

June 2021



LOS ANGELES BASIN GEOLOGICAL SOCIETY

June 24th (Thursday) – 12:00 Noon

This will be a virtual (on-line) meeting using ZOOM. See below for instructions.

Turning Hills into Mountains: How the collision of the Santa Ana Mountains and the Puente Hills dominate OC's seismic hazard

Eldon Gath
Earth Consultants International

Note: We did not have this presentation last month owing to technical difficulties.

Abstract

About one million years ago, not long by geologic standards, what will become central Orange County was under the waters of the Pacific Ocean, and the beach was to the east, perhaps as far as San Bernardino. Obviously things have changed for the better if you happen to own property in Orange County, but this change has not come without hazard to those properties. Although Orange County has never really experienced its own large earthquake, the earthquake hazard is very real, and it has been the regular occurrence of such large earthquakes that has crafted the landscape of the Orange County that we see today. The Santa Ana Mountains are being driven north episodically about 3-6 feet by M~7 earthquakes on the Elsinore fault where it trends northwest along their eastern flank. This relentless northerly push that started 2-

3 million years ago has shoved thousands of feet and 70 million years of OC's sedimentary rocks onto the nose of the granitic-cored mountain range much as a snow plow shoves the snow onto its blade and if angled, out to the side. Meanwhile, about 1 million years ago, the Puente Hills began to rise above sea level by the push of the Puente Hills thrust fault. As they began to rise, the southern part was scraped off and pushed to the west along an old fault that became the Whittier fault. As the Santa Ana Mountains and the Puente Hills continued to converge, space became a problem, and the younger sediments of the Santa Ana River began to buckle upwards forming the Anaheim, Peralta, and Coyote Hills, and Loma Ridge. The Santa Ana River remains trapped within this zone of collision between the Puente Hills and the Santa Ana Mountains, but the uplift of the Puente Hills in the Santa Ana Canyon has accelerated in the last

100,000 years due to the collision, resulting in highly elevated river gravel terraces on the south flank of the Puente Hills. This collision is pretty complicated but discernable in the landscape and the geology. How it relates to earthquake hazard is also complicated because we only have limited observational data on the Elsinore and Whittier faults, and even more limited and inferential data on the Puente Hills fault. What these data tell us though is that these faults fail in very large (M7+) earthquakes, and all of them are nearing the ends of their recurrence cycles. However, there are also a myriad of smaller faults (Coyote Hills east and west, Peralta Hills, El Modena, and Chino faults) plus landforms that are suggestive of underlying fault causation (Loma Ridge, Santiago Canyon, Anaheim Hills, and many more). We have no data on the earthquake cycles on these faults. Do they rupture separately in M6.5+ events or do they rupture in conjunction with the Elsinore, Puente or Whittier faults in M7.5+ events? We simply do not know, but we can tell from the microseismicity that they are stressed, and will someday release that stress onto the population of Orange County.

Speaker's Biography

Eldon Gath, President of Earth Consultants International and a 41-year resident of Orange County, has worked on engineering geology projects all over the world but surprisingly few consulting projects actually in Orange County. However he has spent decades looking at, and thinking about, the tectonic geomorphology of Orange County, and this talk is the synthesis of an MS at CSLA (two actually), a PhD at UCR, and a PhD at UCI - all incomplete. Eldon is a Fellow of the GSA; a Life Member and Past President of AEG; the past US National Group Leader and North American VP of IAEG; and an Honorary Member, Board Member, and Past President of SCGS. He served as the GSA/AEG Richard Jahns Distinguished Lecturer in Applied Geology in 2015 and this is one of the talks he presented, though updated with new thoughts (and maybe a little data). Eldon has also been active in the Orange County Historical Society, giving a version of this talk to several historical society groups, though unfortunately the last three scheduled talks had to be postponed, and using the opportunity to bring a bit of geologic history and earthquake hazard awareness to an entirely different OC population.

This will be a virtual meeting using Zoom.

When:

Thursday, June 24th, 2021

12:00-1:00 pm

Virtual Meeting Reservations:

Reservations should be made by:

12:00 Noon Wednesday June 23rd.

To register please email our LABGS secretary, Joseph Landeros at landerosjd@gmail.com

This is just to get a head count.

To join the talk, please use the following Zoom link (paste it into your web browser):

<https://us02web.zoom.us/j/88483961692?pwd=VVN5Uks3Z0RrUzE0ZXI2aWJ3Ulh6QT09>

ID: 884 8396 1692

Passcode: 584742

Please download the ZOOM app before the start of the talk, if you have not already done so.

Announcements:

Nate Busch is stepping down after several years service as LABGS Vice President and Program Chair. The membership and officers of LABGS wish to give him a hearty thank you.

Commencing in September, Chris Smart will assume these duties. Thanks very much Chris for stepping up for us.

Volunteer needed:

Bill Long is stepping down as Special Projects board member owing to now working in Bakersfield. Thanks, Bill for your service to the LABGS. Is there a member who would like to take over this responsibility in September?

Remember that the LABGS does not hold meetings in July and August. We will commence again on the 4th Thursday in September. We hope to be able to start having live luncheon meetings at The Grand in Long Beach. Look for future emails.

Do you know if your PSAAPG/LABGS membership is current?

If you don't know, please check via the PSAAPG website:

<http://www.psaapg.info/cloud/miscellaneous/dues.php>

Please inform a LABGS Board member if you have a pertinent announcement or chime in at the end of the Zoom meeting.

Job Posting:

We have been informed that the City of Long Beach Energy Resources Department has an opening for a professional geologist to fill John Jepson's position upon his retirement (way to go, John). The link to this job posting is:

[GEOLOGIST | Job Details tab | Career Pages \(governmentjobs.com\)](#)

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