set to revitalize Los Angeles' Exposition Park.

In the course of our geotechnical engineering design on the museum, the base-isolation designer concluded that the ground motions considered in their initial design would result in excessive movements of the structure. A re-design would likely have led to significant impacts to schedule and budget. Furthermore, the re-design would have necessitated larger structural elements (e.g., columns and beams), resulting in a less aesthetic structure. This prompted the team to apply a new approach to more accurately and precisely predict the ground motions for the site, possibly reducing the amplitudes predicted for the design earthquake.

LUCAS MUSEUM (CONTINUED FROM PG. 1)

The original ground motions were obtained using traditional, ergodic seismic hazard analysis (SHA) methods. These traditional approaches rely on broad datasets from across the world. Consequently, these approaches are very uncertain and may be biased at the site of interest. Recently, non-ergodic SHA procedures have been developed that use ground motion records at or near the site of interest, along with simulations, to develop more refined ground motion estimates. The implementation of non-ergodic SHA is considerably more complicated than traditional ergodic SHA. However, our team of three engineers and one seismologist teamed up with leading expert Jonathan Stewart from UCLA to implement these state-of-the-art analysis procedures at the Lucas Museum site. Faced with many challenges along the way, the design team worked tirelessly to perform this analysis in a little more than one month.

The team faced a highly respected peer-review panel composed of a number of experts, and was ultimately able to demonstrate that the state-of-the-art non-ergodic analysis yielded results that were more accurate than those from the original analysis. These refined analyses indicate that the original base isolators will have the capacity to accommodate the anticipated shaking during the design earthquake event. Therefore, this analysis eliminated the need for what would have been substantial redesign of portions of the project. Not only did this cutting-edge science save the project millions of dollars in potential re-design costs; it also meant that the sleek, lofty design of the building could remain as in the original concept without the need for additional, unaesthetic structural supports.

Authors pictured from left to right: David Teague, Gilead Wurman, Pedro Espinosa, Bahareh Heidarzadeh.

DRONES ENHANCE ENGINEERING CAPABILITIES

by Annamarie Clark, PE
San Ramon, California

Drones, also known as Unmanned Aircraft Systems (UASs), have made significant inroads into the AEC world. Drones have enabled incredible gains in productivity, reduced the time and cost of many operations significantly, and unlocked entirely new service areas.

The ease of obtaining drones means that anyone who wants to use them for design and construction projects can get started quickly and cheaply. However, the reality is that there are nuances to getting the most accurate data out of the drone, and using drones always carries a certain level of risk that not everyone should undertake.

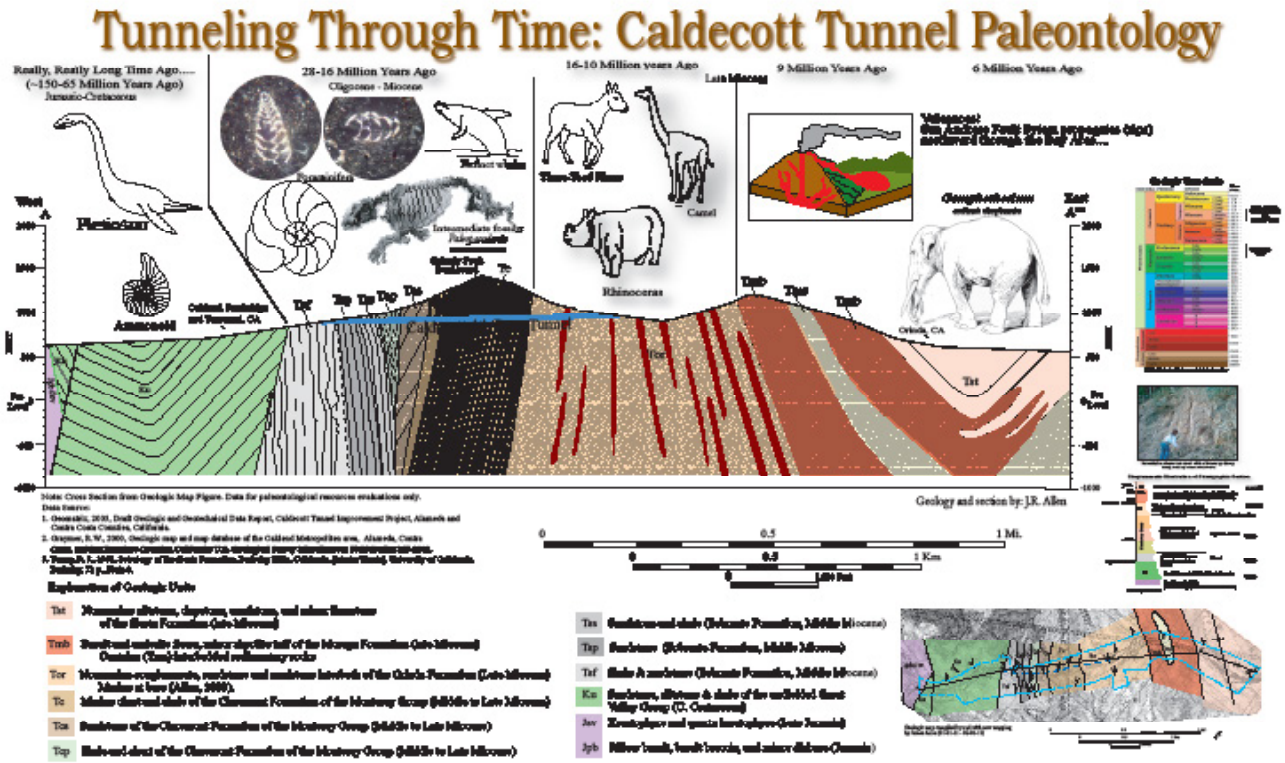
Many development projects today must carefully manage their legal and public relations profiles. With drones taking such a high-visibility position in public media today, clients have expressed a keen interest in limiting their legal exposure from drone operations on their projects. In response, ENGEO is instituting airline-style procedures focused on improving safety and managing our growing fleet of drones and pilots.

We utilize a Flight Operations Manual, Operations Specifications, and a Safety Management System in the US, which are required for charter and airline operators, but almost unheard-of among drone operators. In New Zealand we follow local regulations. Additionally, all our drone operations are covered by a dedicated drone insurance policy.

ENGEO's team in the US and New Zealand offers a variety of drone services, including landslide mapping, creek erosion mapping and large-site reconnaissance. We can also create high-resolution orthophotos and digital terrain models to assist clients with visualization of complex 3D features.

PALEONTOLOGICAL RESOURCES PROTECTION IS MANDATORY UNDER CEQA

by James Allen, PG
San Ramon, California



Paleontological resources protection is mandatory under the California Environmental Quality Act (CEQA) in areas that include potentially fossiliferous bedrock and/or surficial deposit units. Paleontological resources include fossils of marine and non-marine vertebrates, invertebrates, microfossils and plants—the remains or traces of once-living organisms preserved in sediments or sedimentary rocks—and the geologic context in which they occur. Most fossil remains are the preserved hard parts of plants or animals, and they include bones and teeth of once-living vertebrate animals, shells or body impressions of invertebrate animals, and impressions and carbonized or mineralized parts of plants (e.g., petrified wood). Trace fossils include preserved footprints, trackways, and burrows of prehistoric animals and root casts created by plants.

Fossils are scientifically important because they provide the only available direct evidence of the anatomy, geographic distribution, and ecology of organisms of the past. Scientific studies based on fossils and comparisons between them continue to refine details of the basic history of life and to expand into new areas of investigation as new discoveries are made in the field and new questions are asked. In conjunction with physical geologic investigations, the use of fossils as indicators of geologic time and ancient environments also contributes to an understanding of the physical history of the Earth, the distribution of mineral resources, dynamics of Earth processes, and past climatic changes.

Paleontological resources are older than 5,000 years before present (B.P.) i.e., they include resources from the first half of the Holocene (Society for Vertebrate Paleontology 2010). By convention, paleontological resources do not include human remains, artifacts (objects created by humans), or other evidence of past human activities; these are subjects of the field of archaeology. However, if human remains over 5,000 years old were found in-situ with pre-historic fossils, such as mammoth or sabrecat, this would be of utmost importance in California. Reports follow CEQA legislation and the Society of Vertebrate Paleontology (SVP) whose standards are broadly accepted.

ENGEO GROWTH CONTINUES WITH NEW OFFICE OPENINGS

ENGEO continues international growth with a new office in Adelaide, Australia. We are making waves in the Bay of Plenty, as the company expands its national presence with the opening of a fourth New Zealand office in Tauranga in January 2018. California expansion includes an upgraded office in Oakland, and new offices at Treasure Island and Santa Maria.

And, we are back in Nevada with an office in Reno. From our 14 offices we are fanatical about providing extreme client service through 2018 and beyond. We look forward to sharing further international expansion plans over the coming months.

ENGEO RANKS 5TH EQUAL IN IBM BEST WORKPLACES AWARDS IN NEW ZEALAND

ENGEO has been awarded 5th equal place in the Small-Medium category of the 2017 IBM Best Workplaces Awards in New Zealand. This is the first year ENGEO has been part of the survey. The Best Workplaces Survey identifies the best places to work in New Zealand as rated by employees each year. There were 16 organizations in the Small-Medium category and ENGEO shares 5th place with another finalist. 173 competing organizations, employing a combined total of over 43,000 employees, participated in the survey and provided their perceptions of their workplace, leaders and aspects of their employment.

Annual Team Business Planning Lawnbowls event, New Zealand. Pictured from left to right: Natalie Flatman, Hamish Foy, Reuben Williams, Jacinta Morgan and Jed Watts.

ENGEO's New Zealand General Manager, Greg Martin, says, "ENGEO being recognized as a top workplace here in New Zealand is excellent news. We strive to create a best place to work not for the award but because culture is number one and our culture is all about creating an environment in which our professionals can flourish."

Emma Martin, Consultant, IBM New Zealand says, "ENGEO is in elite company, and among the best organizations in New Zealand at leading, involving, enabling and valuing their employees. Ranking 5th equal in only their first year in the survey is evidence and recognition of a strong culture and employment brand." ENGEO attributes the company's success to a culture of service, collaboration, optimism and excitement. Employees at ENGEO are passionate about what they do and love to share their knowledge while serving others. Our vision is to be the most admired and trusted service company in the world – not limiting ourselves to just engineering. Our people, culture and progressive leadership team create an environment that drives innovation and our ability to take on any challenge.