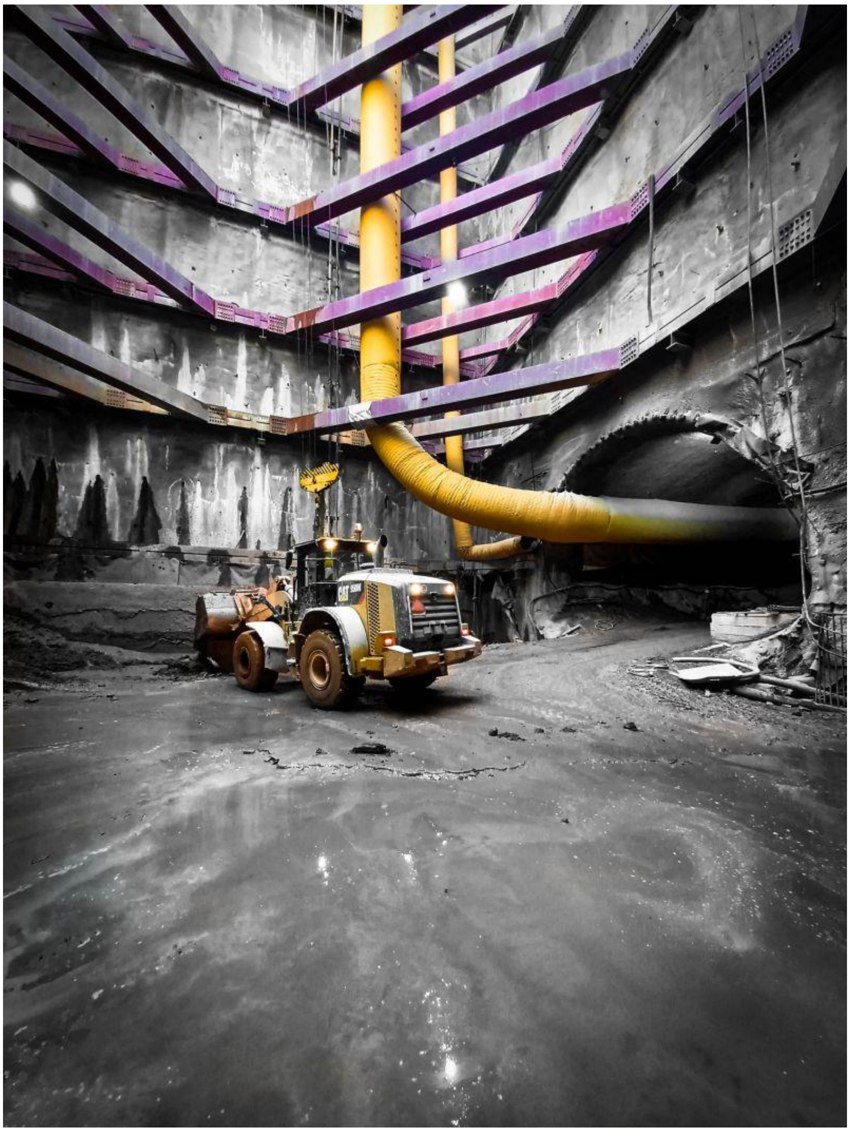
INTERNATIONAL SYMPOSIUM
PRESERVATION OF MONUMENTS & HISTORIC SITES
ATHENS TC301
SEPTEMBER 2026 | ATHENS, GREECE

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΤΑΙΡΕΙΑ ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ & ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Τα Νέα της Ε Ε Ε Ε Γ Μ

193

Αρ. 193 – ΝΟΕΜΒΡΙΟΣ 2024



Athens Metro Line4 - GNA Forestation
ΜΙΧΑΛΗΣ ΠΑΠΑΔΑΚΗΣ

SIMSG ISSMGE

ISRM

ISSN: 2732-7248

Π Ε Ρ Ι Ε Χ Ο Μ Ε Ν Α

ΑΡΘΡΑ

Can AI review the scientific literature — and figure out what it all means?

Artificial intelligence could help speedily summarize research. But it comes with risks.

Illustration: Piotr Kowlaczyk

When Sam Rodriques was a neurobiology graduate student, he was struck by a fundamental limitation of science. Even if researchers had already produced all the information needed to understand a human cell or a brain, "I'm not sure we would know it", he says, "because no human has the ability to understand or read all the literature and get a comprehensive view."

Five years later, Rodriques says he is closer to solving that problem using artificial intelligence (AI). In September, he and his team at the US start-up FutureHouse announced that an AI-based system they had built could, within minutes, produce syntheses of scientific knowledge that were more accurate than Wikipedia pages[1]. The team promptly generated Wikipedia-style entries on around 17,000 human genes, most of which previously lacked a detailed page.

Rodriques is not the only one turning to AI to help synthesize science. For decades, scholars have been trying to accelerate the onerous task of compiling bodies of research into reviews. "They're too long, they're incredibly intensive and they're often out of date by the time they're written," says Iain Marshall, who studies research synthesis at King's College London. The explosion of interest in large language models (LLMs), the generative-AI programs that underlie tools such as ChatGPT, is prompting fresh excitement about automating the task.

Some of the newer AI-powered science search engines can already help people to produce narrative literature reviews - a written tour of studies - by finding, sorting and summarizing publications. But they can't yet produce a high-quality review by themselves. The toughest challenge of all is the 'gold-standard' systematic review, which involves stringent procedures to search and assess papers, and often a meta-analysis to synthesize the results. Most researchers agree that these are a long way from being fully automated. "I'm sure we'll eventually get there," says Paul Glasziou, a specialist in evidence and systematic reviews at Bond University in Gold Coast, Australia. "I just can't tell you whether that's 10 years away or 100 years away."

At the same time, however, researchers fear that AI tools could lead to more sloppy, inaccurate or misleading reviews polluting the literature. "The worry is that all the decades of research on how to do good evidence synthesis starts to be undermined," says James Thomas, who studies evidence synthesis at University College London.

Computer-assisted reviews

Computer software has been helping researchers to search and parse the research literature for decades. Well before LLMs emerged, scientists were using machine-learning and other algorithms to help to identify particular studies or to quickly pull findings out of papers. But the advent of systems such as ChatGPT has triggered a frenzy of interest in speeding up this process by combining LLMs with other software.

It would be terribly naive to ask ChatGPT — or any other AI chatbot — to simply write an academic literature review from scratch, researchers say. These LLMs generate text by training on enormous amounts of writing, but most commercial AI firms do not reveal what data the models were trained on. If asked to review research on a topic, an LLM such as ChatGPT is likely to draw on credible academic research, inaccurate blogs and who knows what other information, says Marshall. "There'll be no weighing up of what the most pertinent, high-quality literature is," he says. And because LLMs work by repeatedly generating statistically plausible words in response to a query, they produce different answers to the same question and 'hallucinate' errors — including, notoriously, non-existent academic references. "None of the processes which are regarded as good practice in research synthesis take place," Marshall says.

A more sophisticated process involves uploading a corpus of pre-selected papers to an LLM, and asking it to extract insights from them, basing its answer only on those studies. This 'retrieval-augmented generation' seems to cut down on hallucinations, although it does not prevent them. The process can also be set up so that the LLM will reference the sources it drew its information from.

This is the basis for specialized, AI-powered science search engines such as Consensus and Elicit. Most companies do not reveal exact details of how their systems work. But they typically turn a user's question into a computerized search across academic databases such as Semantic Scholar and PubMed, returning the most relevant results.

An LLM then summarizes each of these studies and synthesizes them into an answer that cites its sources; the user is given various options to filter the work they want to include. "They are search engines first and foremost," says Aaron Tay, who heads data services at Singapore Management University and blogs about AI tools. "At the very least, what they cite is definitely real."

These tools "can certainly make your review and writing processes efficient", says Mushtaq Bilal, a postdoctoral researcher at the University of Southern Denmark in Odense, who trains academics in AI tools and has designed his own, called Research Kick. Another AI system called Scite, for example, can quickly generate a detailed breakdown of papers that support or refute a claim. Elicit and other systems can also extract insights from different sections of papers — the methods, conclusions and so on. There's "a huge amount of labour that you can outsource", Bilal says.

But most AI science search engines cannot produce an accurate literature review autonomously, Bilal says. Their output is more "at the level of an undergraduate student who pulls an all-nighter and comes up with the main points of a few papers". It is better for researchers to use the tools to optimize parts of the review process, he says. James Brady, head of engineering at Elicit, says that its users are augmenting steps of reviewing "to great effect".

Another limitation of some tools, including Elicit, is that they can only search open-access papers and abstracts, rather than the full text of articles. (Elicit, in Oakland, California, searches about 125 million papers; Consensus, in Boston, Massachusetts, looks at more than 200 million.) Bilal notes that much of the research literature is paywalled and it's computationally intensive to search a lot of full text. "Running an AI app through the whole text of millions of articles will take a lot of time, and it will become prohibitively expensive," he says.

Full-text search

For Rodriques, money was in plentiful supply, because FutureHouse, a non-profit organization in San Francisco, California, is backed by former Google chief executive Eric Schmidt and other funders. Founded in 2023, FutureHouse aims to automate research tasks using AI.

This September, Rodriques and his team revealed PaperQA2, FutureHouse's open-source, prototype AI system[1]. When it is given a query, PaperQA2 searches several academic databases for relevant papers and tries to access the full text of both open-access and paywalled content. (Rodriques says the team has access to many paywalled papers through its members' academic affiliations.) The system then identifies and summarizes the most relevant elements. In part because PaperQA2 digests the full text of papers, running it is expensive, he says.

The FutureHouse team tested the system by using it to generate Wikipedia-style articles on individual human genes. They then gave several hundred AI-written statements from these articles, along with statements from real (human-written) Wikipedia articles on the same topic, to a blinded panel of PhD and postdoctoral biologists. The panel found that human-authored articles contained twice as many 'reasoning errors' — in which a written claim is not properly supported by the citation — than did ones written by the AI tool. Because the tool outperforms people in this way, the team titled its paper 'Language agents achieve superhuman synthesis of scientific knowledge'.

Tay says that PaperQA2 and another tool called Undermind take longer than conventional search engines to return results — minutes rather than seconds — because they conduct more-sophisticated searches, using the results of the initial search to track down other citations and key phrases, for example. "That all adds up to being very computationally expensive and slow, but gives a substantially higher quality search," he says.

Systematic challenge

Narrative summaries of the literature are hard enough to produce, but systematic reviews are even worse. They can take people many months or even years to complete[2].

A systematic review involves at least 25 careful steps, according to a breakdown from Glasziou's team. After combing through the literature, a researcher must filter their longlist to find the most pertinent papers, then extract data, screen studies for potential bias and synthesize the results. (Many of these steps are done in duplicate by another researcher to check for inconsistencies.) This laborious method — which is supposed to be rigorous, transparent and reproducible — is considered worthwhile in medicine, for instance, because clinicians use the results to guide important decisions about treating patients.

In 2019, before ChatGPT came along, Glasziou and his colleagues set out to achieve a world record in science: a systematic review in two weeks. He and others, including Marshall and Thomas, had already developed computer tools to reduce the time involved. The menu of software available by that time included RobotSearch, a machine-learning model trained to quickly identify randomized trials from a collection of studies. RobotReviewer, another AI system, helps to assess whether a study is at risk of bias because it was not adequately blinded, for instance. "All of those are important little tools in shaving down the time of doing a systematic review," Glasziou says.

The clock started at 9:30 a.m. on Monday 21 January 2019. The team cruised across the line at lunchtime on Friday 1 February, after a total of nine working days[3]. "I was excited," says epidemiologist Anna Mae Scott at the University of Oxford, UK, who led the study while at Bond University; everyone celebrated with cake. Since then, the team has pared its record down to five days.

Could the process get faster? Other researchers have been working to automate aspects of systematic reviews, too. In 2015, Glasziou founded the International Collaboration for the Automation of Systematic Reviews, a niche community that, fittingly, has produced several systematic reviews about tools for automating systematic reviews[4]. But even so, "not very many [tools] have seen widespread acceptance", says Marshall. "It's just a question of how mature the technology is."

Elicit is one company that says its tool helps researchers with systematic reviews, not just narrative ones. The firm does not offer systematic reviews at the push of a button, says Brady, but its system does automate some of the steps — including screening papers and extracting data and insights. Brady says that most researchers who use it for systematic reviews have uploaded relevant papers they find using other search techniques.

Systematic-review aficionados worry that AI tools are at risk of failing to meet two essential criteria of the studies: transparency and reproducibility. "If I can't see the methods used, then it is not a systematic review, it is simply a review article," says Justin Clark, who builds review automation tools as part of Glasziou's team. Brady says that the papers that reviewers upload to Elicit "are an excellent, transparent record" of their starting literature. As for reproducibility: "We don't guarantee that our results are always going to be identical across repeats of the same steps, but we aim to make it so — within reason," he says, adding that transparency and reproducibility will be important as the firm improves its system.

Specialists in reviewing say they would like to see more published evaluations of the accuracy and reproducibility of AI systems that have been designed to help produce literature reviews. "Building cool tools and trying stuff out is really good fun," says Clark. "Doing a hardcore evaluative study is a lot of hard work."

Earlier this year, Clark led a systematic review of studies that had used generative AI tools to help with systematic reviewing. He and his team found only 15 published studies in which the AI's performance had been adequately compared with that of a person. The results, which have not yet been published or peer reviewed, suggest that these AI systems can extract some data from uploaded studies and assess the risk of bias of clinical trials. "It seems to do OK with reading and assessing papers," Clark says, "but it did very badly at all these other tasks", including designing and con-ducting a thorough literature search. (Existing computer software can already do the final step of synthesizing data using a meta-analysis.)

Glasziou and his team are still trying to shave time off their reviewing record through improved tools, which are available on a website they call the Evidence Review Accelerator. "It won't be one big thing. It's that every year you'll get faster and faster," Glasziou predicts. In 2022, for instance, the group released a computerized tool called Methods Wizard, which asks users a series of questions about their methods and then writes a protocol for them without using AI.

Rushed reviews?

Automating the synthesis of information also comes with risks. Researchers have known for years that many systematic reviews are redundant or of poor quality[5], and AI could make these problems worse. Authors might knowingly or unknowingly use AI tools to race through a review that does not follow rigorous procedures, or which includes poor-quality work, and get a misleading result.

By contrast, says Glasziou, AI could also encourage researchers to do a quick check of previously published literature when they wouldn't have bothered before. "AI may raise their game," he says. And Brady says that, in future, AI tools could help to flag and filter out poor-quality papers by looking for telltale signs such as P-hacking, a form of data manipulation.

Glasziou sees the situation as a balance of two forces: AI tools could help scientists to produce high-quality reviews, but might also fuel the rapid generation of substandard ones. "I don't know what the net impact is going to be on the published literature," he says.

Some people argue that the ability to synthesize and make sense of the world's knowledge should not lie solely in the hands of opaque, profit-making companies. Clark wants to see non-profit groups build and carefully test AI tools. He and other researchers welcomed the announcement from two UK funders last month that they are investing more than US$70 million in evidence-synthesis systems. "We just want to be cautious and careful," Clark says. "We want to make sure that the answers that [technology] is helping to provide to us are correct."

References

1. Skarlinski, M. D. *et al.* Preprint at arXiv https://doi.org/10.48550/arXiv.2409.13740 (2024).
2. Borah, R., Brown, A. W., Capers, P. L. & Kaiser, K. A. *BMJ Open* **7**, e012545 (2017). Article PubMed Google Scholar
3. Clark, J. *et al. J. Clin. Epidemiol.* **121**, 81–90 (2020). Article PubMed Google Scholar
4. Blaizot, A. *et al. Res. Synth. Methods* **13**, 353–362 (2022). Article PubMed Google Scholar
5. Ioannidis, J. P. A. *Milbank Q.* **94**, 485–514 (2016). Article PubMed Google Scholar

Nature **635**, 276-278 (2024), *doi: https://doi.org/10.1038/d41586-024-03676-9*

(Helen Pearson / Nature, 13 November 2024, https://www.nature.com/articles/d41586-024-03676-9)

'Giant Lab Experiment' Leads to New Model for Predicting Landslides

A rockslide at Feather River Canyon, in northern California, blocks Route 70 on Oct. 24, 2021. Researchers at The University of Texas at Austin and UC Santa Cruz have a found a new way to predict a region's landslide potential from its rocks. Credit: U.S. Geological Survey

Landslides are a perennial threat in California, where the geology and steep topography mean the land is more prone to slipping than in other places.

Now, researchers at the University of Texas Institute for Geophysics and UC Santa Cruz studying two large Northern California landslides think they've found the key to predicting landslide motion hidden in the very rocks where they happen. And it's thanks — in part — to earthquake science.

Published Oct. 16, 2024, in *Science Advances*, the researchers found that much of the physics and geological factors behind California's earthquakes and landslides are the same. By applying earthquake rules to landslides, the researchers believe they have a technique that can predict how easily — and how fast — a surface will slide when rainfall increases.

The key to figuring out the connection was in the type of rock where the landslides form. The California Coast Ranges are a mélange of rocks with different characteristics, beaten up to varying degrees over eons of tectonic movement. When the rock is clay-like and soft, the land surface moves easily but slowly, shifting a few inches or feet over a matter of weeks. Harder rocks, however, are less able to move, allowing strain to build, and leading to faster, more catastrophic landslides when the earth does finally fail.

"Gravity will always win," said co-author, Demian Saffer, director of UTIG. "It's just a question of whether it wins in a split second or whether it wins over the long term."

California experiences frequent destructive landslides. In September 2024, hundreds of residents in Rancho Palos Verdes were told to evacuate when a massive landslide slowly tore apart their Southern California city. The land movement had steadily worsened after historic storms earlier in the year. The new study could help communities know when rainfall and other events are likely to raise the risk of future slides.

"This study provides us with a framework for understanding how much motion to expect based on a change in rainfall, which leads to a change in water pressure in the ground that then translates into motion," said the study's lead author Noah Finnegan, a professor of earth and planetary sciences at UC Santa Cruz.

The breakthrough came when the researchers set out to see whether measuring a landslide could reveal the underlying rock physics, in effect treating it as a real-world lab experiment — the kind that earthquake scientists run on individual rocks pulled from earthquake faults but on a much larger scale. They took recent data on land movement and other environmental observations for two long-running Northern California landslides and used it to correctly calculate the characteristics of the rocks underlying the landslides. They then tested the same idea on another landslide dating back to the early 1980s, with similarly successful results.

Damage to homes and roads following a landslide in La Jolla, California, on Oct. 4, 2007. Research by scientists from The University of Texas at Austin and UC Santa Cruz could help communities map areas at high risk of landslide. Credit: U.S. Geological Survey

According to Saffer, developing a landslide hazard map could be as simple as running the calculations in reverse: Analyzing a location's rocks can determine its landslide potential.

"If you can make targeted measurements of rheology (the rock's behavior and how it fails) in laboratory experiments, combining this with geologic mapping would allow a predicttion of responses to rainfall, or even earthquake-induced shaking, highlighting high and low risk zones for rapid versus creeping landslide hazards," he said.

Saffer and Finnegan are looking to test and refine their model in other terrains where other rock types are prevalent.

The research was funded by the National Science Foundation.

For a deep dive into the science behind the research read UC Santa Cruz's story: Understanding landslides: a new model for predicting motion.

For more information, contact: Anton Caputo, Jackson School of Geosciences, 210-602-2085; Monica Kortsha, Jackson School of Geosciences, 512-471-2241; Constantino Panagopulos, University of Texas Institute for Geophysics, 512-574-7376; Julia Sames, Department of Earth and Planetary Sciences, 210-415-9556.

(TEXAS Geosciences, The University of Texas at Austin, Jackson School of Geosciences / October 29, 2024, https://www.jsg.utexas.edu/news/2024/10/giant-lab-experiment-leads-to-new-model-for-predicting-landslides)

Seasonal slow slip in landslides as a window into the frictional rheology of creeping shear zones

Noah J. Finnegan and Demian M. Saffer

Abstract

Whether Earth materials exhibit frictional creep or catastrophic failure is a crucial but unresolved problem in predicting landslide and earthquake hazards. Here, we show that field-scale observations of sliding velocity and pore water pressure at two creeping landslides are explained by velocity-strengthening friction, in close agreement with laboratory measurements on similar materials. This suggests that the rate-strengthening friction commonly measured in clay-rich materials may govern episodic slow slip in landslides, in addition to tectonic faults. Further, our results show more generally that transient slow slip can arise in velocity-strengthening materials from modulation of effective normal stress through pore pressure fluctuations. This challenges the idea that episodic slow slip requires a narrow range of transitional frictional properties near the stability threshold, or pore pressure feedbacks operating on initially unstable frictional slip.

INTRODUCTION

Landslides are triggered when shear stress acting in the downhill direction is greater than or equal to the shear strength resisting sliding within a hillslope. Assuming Coulomb friction, this condition occurs when

$$\frac{\tau}{(\sigma - P)\,\mu + c\prime} \geq 1 \qquad (1)$$

where τ is shear stress, σ is normal stress, P is pore fluid pressure (and $\sigma - P$ is effective normal stress), μ is the static coefficient of friction (equivalent to tanϕ in soil mechanics, where ϕ is the friction angle), and c' is effective cohesion. For rainfall-triggered landslides, as well as many coseismic landslides, failure is primarily controlled by the evolution of pore water pressure in both space (*1*, *2*) and time (*3*, *4*). In addition, coseismic landslides can occur due to transient increases in τ relative to (σ − P) resulting from the passage of seismic waves (*5*).

As is the case for tectonic faulting and earthquakes, when the conditions in Eq. 1 are met, predicting whether landslide failure will occur catastrophically or by slow transient creep remains a basic and unresolved question in geomorphology and natural hazards research (*6*–*8*). At a fundamental level, this behavior is governed by the rheology of the slide material and failure plane; observations of landslide motion thus encode key information about the governing rheology. Some mechanisms proposed to stabilize frictional sliding include clay swelling that increases lateral boundary friction during periods of high pore pressure (*9*); basal pore water pressure redistribution due to roughness (*10*); and perhaps most commonly the conceptual framework based on critical state soil mechanics that links stable (slow and quasi-continuous) landslide motion to shear-induced dilation of pore spaces at the grain scale. In this model, dilation reduces pore fluid pressure as sliding initiates and hence increases effective normal stress and basal friction, serving to limit the slide's velocity by suppressing rapid runaway slip (*6*, *7*, *11*–*13*). Notably, dilatant strengthening has also been invoked to explain episodic slow slip events ("slow earthquakes") on tectonic faults (*14*) and along the beds of ice streams (*13*); however, in ice streams, this process is arguably rare (*15*).

Rate-and-state friction is an empirically developed friction model that describes sliding friction in rock as well as a range of other materials including some plastics, some metals, wood, and paper (*16*). The model, which is widely applied to tectonic faults (*16*–*18*), provides a potentially powerful alternative approach to explain the rheology and predict the dynamics of landslides, including under what conditions rapid and catastrophic failure will occur (*8*, *19*–*21*). For example, a challenge with dilatant strengthening is that for the millimeter- to centimeter-wide localized shear zones typical of slow landslides (*22*–*24*), dilation can only operate over a slip length scale that is comparable to the shear zone thickness itself before a critical state porosity is reached and catastrophic failure occurs (*7*). Yet, this length scale is often orders of magnitude smaller than the decimeter- to meter-scale annual displacements that are typical of many slow landslides (*8*), which suggests that dilatant strengthening at the grain scale is unlikely to provide a universal explanation for stable frictional creep in these systems, although pore pressure modulation of shear strength could occur through other processes such as pressure redistribution due to roughness (*10*) or following stick-slip events (*25*). Nevertheless, widely observed frictional creep in experiments on clay-rich sediments and fault gouges (*26*–*31*) and on the shallow reaches of tectonic faults at temperatures and effective stresses similar to landslides (*32*–*34*) demonstrates that stable frictional sliding is possible, and even likely, without necessarily appealing to a dilatancy–pore fluid pressure feedback.

Here, we show that field-scale observations of sliding velocity and pore water pressure at two creeping landslides are explained by velocity-strengthening friction, in close agreement with laboratory measurements on similar materials. In the rate-and-state friction framework, the steady-state coefficient of sliding friction, μ_{ss}, varies logarithmically with the sliding velocity, V

$$\mu_{ss} = \frac{\tau}{(\sigma - P)} = \mu_0 + (a - b)\ \ln\left(\frac{V}{V_o}\right) \qquad (2)$$

(*16*–*18*). In Eq. 2, (a − b) defines the rate dependence of friction and governs the sensitivity of the coefficient of sliding friction to the sliding velocity, V (normalized to a reference velocity, V_o). Individually, the parameter (a) governs the magnitude of a transient so-called "direct effect," in which the coefficient of sliding friction opposes acceleration due to dilation and a positive rate dependence of contact strength. The parameter (b), in turn, describes the so-called "evolution effect," which is interpreted to reflect the evolution of the real area of frictional contact (i.e., at grain boundaries or asperities) following a perturbation in velocity. Extensive experimental evidence shows that (a − b), which mathematically expresses the competition between the processes described above, can be either positive or negative, depending on rock type, accumulated shear strain, and temperature, among other factors (*16*, *18*, *26*–*31*). In this framework, velocity weakening, in which frictional resistance decreases with increasing sliding velocity and defined by negative values of (a − b), is a prerequisite for the nucleation of unstable slip (*16*). In contrast, in materials characterized by velocity-strengthening behavior, defined by positive values of (a − b), failure is thought to arise only by stable sliding or slow creep. From the perspective of landslide failure, the fact that rocks can exhibit either velocity-weakening or velocity-strengthening behavior provides a possible mechanism to differentiate bedrock landslides that accelerate catastrophically from those that exhibit apparently stable frictional sliding (*19*). To the extent that this difference in behavior is governed by rock type (*26*–*30*), it also suggests that it may be possible to predict which landslides are prone to catastrophic acceleration on the basis of geologic mapping and measurable material properties.

Few detailed observations exist to test whether models developed for fault friction can also be applied to landslides, or even to more generally define the rheology of landslide failure planes over relevant spatial and temporal scales. To date, a few studies have used a rate-and-state framework to explain observations of transient landslide motion (*19*–*21*, *35*). Handwerger *et al.* argued that the small size of landslides relative to the critical nucleation length for dynamic elastic rupture means that many landslides may slide stably despite velocity-weakening friction, essentially representing the initiation of unstable failure, but which is unable to grow beyond a slow nucleation phase (*20*). In support of this view, seismic tremor emanating from two patches on the base of the 2014 Askja caldera landslide before its catastrophic failure was interpreted to reflect velocity-weakening patches on the bed of the landslide that were below the critical nucleation length for dynamic elastic rupture (21). Alternatively, landslide deceleration in other settings following stress perturbations has been interpreted as evidence that ($a - b$) must be positive (19, 35). Because all of these studies consider transient landslide dynamics in one way or another, they require independent fitting of at least three parameters: a, b, and D_c, the critical length scale associated with refreshing frictional asperities, as well as, in one case, assumptions about the elastic properties of landslide materials (20). In addition, in two of the studies (19, 35), no information was available to constrain pore fluid pressures, requiring the further assumption of constant effective normal stress.

Because many slow landslides undergo seasonal cycles of acceleration and deceleration that reveal tight coupling between pore pressure (and thus effective stress) and slide velocity (36–39)—at low enough sliding velocities that inertial effects are negligible—treatment of these systems as steady-state failure is appropriate (31–34). At the same time, the large saturated hydraulic diffusivity (~10^{-4} m^2/s) (40–42) of many slow landslides, including Oak Ridge earthflow, which we use in our analysis below, results in rapid (<1 day) response times of landslide velocity (and hence basal effective stress) to rainfall-induced pore fluid pressure pulses (40), suggesting that an assumption of hydrologic steady state is also appropriate for the timescales considered here. For these reasons, here we adopt a steady-state perspective on creeping landslide friction to investigate the role of rate-and-state frictional rheology in explaining their observed motion.

We solve for ($a - b$) in Eq. 2 directly, using displacement and pore fluid pressure measurements from two slow-moving landslides, Oak Ridge earthflow (40) and Minor Creek earthflow (43), in California's coast ranges. Constraints on both the shear and normal stress from field measurements (Materials and Methods) illuminate the relationship between velocity and the coefficient of sliding friction (and vice versa; see Eq. 2). Implicit in this treatment of the data is the fact that when in motion, the ratio $\frac{\tau}{(\sigma - P)}$ at the slip surface represents the coefficient of sliding friction because the slip surface is at a state of failure and sliding. In comparison in laboratory experiments designed to probe the frictional rheology of Earth materials, the dependence of shear strength on sliding velocity is typically investigated via a controlled velocity boundary condition and measurement of the resulting friction coefficient (18). Here, we treat the two landslides as field-scale experiments to obtain constraints on frictional behavior by approaching the problem in reverse—with variations in velocity driven by changes in $\frac{\tau}{(\sigma - P)}$, and by measuring the corresponding sliding velocity.

California's Franciscan mélange is an assemblage of variably deformed and metamorphosed rock units formed as part of the accretionary wedge in a subduction zone during the Mesozoic and early Cenozoic eras (44). Franciscan mélange is a block-in-matrix lithology, with a matrix of clay- and siltstones containing blocks of more competent lithologies, including sandstone, chert, greenstone, and blueschist that range widely in size. The formation has been exhumed and uplifted in the California coast ranges, where it is well known for hosting slow landslides (23, 45). Soil cover is usually very thin (~10 cm) above the Franciscan mélange and its vadose zone structure is characterized by a thin (<3 m) seasonally unsaturated zone of weathered mudstone mélange overlying perennially saturated, unweathered mudstone mélange (40, 46). The matrix of the unweathered Franciscan mélange exhibits a combination of low shear strength [e.g., (47)] and low hydraulic conductivity, 10^{-6} to 10^{-10} m/s, as constrained by slug tests at Minor Creek (43) and permeameter measurements at Oak Ridge (39). Details about the pore pressure and deformation monitoring for Minor Creek earthflow are reported in (43) and outlined in Materials and Methods. We use the basal pore pressure and deformation data from Minor Creek that are distilled in (7). Details about the pore pressure and deformation monitoring at Oak Ridge earthflow are reported in (40) and in Materials and Methods. We use pore pressure data from a 2.5-m-deep piezometer at Oak Ridge, and landslide displacement is quantified via extensometers and Global Positioning System (GPS). Figure 1A shows the network of GPS stations, extensometers, and the pore fluid pressure sensor used below, which is also described in more detail in Materials and Methods.

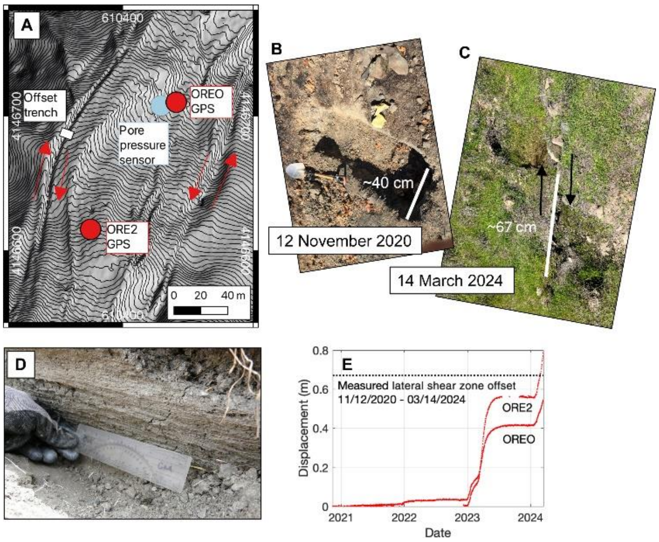


Fig. 1. Landslide shear zones and localized slip.

(**A**) One-meter LiDAR-derived contour map of the "transport zone" of Oak Ridge earthflow showing the placement of instrumentation used here. The white rectangle indicates the location of the photographs in (B) and (C). Coordinates are in UTM Zone 10 N. (**B** and **C**) Offset of a trench excavated across the lateral shear margin at the location of the white rectangle in (A) between November 2020 and March 2024. (**D**) Slickenlines observed along the western shear zone in spring 2017. (**E**) Offset measured in the trench (C) compared to measured GPS displacement upslope and downslope over the same time interval that is spanned by the photographs in (B) and (C).

RESULTS

Slip localization in earthflow shear zones

…

Science Advances, 16 Oct 2024, Vol 10, Issue 42, DOI: 10.1126/sciadv.adq9399

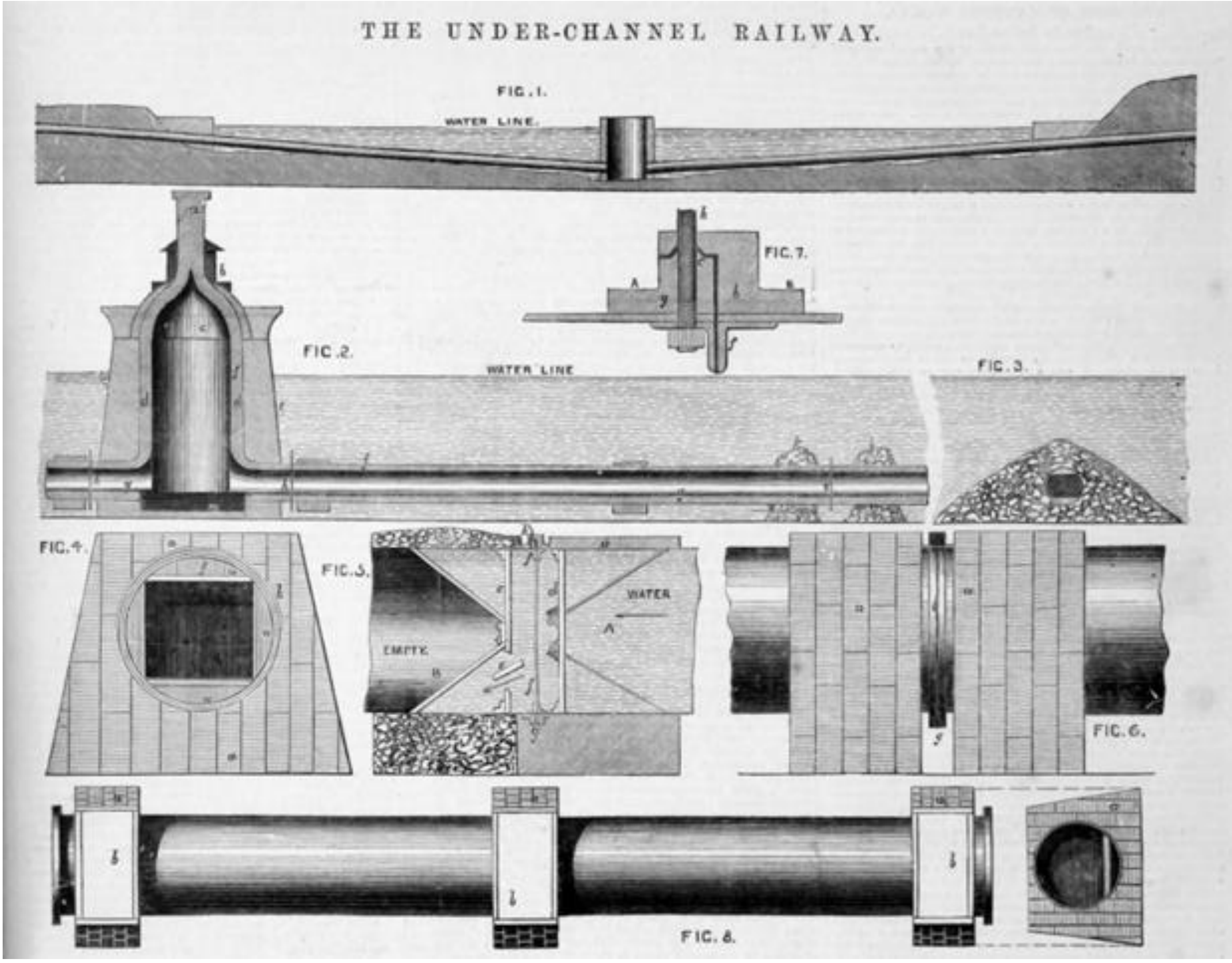
November 1861: Chalmers' under Channel railway

In 1861 The Engineer reported on an early proposal to build a subsea railway across the English Channel

Over the years The Engineer has reported on several schemes to connect the UK to mainland Europe and, as we know, only one project has been successful so far.

Tunnels and bridges have been proposed and in 1880 work started on experimental tunnels in Folkstone that were dug by hand and an early tunnel boring machine.

Nineteen years earlier, The Engineer reported on how a certain James Chalmers of Montreal had 'patented the means whereby he proposes to open a railway communication under the channel.'



Chalmers' idea was somewhat unique in that he'd connect sections of tube and submerge them, rather than dig a tunnel.

The Engineer said: "The shape and form of the tubular roadway may be varied, but it is preferred that such tubular roadway for deep water should be of a circular section, having a rectangular inner way formed therein, as thereby the pressure of the water at great depths may be divided between the tubes by allowing the leakage of the outer or circular tube to collect between it and the inner one, until it obtains such pressure as the inner or square tube may safely carry, then drawing it off through valves into the inner tube, thus relieving by reaction the pressure on the outer or circular tube.

"The length or sections of a tubular way have each bulkheads or partitions, one near each end, which are of a strength to resist the pressure of the water when the length or section is submerged, and when it has been emptied of water."

Each end of a length or section of the tubular way would be formed with inner flanges, as well as with an outer flange. The construction of a tubular roadway could be commenced from shore or bank, and Chalmers thought it preferable to start at a spot 'intermediate of the two shores or banks of the River, Sea, or other water'.

In the tower, suitable steam engines, pumps and machinery are to be constructed, in order to pump away the water in the tower, and to keep it free from water

"In order to commence the works at a point intermediate of the two shores or banks, a tower is first submerged of such dimensions as to descend to the bottom of the water, and to ascend to some height above its upper surface, provision being made for connecting the ends of the tubular ways on opposite sides of the tower in like manner to that in which the ends of the lengths or sections of the tubular way are connected end to end, when they are submerged," said The Engineer.

Our Victorian predecessor continued: "In the tower, suitable steam engines, pumps and machinery are to be constructed, in order to pump away the water in the tower, and to keep it free from water. The lengths or sections of the tubular roadway are in succession floated out to positions they are to occupy, and are then submerged and coupled up, and their inner flanges riveted or connected by screw bolts and nuts, and, as each length section of the tubular roadway is in succession coupled up, the water used therein to aid in submerging it is allowed to flow from it into the sections previously submerged, and thence to the tower where the water is raised and pumped away.

To have a clear way through the lengths of tubular roadway between the tower and the length next to the one last submerged, the bulkheads or partitions were removed as the work proceeded. The outermost bulkhead or partition would remain until another length had been submerged and fixed to the end of the one previously submerged.

When compiling our archive pieces, it is common practise to investigate the career of the main protagonist, but Chalmers left little trace of himself to study. Luckily, The ICE Archive helped to fill in the blanks. They pointed out that Chalmers was quite an inventor, having invented the Chalmers Target, armour for naval warships detailed in Ships of War—Petition of Mr James Chalmers - Hansard - UK Parliament. The ICE Archive told us also that he wrote a book about naval construction. We might also assume he wrote 'The Channel Railway, connecting England & France' prior to his untimely death at the age of 49.

His passing warranted a small obituary in the January 1, 1869 edition of The Engineer, which noted that Chalmers left his widow and family in 'very straightened circumstances'.

"It is to be hoped his exertions on behalf of the public service will not be overlooked by the government," said The Engineer.

READ THE ENGINEER'S ORIGINAL ARTICLE ON CHALMERS' PROPOSAL

(THE ENGINEER, 18 Nov 2024, https://www.theengineer.co.uk/content/archive/november-1861-chalmers-under-channel-railway)

Review of *Foundations, abutments and footings* (Hool and Kinne, Eds., 1923), Section 4: Spread footings, featuring the Tunkhannock Viaduct as a case study

Michael Bennett, P.E., M.ASCE (Gannett Fleming TranSystems: Audubon, PA)

US railroads truly brought the nation into the modern age. The completion of the Transcontinental Railroad in 1869 heralded a boom in railroad construction, and new tracks crept across the nation like vines over the ensuing decades. Four other routes from the Mississippi River to the Pacific Ocean joined the original by 1900, and these lines connected with a much denser network of eastern railroads to unite the nation's producers and consumers. Railroads also helped nurture the Industrial Revolution, as the legs of the "iron traingle" of coal, steel, and railroads reinforced each other's growth and that of related industries. Collectively, the rail boom fueled the US's transformation into an economic and international superpower. By 1916, the country boasted over 250,000 miles of trackage, enough to reach the Moon – and still construct four tracks from New York to San Francisco (AAR 2024).

As railroads created the modern US, their employees helped create modern civil engineering. Yet their innovations were as unevenly distributed across the profession as their employers' tracks were across the country. Structural engineering was fairly well-covered. The Cooper E-load series for railroad bridge design, which debuted in the Transactions of ASCE in 1894, was among the first universal design codes in American civil engineering practice and remains in use today. By contrast, early geotechnical studies from US railroad civil engineers were more scattershot and consisted mainly of case histories of tunnels, landslides, and bridges. Civil engineers elsewhere took different approaches. From 1914 to 1922, the Geotechnical Commission of the Swedish State Railways performed the first in-depth geotechnical study (and coined the term "geotechnical") following a series of lethal slide-induced derailments. In the US, though, geotechnical questions in civil engineering generally received less methodical consideration than structural ones, and railroads were no exception (SJGK 1922).

Section 4 of *Foundations, abutments and footings*, which covered spread footings, plainly reflected the gap in US civil engineering in 1923 between increasingly sophisticated structural analyses and geotechnical designs that were still primitive. The listed author of the section was Albert Wolf, cited as president of the civil engineering and architectural firm of Wolf, Sexton, Harper, and Treaux; however, he had died in 1921. Plenty of books have been published posthumously, so it remains unclear whether Wolf himself authored Section 4 or whether editors George Hool and William Kinne compiled it from his previous writings. In any event, Wolf was ably qualified for the assignment. He had studied civil engineering at universities in Strasbourg and Berlin before returning home to the US, where he had practiced for over 30 years (Hool and Kinne 1923, Marquis 1917, Marquis 1926).

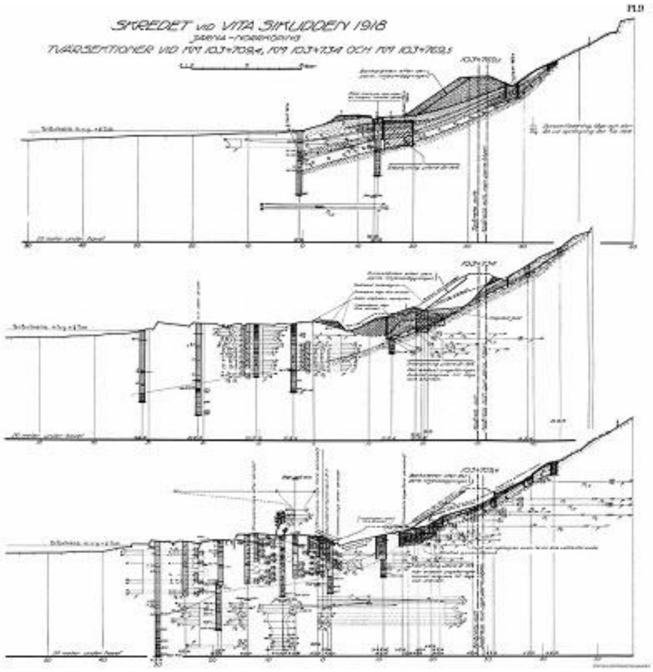


IMAGE 1: Geotechnical cross-section of the site of the Vita Sikudden landslide near Norrköping, Sweden in October 1918. *Source: SJGK (1922).*

IMAGE 2: Aftermath of the 1918 Vita Sikudden landslide, which derailed a train and killed 41 passengers. *Source: SJGK (1922).*

Wolf included some geotechnical material in Section 4. At one point, he noted that a soil's bearing capacity can be increased by improving its drainage. This insight makes sense a century later when viewed through the lens of pore pressures, effective stresses, and shear strengths. Wolf also observed that "any table of bearing values for various soils should be used with a great deal of discretion and modified to correspond with what experience has taught to be safe," showing an awareness not all civil engineers then shared (see entry for Section 1). Later, Wolf wrote that "plain concrete footings should be used" for structures founded on bedrock "rather than reinforced concrete since owing to the unyielding character of the foundation the reinforced concrete footing could not act as designed." Clearly, he recognized that structural and geotechnical considerations were interdependent (Wolf 1923).

Despite Wolf's (or the editors') awareness on these counts, though, Section 4 consisted predominantly of structural calculations. Wolf used worked examples to show readers how to determine the loads on footings, proportion their areas and depths, size their rebars as needed, and check their shear and moment capacities. Some examples showcased recent key developments in structural engineering. Wolf discussed at length the research Arthur Talbot did on reinforced concrete footings at the University of Illinois in the early 1910s; the work demonstrated the need for clear cover of rebar and for considerations of its delamination. Other examples of Wolf's illustrate what remained to be standardized in the field. The advent of universal LRFD-based structural codes has rendered moot his discussions on how multiplication or reduction factors for live loads varied across municipalities (Wolf 1923).

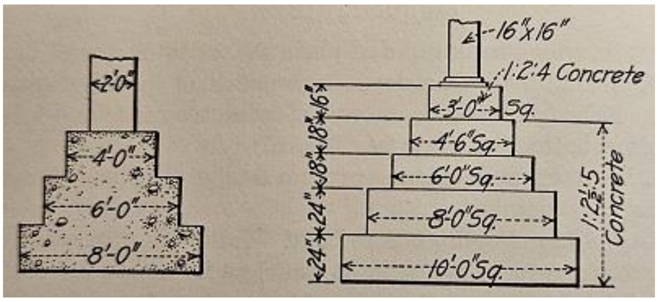


IMAGE 3: Stepped footings suggested by Albert Wolf for economizing concrete use. Source: Wolf (1923).

Current geo-professionals reading Section 4 may be most struck by its most fundamental assumption. Wolf grasped that structural engineering needed to include geotechnical considerations, but Section 4 also indicates that he and editors Hool and Kinne felt the growing intricacy of structural design was more than enough to compensate for any subsurface hiccups. This assumption was brave at best and risky at worst. Karl Terzaghi later estimated that every reported foundation failure in the early 1900s was accompanied by at least 10 unreported ones (see entry for Terzaghi (1925)). However, the perspective Wolf, Hool, and Kinne held predominated among civil engineers 100 years ago. Practitioners saw subsurface conditions as problems to be worked out during construction, not constraints to be incorporated into design. A case history Wolf had penned a few years earlier for a book on reinforced concrete construction, one also edited by George Hool, reflected this viewpoint even more clearly than Section 4. The case study was on one of the US's biggest, boldest railroad civil engineering projects of the early 20th century – the Delaware, Lackawanna, and Western Railroad's Tunkhannock Viaduct, 16 miles northwest of Scranton, Pennsylvania (Wolf 1916, Wolf 1923).

The Lackawanna Railroad, as everyone called it, was an industry powerhouse as the 20th century began. Founded in Scranton 50 years earlier, it had grown quickly as the region's iron and anthracite coal deposits were rapidly developed after the Civil War. The Lackawanna and its civil engineers soon designed and built a line from Hoboken (and, by ferry, Manhattan) to Buffalo, connecting Atlantic Ocean ports with their Great Lakes counterparts, and heavy coal and steel traffic followed. Scranton became the heart of the Lackawanna system, serving as home to the railroad's headquarters, locomotive shops, and a major freight yard. The Lackawanna also took advantage of its proximity to northeast Pennsylvania's vast deposits of anthracite coal by having its engines built to burn it. Anthracite is harder and ignites at higher temperatures than the bituminous coal most railroads used to power their locomotives, but it also emits less soot in combustion. Beginning in the early 1900s, the Lackawanna touted its cleaner-burning fuel with ads featuring a character named Phoebe Snow. An archetypal Gibson girl, she waxed eloquent in clever poems about how spotless her white linens stayed aboard the "Road of Anthracite" (Flanagan 1984, Steamtown NHS).

IMAGE 4: The Tunkhannock Viaduct soars over the valley of its namesake creek in Nicholson, PA. *Source: Author.*

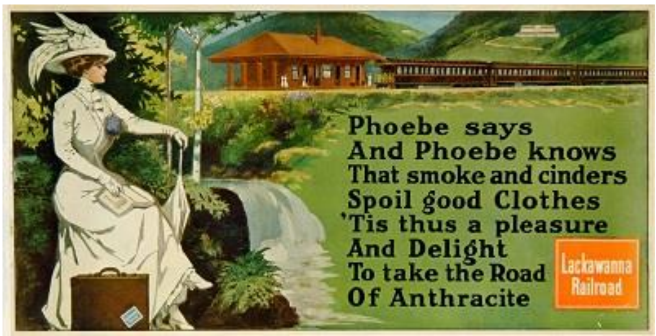


IMAGE 5: A Lackawanna Railroad advertisement from the early 1900s featuring Phoebe Snow. Source: RRMPA (2024).

Meanwhile, Phoebe's corporate overlords puzzled over how to navigate an increasingly restrictive business environment. The Gilded Age had been good for railroads, if not for their employees and customers. The Lackawanna Railroad owned many of the mines from which it hauled anthracite coal, giving it a vertical monopoly on the commodity, and it was hardly unique in this regard. Like its peers, the Lackawanna also set its own rates for shipping freight, and chagrined companies had little choice but to pay these oft-exorbitant fees. In 1887, the US government had begun regulating rates for passenger and freight service to keep railroads from holding their clients over a barrel. The nation's carriers could no longer reap the heady rewards of unbridled capitalism, and they had to change course to maintain profitability. William Truesdale, who became the Lackawanna's president in 1899, decided to do so by undertaking massive infrastructural improvements (Flanagan 1984, Steamtown NHS).

Truesdale and his civil engineers soon kicked off three major projects. The first involved building the railroad a modern headquarters which would double as its Scranton train station. The structure was finished in 1908 at a cost of $500,000, or $16.8 million in 2024. Arriving travelers stepped into a two story-high marbled waiting room featuring a Tiffany glass ceiling and tiles depicting scenes along the Lackawanna's Hoboken-Buffalo main line. The three floors (another was added later) above them housed the railroad's finance, engineering, construction, legal, freight, and real estate departments. Next, the Lackawanna built the Slateford Cutoff, a 30-mile stretch of track across western New Jersey that shaved 12 miles off its main line. The cutoff featured additional tracks, long straightaways, easy curves, dramatic viaducts, and grade-separated crossings; it also used reinforced concrete extensively at a time when it was not yet in vogue for railroad construction. The Slateford Cutoff was completed in 1911 at a cost of $11 million, or $365 million in 2024 (Flanagan 1984, NAL 1976, Steamtown NHS, Webster 2024).

IMAGE 6: Exterior of the Lackawanna Railroad's Scranton station, since retrofitted into a hotel. *Source: Author.*

IMAGE 7: Interior of the Lackawanna Railroad's Scranton station, featuring "LRR" insignias on the balcony's balustrades. *Source: Author.*

In the early 1910s, William Truesdale and his civil engineers buckled down to work on the third, and in many ways most daunting, of his planned major infrastructure projects. The Lackawanna's main line between Clarks Summit, a few miles northwest of Scranton, and Hallstead, a hamlet on the Susquehanna River near the New York state line, dated back to the 1850s. Like most early railroads, it had been built economically to follow the surrounding terrain – in its case, Pennsylvania's rugged Endless Mountains. Yet this section had scarcely been improved since then and now featured some of the steepest grades and sharpest curves on the entire Hoboken-Buffalo route. Truesdale and his civil engineering team determined that building a cutoff to Hallstead would be the most economical option for straightening and flattening this section of the Lackawanna's main line (NAL 1976).

The route Truesdale and his civil engineers selected for the Hallstead Cutoff would trim only 3.6 miles off the Hoboken-Buffalo trip, but it would save the Lackawanna Railroad far more than distance alone could indicate. The cutoff would feature a maximum grade 40 percent gentler than the existing route (0.68% versus 1.23%) and a maximum curve half as sharp (3.0° versus 6.4°). It would also feature six fewer circles worth of total curvature (1,570° versus 3,970°) than the extant Lackawanna route and would be 30 feet lower at Clarks Summit, easing the tough climb from Scranton into the Endless Mountains. Ultimately, the cutoff would save freight trains an hour between Scranton and Binghamton, New York, and would save passenger trains 20 minutes. The cutoff would be a formidable civil engineering challenge involving massive cuts, huge fills, and a 3,630-foot tunnel. Its linchpin, though, would be a mammoth viaduct over Tunkhannock Creek in the borough of Nicholson. A large fill with culverts might have been cheaper to build, but Lackawanna civil engineers chose a viaduct after observing the raging creek during a spring flood (ASCE 1914, ASCE 2024, NAL 1976).

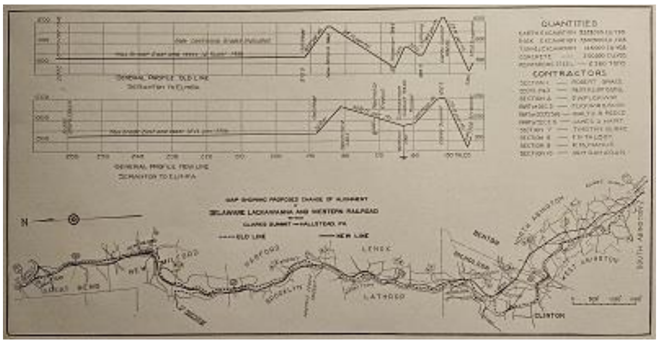


IMAGE 8: Map of the Hallstead Cutoff and the Lackawanna Railroad's extant route, 1914. *Source: ASCE (1914).*

Two Lackawanna designers – civil engineer Abraham Cohen, still in his 20s, and seasoned architect William Botsford – worked hand in glove to make the Tunkhannock Viaduct both beautiful and functional. They modeled their final design on the Pont du Gard aqueduct of the Roman Empire. It would be 2,375 feet long, have 12 arches, and soar 240 feet above the creek and 180 feet above the Lackawanna's existing main line. (Tragically, after Botsford visited Europe in early 1912 to study historic architecture there, he attempted to return home – and perished – on the Titanic.) The viaduct would be a marvel of advanced structural design. Albert Wolf rightfully noted that "this bridge is indicative of the high state of development of the concrete designing practice of the D.L.&W. R.R. and in addition reflects great credit upon the status of concrete bridge design and construction in America" as he elaborated on its structural details. The viaduct's geotechnical design also reflected the state of US practice, albeit in a less flattering light. Cohen and Botsford prudently decided to found the structure on bedrock, and the Lackawanna determined the depth to rock at the site using borings; its mining subsidiaries already used the practice to locate economical coal seams. Still, the designers left the question of how exactly footings would be excavated to bedrock for C.W. Simpson, the Lackawanna's construction engineer for the viaduct, to figure out (Baker 2015, Simpson 1916, Wolf 1916).

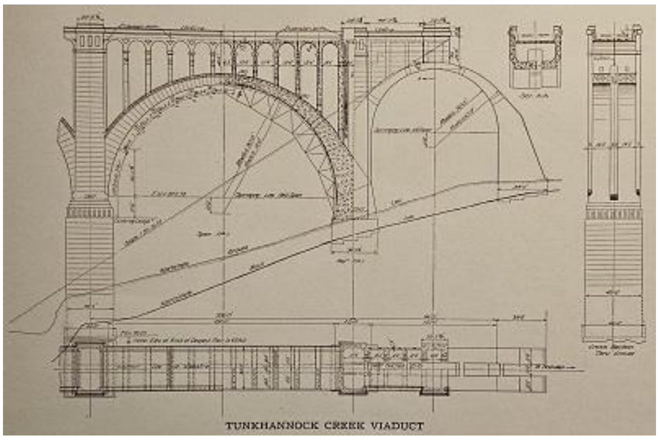


IMAGE 9: Structural detail of the Tunkhannock Viaduct. *Source: ASCE (1914).*

Construction of the Hallstead Cutoff began in May 1912. The 200 skilled craftsmen and 300 laborers under C.W. Simpson's command started work on the Tunkhannock Viaduct by building railroad sidings on the Lackawanna Railroad's extant main line and constructing temporary narrow-gauge tracks around the site for moving construction supplies and excavated soil and rock. One of the first obstacles the Lackawanna faced was getting dynamite to the site for construction. The railroad, mindful of all the coal it carried, strictly forbade trains on its lines from hauling explosives. Instead, the dynamite had to travel through another railroad's depot 11 miles away, from which horse-drawn wagons brought it to Nicholson. By

July, the crews were ready to excavate the foundations of the bridge's 11 piers (NAL 1976, NHA 2024, Wolf 1916).

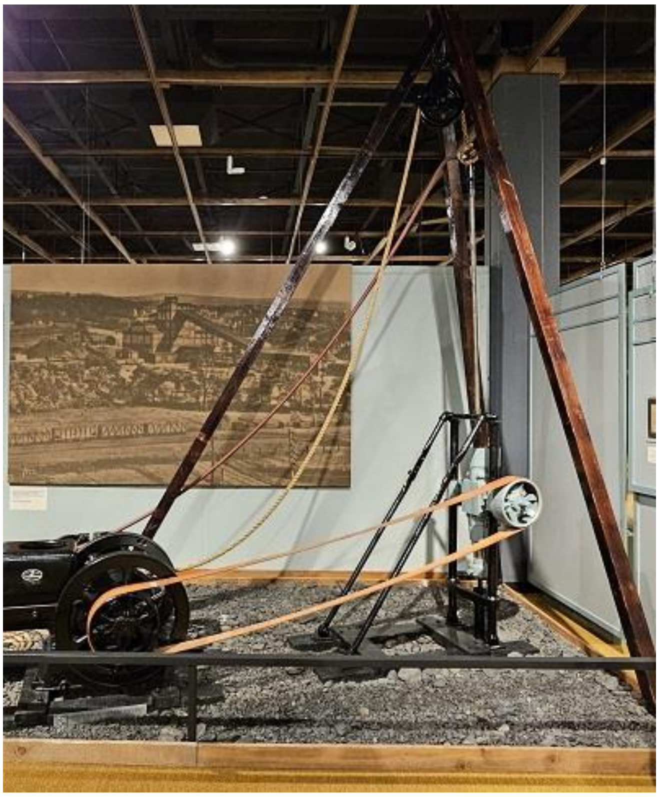


IMAGE 10: Drill rig for locating coal seams, much like what the Lackawanna Railroad would have used to locate bedrock for the Tunkhannock Viaduct. *Source: Author.*

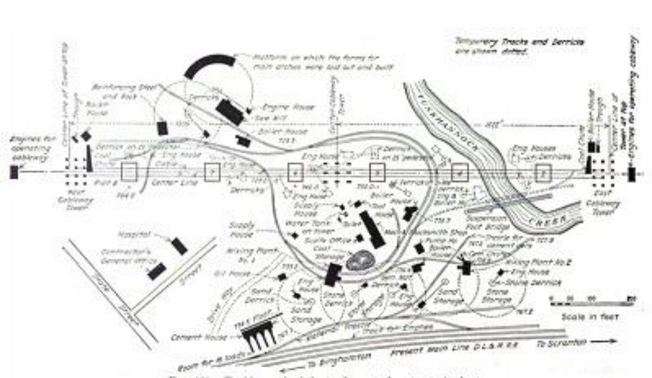


Fig. 429.—Tunkhannock viaduct. Layout of contractor's plant.

IMAGE 11: Diagram of the construction set-up for the central portion of the Tunkhannock Viaduct site. *Source: Wolf (1916).*

Abraham Cohen had designed the Tunkhannock Viaduct to hold the heaviest steam locomotive of the day – the 300-ton Mallet – and loaded cars weighing 3 tons per foot on both its tracks. These massive loads translated into piers measuring 43.5 feet by 36.5 feet at their footings; those of the deepest piers were enlarged to 46 feet by 40 feet. Crews working for Flickwir & Bush, the Lackawanna's contractor for the viaduct, started excavations for the pier footings by laying out steel sheet piling measuring 52 feet by 46 feet around each pier location. Once the sheet piles were partially driven using a steam hammer, excavation began. As it progressed, the sheet piling was gradually driven deeper; meanwhile, the excavated material was used to level the site for construction of work buildings and temporary tracks. When the piling at each pier had been driven to its full height of 30 feet, a second steel sheet pile cofferdam measuring 65 feet by 59 feet was driven around the first and the material between the cofferdams was excavated. Sheet pile driving and excavation then continued within the first cofferdam. Plentiful timber bracing was used to support the excavations as they progressed (Wolf 1916).

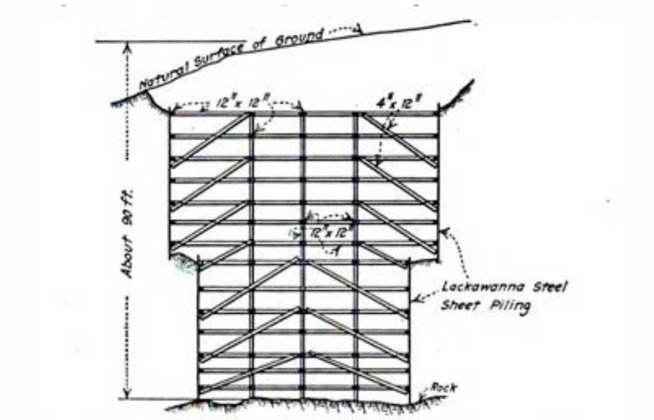


Fig. 432.—Tunkhannock viaduct. Details of cofferdam sheeting and bracing.

Bedrock at the Tunkhannock Viaduct site consists primarily of sandstone, siltstone, and shale and is usually a sound bearing stratum provided it is excavated to intact material and kept dry. The steam shovels and clamshell buckets used by Flickwir & Bush crews ensured that excavation proceeded to sound material; the crews carefully dug out the corners of the cofferdams by hand and, occasionally, broke up boulders with dynamite. Simultaneously, the pumps they deployed within the cofferdams largely kept their excavations dry. However, their luck ran out at Piers 4 and 5, where excavation was significantly affected by running sands. At Pier 4, which is next to Tunkhannock Creek, the issue was encountered 40 feet below grade and quickly grew so severe that the cofferdam shifted 15 inches, its timber bracing warped, and the surrounding ground settled as much as 10 feet. C.W. Simpson got his crews to swiftly and correctly reposition the cofferdam using jacks and additional excavation, but a new strategy for excavation to bedrock was clearly necessary. He hit upon the brilliantly simple idea of using timber sheet piling to divide the interior of the Pier 4 cofferdam into three sections and sequentially excavate each to sound bedrock and pour concrete into it. He also bolstered the dewatering system within the Pier 4 cofferdam so that up to 200,000 gallons of water per hour could be pumped from it. Simpson's scheme worked, and construction of Pier 4 proceeded smoothly from there (Geyer and Wilshusen 1982, PaGEODE 2024, Wolf 1916).

The Pier 4 boondoggle gave Simpson and the Flickwir & Bush crews a better idea of what to expect as excavation progressed at Pier 5, just north of Pier 4, and subsurface conditions there were indeed similar. However, Simpson's plan to reuse his timber sheet piling technique failed due to a key geotechnical detail. Northeast Pennsylvania was heavily glaciated during the last ice age, and the retreating glaciers left behind extensive boulder deposits. Flickwir & Bush crews attempting to drive timber sheet piles in the Pier 5 cofferdam roughly 75 feet below grade found that these boulders, which had not been problematic at Pier 4, were everywhere at Pier 5. The timber sheet piles were soon badly damaged by impacts on boulders, and excavation stalled while a change of plan was worked out. The troubles at Piers 4 and 5 were by then significantly delaying completion of the Tunkhannock Viaduct, and Lackawanna Railroad president Truesdale was no doubt deeply frustrated by the mounting construction expenses and profits lost due to the holdup. The Lackawanna hosted an ASCE excursion train tour of the Hallstead Cutoff in January 1914, but its civil engineers probably downplayed that the excavation issues were threatening to delay its planned completion date of July 1, 1915 (ASCE 1914, Simpson 1916, Wolf 1916).

IMAGE 13: Excavation progresses on Pier 5 of the Tunkhannock Viaduct, October 1913. *Source: Archives West (2017).*

IMAGE 14: View of construction progress overall on the Tunkhannock Viaduct, fall 1913. *Source: ASCE (1914).*

At length, however, C.W. Simpson and Flickwir & Bush worked out a solution at Pier 5. Pneumatic caissons, or chambers filled with forced air in which excavation proceeds manually, were on their way out in construction by 1914 but represented one of the few viable alternatives left at the project team's disposal. Furthermore, the threat of decompression sickness which had formerly plagued caisson workers had by then been effectively addressed using airlocks. Flickwir & Bush brought an airlock-equipped caisson to the Pier 5 site in December 1914 and promptly resumed excavation. The caisson steadily inched downward as its crew dug material out from beneath it, and laborers outside the caisson accelerated its descent by pouring concrete atop it. When the Pier 5 caisson reached sound bedrock in February 1915, Flickwir & Bush backfilled it with concrete, and Pier 5 swiftly began rising toward its comrades. From there, the structural construction of using steel falsework trusses to erect the Tunkhannock Viaduct's 12 arches (two are buried within the viaduct's approaches) and pouring the concrete arches using a cable system proceeded rapidly. Simpson had twice surmounted serious subsurface issues with his quick improvisation, but the geotechnical headaches he had been forced to tackle slowly and painfully stood in stark contrast to the neat efficiency with which structural work on the viaduct proceeded (NAL 1976, Simpson 1916, Wolf 1916).

The Tunkhannock Viaduct's foundation problems were the main reason the Lackawanna Railroad and its contractors completed the Hallstead Cutoff 4 months behind schedule in November 1915. Still, the feat was nothing short of astounding. The project had cost $12 million, or $378 million in 2024. It had involved excavating 5.5 million cubic yards of soil and 7.6 million cubic yards of rock, and it had used 300,000 cubic yards of concrete and 2,360 tons of rebar. The Tunkhannock Viaduct alone had cost $1.4 million, or $44.1 million in 2024, and had used roughly half of the cutoff's total concrete and rebar. Its 11 piers had required excavations ranging in depth from 60 to 103 feet, and bedrock at the deepest pier lay 309 feet below the double-tracked bridge deck. So exacting were the Lackawanna's construction standards that each pier, some of which were over 200 feet high, was within a quarter inch of plumb. Sadly, some numbers from the project were far more sobering; 30 workers had died building the viaduct. Still, the fact remained that the Lackawanna had built the largest concrete bridge, if not structure, in the world (ASCE 1914, ASCE 2024, Baker 2015, NAL 1976, NHA 2024, Simpson 1916, Webster 2024, Wolf 1916).

IMAGE 15: Souvenir booklet from the ASCE excursion train to the Hallstead Cutoff, January 22, 1914. Source: Author's collection.

IMAGE 16: Civil engineers on the ASCE excursion train step out in derbies and fur coats to better view the construction of the Tunkhannock Viaduct. *Source: NPS (2022).*

The Lackawanna Railroad commemorated the Hallstead Cutoff with a grand opening ceremony for it on November 7, 1915. Fittingly, the ceremony was held at the Tunkhannock Viaduct. Dignitaries included the governor of Pennsylvania and a 50-year Lackawanna employee who had ridden one of the railroad's first passenger trains in 1851. Predictably, the keynote speaker was William Truesdale, who vowed that his railroad would continue to strive for constant improvement in its infrastructure and service. With a shout of "All aboard!" from a Lackawanna conductor, the first passenger train then chugged across the viaduct to raucous cheering. It appeared that Phoebe Snow's travels on the Road of Anthracite would be swifter and more pleasant for a long time to come (Baker 1915, Scranton Times 1915, Wolf 1916).

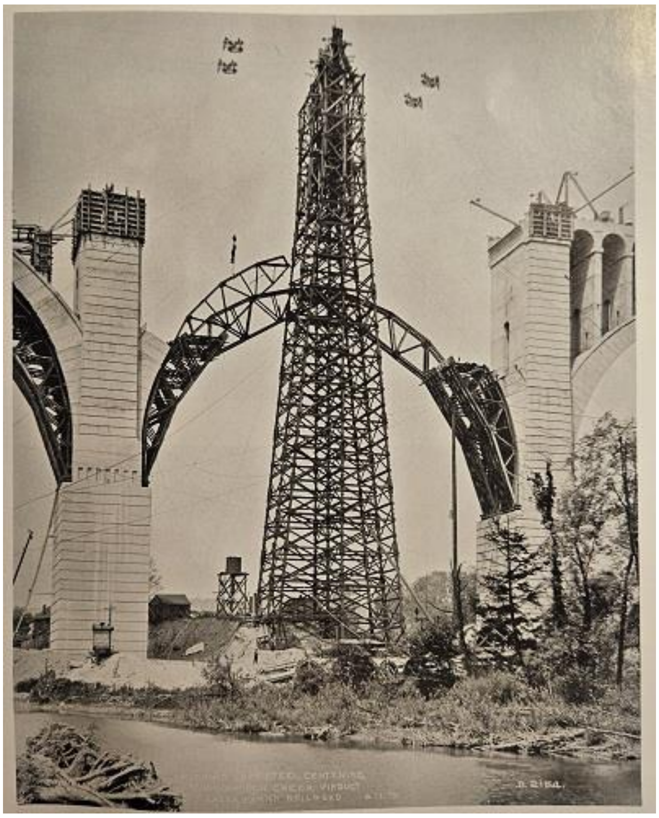


IMAGE 17: The tower used to transport concrete along the Tunkhannock Viaduct for pouring via cable-mounted buckets, spring 1915. *Source: NAL (1976).*

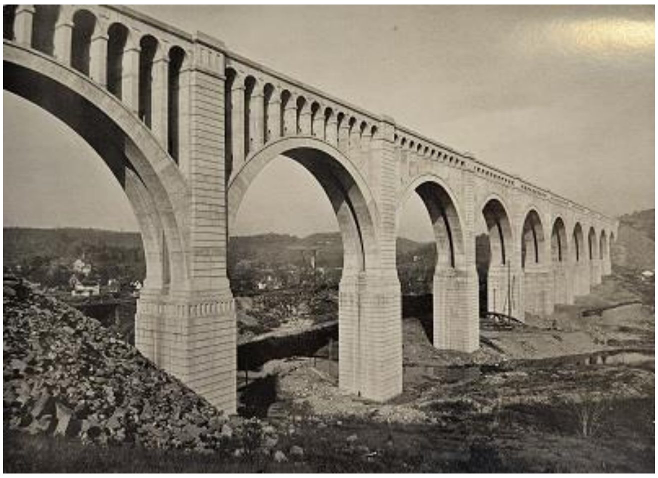


IMAGE 18: The Tunkhannock Viaduct upon completion, fall 1915. *Source: NAL (1976).*

"Railroading is changing very rapidly," Truesdale noted in his dedicatory remarks, "and no prophet who is wise will venture a prediction as to what the next development will be." Unbeknownst to him, the next development was already there that day, as dozens of locals drove their automobiles to the opening ceremony. In hindsight, the Lackawanna Railroad's completion of the viaduct marked high noon for US railroads as well as any event could. Further ambitious projects on the scale of the Hallstead Cutoff were initially shelved when the country entered World War I in 1917. (To save anthracite for the war effort, the US government ordered all railroads to burn bituminous coal during the conflict, prompting the Lackawanna to retire Phoebe Snow.) A short but painful recession followed the war, and the Supreme Court further curtailed railroad spending by forcing lines to divest their vertical monopolies, such as the Lackawanna's coal companies. As the 1920s got roaring, the shift toward cars became even more noticeable. It was research for highway, not railroad, construction that led to many early advances in geotechnical engineering as the discipline came into its own at that time. The Great Depression and World War II temporarily halted further paradigm shifts in US transportation – rail passenger miles traveled hit its peak in 1944 – but the automotive age shifted into high gear as peacetime returned (Steamtown NHS).

IMAGE 19: The first train over the Tunkhannock Viaduct looks tiny by comparison as it crosses the structure, November 7, 1915. *Source: Fulton (2015).*

During the 1950s, the economic tide turned harshly against American railroads. The US government invested its transportation resources in alternative modes of infrastructure, including airports, pipelines, canals such as the St. Lawrence Seaway, and – most notably – the interstate highway system. The cross-country freeway network was an undeniable positive but created a market distortion that subsidized the automobile, trucking, and oil industries and made it tough for railroads to compete. A 1959 geotechnical report for Interstate 81 near Scranton noted that its planned alignment extended across a bridge "over […] the Delaware, Lackawanna, and Western Railroad." The symbolic, if inadvertent, juxtaposition of the interstate soaring high above the railroad track was powerful. Meanwhile, the federal regulatory structure designed to keep Gilded Age railroads from holding competitors and clients over a barrel now held those railroads over one by restricting their abilities to set competitive and goods-specific freight shipping rates and to discontinue money-losing passenger services. Consumers switched to the cheaper, more flexible alternatives of car travel and long-haul trucking, and American railroads' retreat soon turned into a rout (AAR 2024, GFCC 1959, Steamtown NHS).

The Lackawanna Railroad struggled gamely to keep going. It replaced its anthracite-powered steam locomotives with diesel engines that were easier to run and maintain and, with an eye on nostalgia, even renamed its marquee passenger train the Phoebe Snow. (It was from this train that an aspiring musician took her stage name en route to pop stardom.) However, the triple blow of the rise of the interstates, extensive infrastructure damage from Hurricane Diane in 1955, and the precipitous postwar decline of the Pennsylvania anthracite industry meant that the Lackawanna's strenuous efforts merely bought it time. Next, it followed many of its floundering US peers in merging with an old rival to try to stay afloat; in 1960, the Lackawanna threw in its lot with the Erie Railroad. The new company remained solvent for 12 more years, a respectable performance compared to how quickly most of the panicked, ill-advised rail mergers of the era tanked. In the end, though, the Erie Lackawanna was done in by economic forces beyond its control. The Phoebe Snow left Scranton for the final time in 1966, and the immense track damage done by Hurricane Agnes in June 1972 pushed the Erie Lackawanna into bankruptcy (Holden 2011, STT 2022, Steamtown NHS).

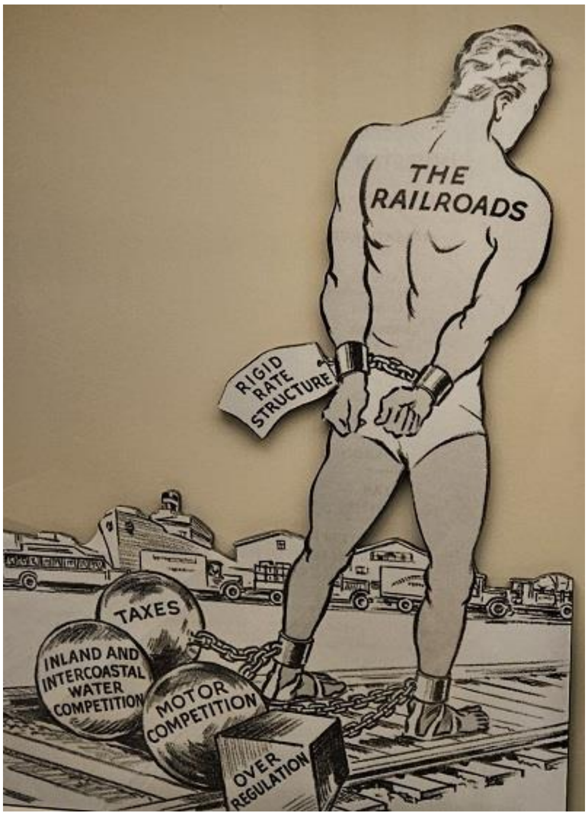
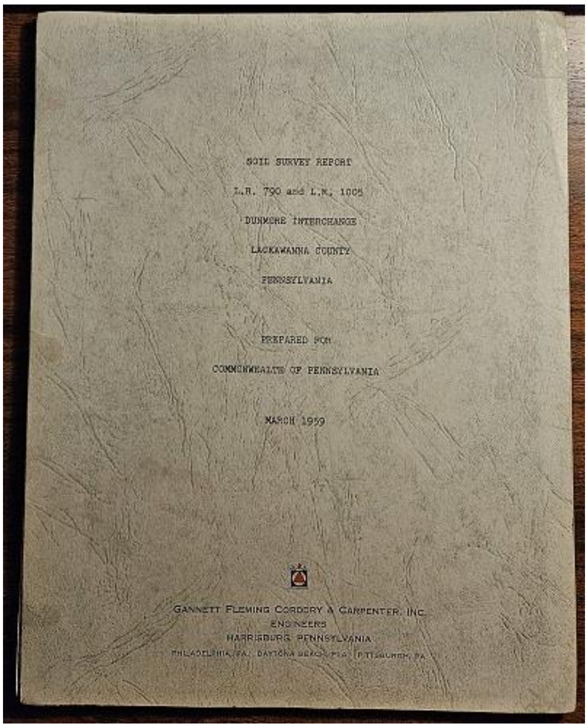


IMAGE 20: A political cartoonist satirizes the plight of US railroads in the mid-20th century. *Source: Steamtown NHS.*


SOIL SURVEY REPORT

L.R. 790 and L.R. 1005

DUNMORE INTERCHANGE

LACKAWANNA COUNTY

PENNSYLVANIA

PREPARED FOR

COMMONWEALTH OF PENNSYLVANIA

MARCH 1959

GANNETT FLEMING CORDDRY & CARPENTER, INC.
ENGINEERS
HARRISBURG, PENNSYLVANIA
PHILADELPHIA, PA. DAYTONA BEACH, FLA. PITTSBURGH, PA.

IMAGE 21: Geotechnical report for L.R. 1005 (now Interstate 81) in Dunmore, PA, just outside of Scranton, March 1959. Source: Author's collection.

By then, the US government was finally acting on the crisis gripping American railroads. The 1970 failure of the Penn Central – another poorly planned merger, but this one between two of the country's most powerful carriers – represented the largest bankruptcy in US history until then and spurred Washington to act. First, Congress nationalized passenger rail service by creating Amtrak; the move saved US railroads roughly $200 million annually, or $1.6 billion in 2024. Next, the government created Conrail to take over and consolidate the operations of bankrupt freight railroads in the northeast US, including the Erie Lackawanna. Finally, Washington passed bipartisan deregulation to modernize federal oversight of railroads, which helped stabilize the health of remaining US freight lines. Conrail soon began turning a profit and was privatized; it has since been purchased by its competitors. US passenger rail has also undergone a renaissance over the past decade. Amtrak now stands on the verge of turning its first profit and recently released a 15-year plan to extend service to destinations where passengers have not disembarked in decades, including Scranton. Regional lawmakers are currently securing funds for the infrastructural improvements necessary to bring passenger rail back to the city, which most Americans now know not from its industrial roots but from the sitcom The Office (AAR 2024, Schaffer 2024, Steamtown NHS).

IMAGE 22: A 1948 diesel locomotive, repainted in Lackawanna Railroad livery for excursion service, sits on display at Steamtown National Historic Site. *Source: Author.*

IMAGE 23: Damage to Lackawanna Railroad tracks in Scranton, PA, from Hurricane Diane, August 1955. *Source: SPL (2024).*

Remnants of the Lackawanna Railroad still dot the landscape in and around Scranton. The Steamtown National Historic Site is housed in the line's former downtown freight yard and ably tells the story of the US's railroading heritage. Blocks away, the railroad's former station and office building now serves as a hotel that combines its historic charms with modern travel conveniences. However, the clearest reminder of the Lackawanna stands in Nicholson, where several freight trains trundle over the Tunkhannock Viaduct every day. The throbbing diesel engines pulling double-stacked trailer containers still look miniscule atop the massive structure with its clear, if worn, marking (added decades after construction) of "LACKAWANNA RR." The graceful behemoth is now a National Historic Civil Engineering Landmark and sits on the National Register of Historic Places, ensuring its preservation for future generations. Part of the structure's historic significance in civil engineering arises from its being the world's largest concrete bridge upon its completion; another comes from its construction, which reflected an era when the complexity of structural design far outpaced that of geotechnical design. However, its deeper historic significance in the profession may be how it reflects the brilliance of American railroads' civil engineers. It was the ingenuity and innovation of people such as Abraham Cohen and C.W. Simpson that made possible structures such as the Tunkhannock Viaduct and rail routes such as the Road of Anthracite (Flanagan 1984, NHA 2024, Steamtown NHS).

IMAGE 24: The Tunkhannock Viaduct frames a November sunrise. *Source: Author.*

Acknowledgments

Sebastian Lobo-Guerrero, Ph.D., P.E., BC.GE, F.ASCE (A.G.E.S., Inc.: Canonsburg, PA), the author's former colleague, reviewed the entry's geotechnical content. Thomas Kennedy (Geopier: Davidson, NC), the author's Virginia Tech classmate, co-authored a 2021 version of the entry posted on an independent webpage.

IMAGE 25: The Lackawanna Railroad's former vault in its Scranton station and headquarters now serves as an ornate hotel coat closet. *Source: Author.*

References

American Association of Railroads (AAR). 2024. "Chronology of America's Freight Railroads." American Association of Railroads. Accessed Oct. 28, 2024. https://www.aar.org/chronology-of-americas-freight-railroads/

American Society of Civil Engineers (ASCE). 1914. Souvenir of Clarks Summit – Hallstead cut-off inspection trip. Scranton, PA: Delaware, Lackawanna, and Western Railroad.

American Society of Civil Engineers (ASCE). 2024. "Tunkhannock Viaduct." ASCE National Historic Civil Engineering Landmarks. Accessed Oct. 27, 2024. https://www.asce.org/about-civil-engineering/history-and-heritage/historic-landmarks/tunkhannock-viaduct

Anthracite Heritage Museum. Scranton, PA: Pennsylvania Historical & Museum Commission. Visited Apr. 14, 2024.

Archives West. 2017. "Delaware, Lackawanna, and Western Railroad photograph collection, 1913." Archives West – Orbis Cascade Alliance, Nov. 27. Accessed Oct. 27, 2024. https://archiveswest.orbiscascade.org/ark:80444/xv28778

Baker, R. 2015. "Still capturing attention, Nicholson Bridge turns 100." Wilkes-Barre Citizens' Voice, Sept. 6. Accessed Nov. 3, 2024.

https://www.citizensvoice.com/news/still-capturing-attention-nicholson-bridge-turns-100/article_e7c19d45-ecd3-5158-8372-577e00a69b34.html

Flanagan, L.G. 1984. "Lackawanna Station historical perspective." Hilton Lackawanna Station, Scranton, PA: 4 pp.

Fulton, B. 2015. "History extra – Nicholson Bridge opened 100 years ago." Scranton Times-Tribune, Nov. 7. Accessed Oct. 27, 2024. https://www.thetimes-tribune.com/2015/11/07/history-extra-nicholson-bridge-opened-100-years-ago/

Gannett Fleming Corddry & Carpenter, Inc. (GFCC). 1959. Soil survey report: L.R. 790 [I-84/I-380] and L.R. 1005 [I-81], Dunmore Interchange, Lackawanna County, Pennsylvania. Harrisburg, PA: Gannett Fleming Corddry & Carpenter, Inc.

Geyer, A.R., and J.P. Wilshusen. 1982. *Engineering characteristics of the rocks of Pennsylvania, 2nd* ed. Harrisburg, PA: Pennsylvania Geological Survey.

Holden, S. 2011. "Phoebe Snow, bluesy singer-songwriter, dies at 60." New York Times, Apr. 27. Accessed Nov. 3, 2024. https://www.nytimes.com/2011/04/27/arts/music/phoebe-snow-bluesy-singer-songwriter-dies-at-58.html

Hool, G.A., and W.S. Kinne, eds. *Foundations, abutments, and footings*. New York, NY: McGraw-Hill.

Marquis, A.N., ed. 1917. *The book of Chicagoans: a biographical dictionary of leading living men and women of the city of Chicago*. Chicago, IL: A.N. Marquis and Co.

Marquis, A.N., ed. 1926. *Who's Who in Chicago: A book of Chicagoans*. Chicago, IL: A.N. Marquis and Co.

National Park Service (NPS). 2016. "Scranton's Lackawanna Station celebrated 100th anniversary in 2008." National Park Service, Dec. 6. Accessed Oct. 27, 2024. https://www.nps.gov/stea/planyourvisit/lackawanna-station-100th-anniversary.htm

National Park Service (NPS). 2022. "Tunkhannock Creek Viaduct construction." National Park Service, Sept. 26. Accessed Oct. 27, 2024. https://www.nps.gov/museum/exhibits/stea/architecture/bridges-viaducts/STEA-7469-F206-tunkhannock-creek-viaduct.html

Nicholson Area Library (NAL). 1976. The bridge was built. Tunkhannock, PA: Van Dyke Press.

Nicholson Heritage Association (NHA). 2024. "Tunkhannock Creek Viaduct." Nicholson Heritage Association. Accessed

Nov. 3, 2024. https://www.nicholsonheritage.org/tunkhannock-creek-viaduct/

Pennsylvania Bureau of Geological Survey (PABGS). 2024. "PaGEODE – Pennsylvania GEOlogic Data Exploration." PA Department of Conservation and Natural Resources. Accessed Oct. 28, 2024. https://maps.dcnr.pa.gov/pageode/

Radisson Lackawanna Station Hotel. Scranton, PA: Radisson. Visited Sept. 1-2, 2024.

Railroad Museum of Pennsylvania (RRMPA). 2024. "Railroad advertising icon Phoebe Snow." Aug. 1, 8:38 AM. Tweet. X, formerly Twitter. Accessed Oct. 27, 2024. https://x.com/rrmuseumpa/status/1818989610241818787

Schaffer, S. 2024. "Planning the return of passenger rail service." WNEP 16 ABC, Oct. 29. Accessed Nov. 3, 2024. https://www.youtube.com/watch?v=qMgJgBNZlfE

Scranton Public Library (SPL). 2024. "Natural disasters in NePA – Hurricane Diane." Scranton Public Library. Accessed Nov. 3, 2024. https://digitalarchives.powerlibrary.org/papd/islandora/object/papd%3Apscrl-ndnepa

Scranton Times. 1915. "Lackawanna intends going ahead with improvements." Scranton Times, Nov. 8. Accessed Nov. 3, 2024. https://explorepahistory.com/odocument.php?docId=1-4-C9

Scranton Times-Tribune. 2022. "Then and now: Lackawanna Station." Scranton Times-Tribune, Jul. 9. Accessed Oct. 27, 2024. https://www.thetimes-tribune.com/2022/07/09/then-now-lackawanna-station/

Simpson, C.W. 1916. "Construction methods on the Tunkhannock and Martin's Creek Viaducts, Lackawanna Railroad." In Proc., 12th Ann. Conv., Chicago, IL: ACI, 100-112.

Statens Järnvägars Geotekniska Kommission [Geotechnical Commission of the [Swedish] State Railways] 1914-22 (SJGK). 1922. Slutbetänkande avgivet till Kunglig Järnvägsstyhelsen den 31 maj 1922 [Final report delivered to the Royal Railway Board on May 31, 1922]. Stockholm, Sweden: Centraltryckeriet [Central Printing Co.].

Steamtown National Historic Site (Steamtown NHS). Scranton, PA: National Park Service. Visited Aug. 31, 2024.

Tri-State Railway Historical Society (TSRHS). 2024. "DL&W F3 locomotive 663." Tri-State Railway Historical Society, Inc. Accessed Nov. 3, 2024. https://www.tristaterail.org/dlw663

Webster, I. 2024. "CPI inflation calculator." Inflation calculator. Accessed Oct. 28, 2024. https://www.in2013dollars.com/us/inflation

Wolf, A.M. 1916. "Chapter XXXII: Construction of the Tunkhannock Creek Viaduct." In *Reinforced concrete construction, Vol. III: Bridges and culverts*, G.A. Hool, ed. New York, NY: McGraw-Hill, 548-574.

Wolf, A.M. 1923. "Section 4: Spread footings." In *Foundations, abutments, and footings*, G.A. Hool and W.S. Kinne, eds. New York, NY: McGraw-Hill, 208-251.

(GEO-INSTITUTE, 15 Nov 2024, https://www.geoinstitute.org/news/jazz-age-geotechnical-engineering-part-5-spread-footings)

Is DIGGS ready for AI?

by **Allen Cadden, P.E., BC.GE, F.ASCE**

Catchy title, eh? For the geotechnical world and everyone else, AI is a new and exciting challenge. And as we have all heard, its value is directly tied to the data it is trained with. That's where DIGGS -- Data Interchange for Geotechnical and Geoenvironmental Specialists -- comes in. If you have not heard of this over the past 15 years, this is the data structure standard initially developed through DOT and FHWA efforts and, for the past 7 years, managed and expanded by the Geo-Institute.

As we have said many times, this is not a database of geotechnical data; this is a standard format that can be used to easily transfer geotechnical data -- boring, in-situ testing, laboratory, grouting, geophysical, pile, instrumentation, MWD, etc -- from one software tool to another. Imagine how wonderful our life will be once we fully adopt this transfer format: when we collect the data in the field electronically, send it to the office and laboratory and then into our analysis, reporting, and presentation tools, then into the field for bidding and construction use -- without ever having to manipulate it or pull info from a PDF. Like AI, this is possible and likely to be a reality for the geotechnical community in the not-too-distant future. Check out DIGGS at www.diggsml.org.

We have a very active group of followers that meet the first Friday of each month to discus application and advancements in the DIGGS world. Please feel free to join us by sending a request at https://www.geoinstitute.org/special-projects/diggs/contact-us. If you have a strong interest in how the schema works, check out our GitHub site. Here you will find development information, documentation, and examples to help get you start down the DIGGS implementation path.

We have several ongoing development efforts supported by the G-I Committee Special Project Fund. These include MWD, vendor support, deep foundations, geophysics, and instrumentation as well as general advancements within the DIGGS schema. You are welcome to join any of these working groups as well.

Let's get AI-ready by standardizing our data transfer with DIGGS!

We're planning to bring you a new DIGGS blog post every month focused on advances, new partnerships, and ways you can use DIGGS and its outputs! Also check out the DIGGS playlist on the G-I YouTube channel for application and training videos.

(GEO-INSTITUTE, 06 Nov 2024, https://www.geoinstitute.org/news/diggs-ready-ai)

ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΤΑΙΡΕΙΑ ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ & ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Διαδικτυακή διάλεξη Τετάρτη 20.11.2024

Δρα Αγγελικής Γραμματικοπούλου

Η εφαρμογή της αριθμητικής ανάλυσης στην αξιολόγηση και στον σχεδιασμό μονοπασσάλων για υπεράκτια αιολικά πάρκα

Περίληψη Διάλεξης

Η αριθμητική ανάλυση χρησιμοποιείται όλο και περισσότερο στην ανάπτυξη μεθοδολογιών γεωτεχνικού σχεδιασμού και στην εφαρμογή τους στην πράξη. Για παράδειγμα, το πρόσφατα ολοκληρωμένο ερευνητικό πρόγραμμα PISA το οποίο χρηματοδοτήθηκε από εταιρείες που δραστηριοποιούνται στη βιομηχανία της υπεράκτιας αιολικής ενέργειας και διεξήχθη σε τρία πανεπιστήμια (University of Oxford, Imperial College London & University College Dublin), ανέπτυξε νέα μεθοδολογία ανάλυσης και σχεδιασμού μονοπασσάλων θεμελίωσης υπεράκτιων ανεμογεννητριών, στην οποία η αριθμητική ανάλυση έχει κεντρικό ρόλο.

Μετά από μια σύντομη περιγραφή της μεθόδου σχεδιασμού PISA, στην διάλεξη θα παρουσιαστούν τρισδιάστατες αριθμητικές αναλύσεις με την μέθοδο των πεπερασμένων στοιχείων που πραγματοποιήθηκαν για τον σχεδιασμό μονοπασσάλων, για έναν αριθμό υπεράκτιων αιολικών πάρκων στη Βόρεια Ευρώπη. Αρχικά, θα παρουσιαστεί η ικανότητα κάποιων προηγμένων καταστατικών προσομοιωμάτων να περιγράφουν την απόκριση του εδάφους για μια ποικιλία τυπικών εδαφών που συναντώνται στη Βόρεια Θάλασσα. Επίσης, θα παρουσιαστεί η μεθοδολογία βαθμονόμησης αυτών των καταστατικών προσομοιωμάτων χρησιμοποιώντας τα αποτελέσματα προηγμένων εργαστηριακών και επιτόπου δοκιμών που γίνονται στο πλαίσιο σχεδιασμού των υπεράκτιων αιολικών πάρκων. Αξίζει να σημειωθεί ότι επειδή τα υπεράκτια αιολικά πάρκα καλύπτουν μεγάλες εκτάσεις, υπάρχει μεγαλύτερη μεταβλητότητα των εδαφικών συνθηκών σε σχέση με πολλά χερσαία έργα, και επομένως η αξιολόγηση των εδαφικών συνθηκών είναι πολλές φορές πιο περίπλοκη. Τέλος, στη διάλεξη θα παρουσιαστεί ο τρόπος με τον οποίο τα αποτελέσματα των αριθμητικών αναλύσεων μπορούν να χρησιμοποιηθούν για την ανάλυση και τον σχεδιασμό μονοπασσάλων μικρού λόγου μήκους προς διάμετρο (L/D), μέσω της εξαγωγής καμπυλών αντίδρασης εδάφους και της εφαρμογής τους σε συμβατικές αναλύσεις p-y.

Σύντομο Βιογραφικό Σημείωμα Ομιλήτριας

Η Αγγελική Γραμματικοπούλου είναι Senior Partner στην Geotechnical Consulting Group (GCG) στο Λονδίνο, Ηνωμένο Βασίλειο, και Fellow του Institution of Civil Engineers (ICE). Είναι πτυχιούχος Πολιτικός Μηχανικός ΑΠΘ (1998) και έχει μεταπτυχιακό (MSc, 1999) και διδακτορικό δίπλωμα (PhD, 2004) στην Γεωτεχνική Μηχανική από το Imperial College του Λονδίνου, στο οποίο και εργάστηκε ως Research Assistant. Το ερευνητικό της έργο επικεντρώθηκε στην καταστατική προσομοίωση αργίλων και συγκεκριμένα στην ανάπτυξη καταστατικών μοντέλων κινηματικής κράτυνσης, τα όποια εισήγαγε στον κώδικα πεπερασμένων στοιχείων ICFEP του Imperial College. Ως μέλος της ομάδας υπολογιστικής γεωτεχνικής μηχανικής της GCG έχει πάνω από 20 χρόνια εμπειρία στην προηγμένη καταστατική προσομοίωση και στην εφαρμογή της στην αριθμητική ανάλυση πολύπλοκων γεωτεχνικών κατασκευών, συμπεριλαμβανομένων χερσαίων και υπεράκτιων θεμελιώσεων, βαθιών εκσκαφών, σηράγγων και φραγμάτων.

Έχει εργαστεί σε πλήθος μεγάλων τεχνικών έργων και έργων υποδομής στο Ηνωμένο Βασίλειο αλλά και σε άλλες χώρες, μεταξύ άλλων, στην καινούρια γραμμή Elizabeth Line του μετρό του Λονδίνου (London Underground Limited, LUL), στην αναβάθμιση των υπόγειων σταθμών Victoria, Bank και Tottenham Court Road επίσης του LUL, στο φράγμα Upper Thames Reservoir (στον σχεδιασμό του οποίου χρησιμοποιήθηκαν τα καταστατικά μοντέλα του ερευνητικού της έργου), σε θεμελιώσεις υπεράκτιων πλατφόρμων εξόρυξης πετρελαίου και σε μεθόδους απόθεσης τελμάτων ορυχείων σιδήρου στην Βραζιλία. Τα τελευταία χρόνια, έχει εργαστεί εκτενώς στην ανάλυση και στον σχεδιασμό μονοπασσάλων για υπεράκτια αιολικά πάρκα σε διάφορες εδαφικές συνθήκες.

Έχει γράψει πάνω από 20 άρθρα σε επιστημονικά περιοδικά και συνέδρια και έχει δώσει διαλέξεις μετά από πρόσκληση σε πανεπιστήμια, επιστημονικές κοινότητες και συνέδρια, συμπεριλαμβανομένων διαλέξεων στο μεταπτυχιακό Γεωτεχνικής Μηχανικής του Imperial College και θεματική διάλεξη στο 10ο Ευρωπαϊκό Συνέδριο Αριθμητικών Μεθόδων στην Γεωτεχνική Μηχανική (10th NUMGE 2023).

Διαδικτυακή διάλεξη Τετάρτη 26.11.2024

Dr. Loretta Batali

2nd generation of Eurocode 7 – Key changes and evolution of pile foundations design

Περίληψη Διάλεξης

The presentation will focus in the first part on the key changes of the 2nd generation of Eurocode 7, in conjunction with the corresponding revision of Eurocode 0 (EN 1990: 2023): new concepts (new geotechnical category, representative value of geotechnical parameters, groundwater, rock mechanics etc.) and new developments (ground improvement, reinforced soils, soil nails etc.).

The 2nd part of the presentation will address more in detail the design of pile foundations according to the 2nd generation of Eurocode 7.

Σύντομο Βιογραφικό Σημείωμα Ομιλήτριας

Loretta Batali is full professor and habilitated for PhD research at the Technical University of Civil Engineering Bucharest (UTCB), Department of Geotechnics and Foundations and Director of the Council for Doctoral Studies. She graduated the Hydraulic Works Faculty of UTCB in 1990, then she obtained a Master degree in 1993 and her PhD degree in 1997, both from INSA Lyon France (with a PhD thesis on the Use of geosynthetic clay liners for landfills).

Topics of interest: Soil mechanics, Foundation engineering, Landfills, Geosynthetics, Retaining structures, Unsaturated soils, Slope stability

She led 4 research projects as director (2 international and 2 national), as well as 2 other projects and was member of another 7 international and 14 national research projects.

She published 9 speciality books and more than 100 scientific and technical papers in journals and conference proceedings. She is appointed as technical expert and verifier for Geotechnics and Foundation domain (Af) by the Public Works Ministry, as well as national and international evaluator for research projects. She has a rich technical activity for geotechnical investigations, geotechnical design and consultancy, verification and expertise, as well as author of technical norms and standards and member of various state comissions. She is involved in the revision of the Eurocode 7 at CEN (TC 250/SC7), as member of PT1 and leading TG B on design examples. Starting from 1.01.2025 Prof. Batali will act as vice chair of SC7.

She is also member of the Romanian Association for Geosynthetics (ARG), after serving for 10 years as scientific secretary and also member of the International Geosynthetics Society (IGS) and of the CEN TC 189 – Geosynthetics.

Since 2021 Loretta Batali is the President of the Romanian Society for Soil mechanics and Foundation Engineering (SRGF), after being vice-president of it for 9 years. She is also member of the International Society for Soil Mechanics and Foundation Engineering (ISSMGE) and chair of the Awards Board Level Committee (AWAC).

ΚΑΝΑΛΙ ΤΗΣ ΕΕΕΕΓΜ ΣΤΟ YOUTUBE

Η Ελληνική Επιστημονική Εταιρεία Εδαφομηχανικής και Γεωτεχνικής Μηχανικής διατηρεί κανάλι με μαγνητοσκοπημένες διαλέξεις που έχει διοργανώσει. Ο σύνδεσμος για το κανάλι είναι:
https://www.youtube.com/@thechannelofhssmge5899

Στον ίδιο σύνδεσμο μπορείτε να πατήσετε το πλήκτρο «εγγραφή» και να εγγραφείτε στο κανάλι μας ενισχύοντάς το έτσι, αλλά και την ίδια την επιστημονική μας εταιρεία.

Η πρώτη μαγνητοσκοπημένη διάλεξη που αναρτήθηκε ήταν αυτή του Πρόδρομου Ψαρρόπουλου στις 9/2/2022 και ακολούθησε τον Απρίλιο του 2023 η ανάρτηση των μαγνητοσκοπημένων διαλέξεων από την Εσπερίδα Μη Κορεσμένων Εδαφών της 1/7/2019 που έγινε μαζί και με την ανάρτηση της μαγνητοσκοπημένης 10ης Αθηναϊκής Διάλεξης του Σπύρου Καβουνίδη.

Από τότε, με οργάνωση από τον Γενικό μας Γραμματέα Γ. Μπελόκα γίνονται όλες οι διαδικτυακές διαλέξεις και στη συνέχεια αποθηκεύονται και διαμορφώνονται στην τελική τους μορφή από το μέλος μας Δ. Τσούτσα και αφού ελεγχθούν από τον Πρόεδρο Μ. Μπαρδάνη και τον ίδιο τον/την ομιλητή/ομιλήτρια, *ο/η οποίος/α δίνει γραπτώς τη συναίνεσή του/της για την ανάρτηση*, αναρτώνται στο κανάλι και καθίστανται δημόσια προσβάσιμες. Εκτός αυτών, λαμβάνεται μέριμνα για την μαγνητοσκόπηση διαλέξεων μετά από πρόσκληση σε συνέδρια που διοργανώνει η ΕΕΕΕΓΜ, ή Αθηναϊκές Διαλέξεις, ή διαλέξεις στην αίθουσα του ΤΕΕ, και αυτές οι μαγνητοσκοπημένες διαλέξεις αφού υποβληθούν στην ίδια διαδικασία επεξεργασίας και ελέγχου αναρτώνται στο κανάλι.

Αυτή τη στιγμή υπάρχουν ανηρτημένες 26 διαλέξεις/συνεδρίες, 23 υπό την ομάδα «βίντεο» και 3 υπό την ομάδα «ζωντανά».

Μέχρι τις 8/12/2024 καταγράφονται:

- 6525 προβολές που αντιστοιχούν σε
- 1204 ώρες προβολής με μέσο χρόνο προβολής κάθε διάλεξης για το 12% περίπου της διάρκειάς της
- στο κανάλι έχουν κάνει μέχρι σήμερα εγγραφή 308 διαφορετικά προφίλ στα οποία αναλογεί το 44% του συνολικού χρόνου προβολής.

Εκκρεμεί η ανάρτηση των διαλέξεων:

- Αγγελικής Γραμματικοπούλου
- Loretta Batali
- Μάνου Ροβίθη (μόλις γίνει στις 17/12/2024)

Το κανάλι μέχρι σήμερα ακολουθεί τους εξής κανόνες:

- Αναρτάται μόνο επιστημονικό περιεχόμενο (διαλέξεις και προσφωνήσεις διαλέξεων)
- Αναρτάται περιεχόμενο που έχει παραχθεί μόνο από διοργάνωση ή συνδιοργάνωση της ΕΕΕΕΓΜ
- Οι αναρτήσεις γίνονται μόνο κατόπιν έγγραφης συναίνεσης του ομιλητή/της ομιλήτριας και έλεγχο από τον ίδιο/ίδια του προς ανάρτηση αρχείου πριν την ανάρτησή του
- Στις αναρτήσεις είναι απενεργοποιημένα τα σχόλια για την προστασία των ομιλητών/ομιλητριών μας από ενδεχόμενο κακόβουλο ή κακοπροαίρετο σχολιασμό.

ΑΡΙΣΤΟΤΕΛΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΟΝΙΚΗΣ
ΠΟΛΥΤΕΧΝΙΚΗ ΣΧΟΛΗ
ΤΜΗΜΑ ΠΟΛΙΤΙΚΩΝ ΜΗΧΑΝΙΚΩΝ
Εκπαιδευτική Εκδρομή σε Έργα Γεωτεχνικού Ενδιαφέροντος

Το Εργαστήριο Εδαφομηχανικής, Θεμελιώσεων και Γεωτεχνικής Σεισμικής Μηχανικής του Τμήματος Πολιτικών Μηχανικών του ΑΠΘ υπό την συνοδεία της Καθηγήτριας Θ. Τίκα, του Καθηγητή. Κ. Γεωργιάδη και του Επίκουρου Καθηγητή Γ. Χαλούλου διοργάνωσε, το διήμερο 15 και 16 Νοεμβρίου, διήμερη εκπαιδευτική εκδρομή σε δύο έργα Γεωτεχνικού ενδιαφέροντος:

1) Τα φράγματα των Πηγών Αώου

2) Έργα υποδομής στο νέο αυτοκινητόδρομο Ε65

Η επίσκεψη ήταν μια εξαιρετική ευκαιρία για τους φοιτητές να δουν πραγματικά γεωτεχνικά έργα και να συνδέσουν τις σπουδές τους με πρακτικές εφαρμογές ενώ η αλληλεπίδραση με τους επιβλέποντες γεωτεχνικούς μηχανικούς των έργων προσέφερε πολύτιμες γνώσεις αναφορικά με τις προκλήσεις της γεωτεχνικής μηχανικής.

☙ ❧

ΕΔΑΒυΤ

ΕΤΑΙΡΕΙΑ ΔΙΕΡΕΥΝΗΣΗΣ ΑΡΧΑΙΑΣ ΚΑΙ ΒΥΖΑΝΤΙΝΗΣ ΤΕΧΝΟΛΟΓΙΑΣ
https://edabyt.gr

Εταιρείας Διερεύνησης της Αρχαιοελληνικής και Βυζαντινής Τεχνολογίας συνδιοργάνωσε, από κοινού με το Κέντρο Διάδοσης Επιστημών και Μουσείο Τεχνολογίας ΝΟΗΣΙΣ, το 3ο Διεθνές Συνέδριο Αρχαίας Ελληνικής Τεχνολογίας, στην Αθήνα, το τριήμερο 19-20-21 Νοεμβρίου 2024 στο Μέγαρον Μουσικής Αθηνών. Το Συνέδριο τέθηκε υπό την αιγίδα του Υπουργείου Πολιτισμού

ΠΡΟΓΡΑΜΜΑ ΕΡΓΑΣΙΩΝ

Τρίτη, 19 Νοεμβρίου 2024

1η Συνεδρία: Προσκεκλημένοι ομιλητές

Wright Michael, Independent Scholar, London **The Antikythera Mechanism as a Mechanical Artefact**

Μουσάς Ξενοφών, Καθηγητής Τομέα Αστροφυσικής, Αστρονομίας και Μηχανικής, Τμήμα Φυσικής, ΕΚΠΑ **Ελληνιστική Επιστήμη: Από τις παρατηρήσεις στην καθαρή επιστήμη και τεχνολογία βασισμένη στους νόμους της Φυσικής. Το παράδειγμα του Μηχανισμού των Αντικυθήρων**

2η Συνεδρία: Λατομική –Γλυπτική

Kozelj Tony, Architect PhD & Archaeologist, Wurch-Kozelj Manuela, Architect PhD & Archaeologist / French School at Athens **The Techniques of Marble Extraction in the Antique Quarries of Thassos**

Κουκουβού Αγγελική, Αρχαιολόγος, Αρχαιολογικό Μουσείο Θεσσαλονίκης **Λατόμευση οικοδομικού λίθου στην αρχαιότητα και οι τεχνικές λιθοτομίας**

Μερκούρη Χριστίνα**,** Αρχαιολόγος, Διευθύντρια Εφορείας Αρχαιοτήτων Δυτικής Αττικής, Αναγνωστοπούλου Ειρήνη, Αρχαιολόγος, Εφορεία Αρχαιοτήτων Δυτικής Αττικής **Αρχαίο λατομείο στην Πετρούπολη**

Μπιλής Θεμιστοκλής, Δρ Αρχιτέκτων Μηχανικός ΕΜΠ, Γερμανικό Αρχαιολογικό Ινστιτούτο **«Phidias Workshop» in Olympia -New Data and New Interpretations**

3η Συνεδρία: Ναυπηγική –Ναυσιπλοΐα

Wachsmann Shelley, Texas A&M University & Institute of Nautical Archaeology **Big and Small: The Construction of the Panathenaic Ship and the Dionysian Ship Cart in Ancient Athens**

Ιωσηφίδης Θωμάς, Αρχαιολόγος, Πανοπούλου Έλενα, Αρχαιολόγος **Ναυπηγική τεχνολογία κατά την Ύστερη Εποχή του Χαλκού: Συγκριτική επισκόπηση των τεκμηρίων μέσω της Γραμμικής Β και των αρχαιολογικών καταλοίπων**

Παπαμαρινόπουλος Σταύρος, Καθηγητής Γεωφυσικής, Πανεπιστήμιο Πατρών **Γνώσεις ναυσιπλοΐας στα ποτάμια συστήματα της Ευρώπης και στον Ατλαντικό Ωκεανό μεταξύ 13ου και 12ου αιώνα π.Χ. σύμφωνα με τα γραφόμενα του αρχαίου κειμένου Αργοναυτικά Ορφικά**

Πρέκα Παπαδήμα Παναγιώτα, Καθηγήτρια Τομέα Αστροφυσικής, Αστρονομίας και Μηχανικής, Τμήμα Φυσικής, ΕΚΠΑ **Γνώσεις Ουρανογραφίας και θαλασσίων ρευμάτων για πλοήγηση στον Ατλαντικό Ωκεανό κατά τον 1ο π.Χ. αιώνα, σύμφωνα με τα γραφόμενα του Πλουτάρχου**

4η Συνεδρία: Οικοδομική, Γεωτεχνική

Gautier Di Confiego Edoardo, Engineer, Former Assistant Prof. at the Polytechnic University of Turin **Nero's Cenatio Rotunda. An Example of Hellenistic Engineering**

Παλυβού Κλαίρη, Ομότ. Καθηγήτρια, Τμήμα Αρχιτεκτόνων Μηχανικών, ΑΠΘ, Ρεθεμιωτάκης Γιώργος, Ομότ. Διευθυντής Αρχαιολογικού Μουσείου Ηρακλείου, Δρ Χρηστάκης Κωστής, Knossos Curator, British School at Athens, Αθανασίου Κώστας, Δρ Αρχιτέκτων Μηχανικός **Mason's Marks from the Minoan Palace of Galatas**

Μπίτης Ιωάννης, Αρχιτέκτων Μηχανικός, Ιταλική Αρχαιολογική Σχολή, Σπανού Νικολία, Αρχαιολόγος, Πανεπιστήμιο Κρήτης, Τσιγωνάκη Χριστίνα, Επίκουρη Καθηγήτρια, Τμήμα Ιστορίας και Αρχαιολογίας, Πανεπιστήμιο Κρήτης **Ο Κοχλίας του Θησαυρού στον Ναό της Αρχαίας Ελεύθερνας**

Ντουνιάς Γεώργιος, Δρ Πολιτικός Μηχανικός-Εδαφομηχανικός Λοτίδης Μιχαήλ, Δρ Μηχανικός Μεταλλείων-Μεταλλουργός / ΕΔΑΦΟΣ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Α.Ε. **Retaining Walls in Ancient Theater Construction -Geotechnical Approach**

Πελεκάνος Μάριος, Δρ Αρχιτέκτων Μηχανικός, Πανεπιστήμιο Frederick, Κύπρος **Οι ξυλόστεγες Βασιλικές του Τροόδους της Κύπρου (15ος-19ος αιώνας). Η μορφολογική εισαγωγή και η προσαρμοστική μετάπλαση του κατασκευαστικού τύπου**

Παπασταθοπούλου Αριστέα, Δρ Αρχαιολόγος, Εφορεία Αρχαιοτήτων Φθιώτιδος-Ευρυτανίας **Ο κτιστός καμαροσκεπής μακεδονικού τύπου τάφος στο Περιβόλι Σπερχειάδος. Η αρχιτεκτονική ενός μνημείου μείζονος σημασίας κτισμένου κατά την εποχή της άνθησης της μακεδονικής κυριαρχίας**

Pizzigoni Attilio, Architect, former Professor at the University of Bergamo, Italy **The Tile of Delphi. Designed to Protect from Rainwater or as a Self-Supporting Structural Element for the Construction of a Vaulted Roof?**

Τετάρτη, 20 Νοεμβρίου 2024

5η Συνεδρία: Βυζάντιο -Άραβες / Χημεία –Υαλουργία

Vus Oleh, Historian PhD, Independent Researcher, Παπασταθοπούλου Αριστέα, Δρ Αρχαιολόγος, Εφορεία Αρχαιοτήτων Φθιώτιδος-Ευρυτανίας **Skivarin – Early Byzantine Fortress in the Belbek Canyon of Crimean Mountains**

Ζαμπάκη Θεοδώρα, Dr Graeco-Arabic Studies, Hellenic Open University **The Greek Tradition of Engineering in Al-Jazarī's Work Kitāb Fī Maʿrifat Al-Ḥiyal Al-Handasiyya (The Book of Knowledge of Ingenious Mechanical Devices)**

Νικολάου Αναστασία, Μέλος ΕΔΙΠ, Τμήμα Ελληνικής Φιλολογίας, Δημοκρίτειο Πανεπιστήμιο Θράκης **Η επίδραση του Παύλου Αιγινήτη στην ιατρική του Αραβικού κόσμου: Η περίπτωση της Θηριακής**

Τουλιάτος Παναγιώτης, Ομότ. Καθηγητής ΕΜΠ, Καθηγητής Πανεπιστημίου Frederick Κύπρου **Κρυμμένες και «αόρατες» οχυρωματικές κατασκευές, ενάντια στους ανθρώπους και τη φύση, στη Βυζαντινή και Μεταβυζαντινή αρχιτεκτονική**

Μανούτσογλου Εμμανουήλ, Καθηγητής Πολυτεχνείου Κρήτης **Θέσεις, φυσικά χαρακτηριστικά και χημισμός των υδάτων δύο Ασκληπιείων της Κρήτης**

6η Συνεδρία: Μηχανολογία και Μετρητικοί Μηχανισμοί

Βασιλειάδου Σουλτάνα, Επίκουρη Καθηγήτρια, Πανεπιστήμιο Δυτικής Αττικής **Locking and Safety Mechanisms in Antiquity**

Τάσιος Θεοδόσιος, Ομότ. Καθηγητής ΕΜΠ **Μηχανολογική Ανάλυση της οιονεί-αυτοκίνησης της Ελεπόλεως του Ποσειδωνίου**

Αργυρόπουλος Αλέξανδρος, Πολιτικός Μηχανικός **Η χρησιμότητα του Μηχανισμού των Αντικυθήρων**

Βούλγαρης Αριστείδης, Δήμος Θεσσαλονίκης, Διεύθυνση Πολιτισμού και Τουρισμού, Μουρατίδης Χριστόφορος, Επίκουρος Καθηγητής Γενικών και Τεχνικών Μαθημάτων, Ακαδημία Εμπορικού Ναυτικού Σύρου, Βοσινάκης Ανδρέας, Όμιλος Φίλων Αστρονομίας Θεσσαλονίκης **The Draconic Gearing of the Antikythera Mechanism: Evidence for its Operation - The Mechanical Behavior of its Parts**

Ευσταθίου Κυριάκος, Ομότ. Καθηγητής ΑΠΘ, Ευσταθίου Μαριάννα, Τεχνολογικό Πανεπιστήμιο Κύπρου, Μπασιακούλης Αλέξανδρος, Μηχανολόγος Μηχανικός, ΑΠΘ, Κόκκινος Νεόφυτος, Τεχνολογικό Πανεπιστήμιο Κύπρου **Ο Μηχανισμός των Αντικυθήρων: ένα εκπαιδευτικό εργαλείο για Σχολές Αστρονομίας ή ένα επιστημονικό όργανο ακριβούς πρόβλεψης αστρονομικών φαινομένων**

Κοτσανάς Κώστας, Μουσείο Αρχαίας Ελληνικής Τεχνολογίας **Το Υδραυλικό Ωρο(Ημερο)λόγιο-Πλανητάριο του Ανδρονίκου Κυρρήστου**

7η Συνεδρία: Υδραυλικά έργα

Αναγνωστοπούλου Ειρήνη, Αρχαιολόγος, Μηλιώνης Ν. Χρήστος, Δρ Αρχαιολόγος, Γιούτσος Νεκτάριος-Πέτρος, Δρ Αρχαιολόγος, Τζεφρώνης Σπυρίδων, Αρχιτέκτων, Βαζαίου Ανεζίνα, Συντηρήτρια / Εφορεία Αρχαιοτήτων Δυτικής Αττικής **Οι δρόμοι του νερού: σύστημα αγωγών – φρεάτων – δεξαμενής αρχαίων χρόνων στις Αχαρνές**

Γιαννοπούλου Μαρία, Δρ Αρχαιολόγος, Εφορεία Αρχαιοτήτων Πειραιώς και Νήσων **Τεχνικά έργα διαχείρισης υδάτων στην Τροιζήνα**

Παπαφωτίου Απόστολος, Δρ Πολιτικός Μηχανικός, ΕΜΠ **Διαχείριση του ύδατος των υδραγωγείων της Ρωμαϊκής Αυτοκρατορίας για υδρευτικούς σκοπούς μέσα από τις επιγραφές και τη νομοθεσία της Πρωτοβυζαντινής Εποχής**

Μιχαλοπούλου Σοφία, Αρχαιολόγος, Εφορεία Αρχαιοτήτων Πειραιώς και Νήσων, Δευτεραίος Πάνος, Πολιτικός Μηχανικός, Χιώτης Ευστάθιος, Δρ Μεταλλειολόγος Μηχανικός, ΙΓΜΕ **Προκαταρκτική έρευνα των αρχαίων υδραυλικών έργων Αίγινας**

8η Συνεδρία: Ξυλουργική -Κεραμουργία / Αγροτική Τεχνολογία –Υφαντική

Λυγκούρη-Τόλια Ευτυχία, Αρχαιολόγος, πρώην Προϊσταμένη ΚΣΤ΄ Εφορείας Προϊστορικών και Κλασικών Αρχαιοτήτων, Αναγνωστοπούλου Άννα-Μαρία, Δρ Αρχαιολόγος, Γιαμαλίδη Μαίρη, Αρχαιολόγος / Εφορεία Αρχαιοτήτων Πειραιώς και Νήσων **Οι κλίβανοι του εργαστηρίου κεραμικής από τη συ-**

στηματική ανασκαφή στη θέση Άγιος Νικόλαος Παλ(λ)ών, στη Βούλα Αττικής

Μαλούτα Μυρτώ, Επίκουρη Καθηγήτρια, Ιόνιο Πανεπιστήμιο **Η συμβολή των παπύρων της Ελληνορωμαϊκής Αιγύπτου στην ιστορία της ξυλουργικής**

Μιχαηλίδου Άννα, Δρ Αρχαιολόγος, Ομότ. Διευθύντρια Ερευνών στο Εθνικό Ινστιτούτο Ιστορικών Ερευνών, Εθνικό Ίδρυμα Ερευνών **Η αναζήτηση της σχέσης γραφής και κεραμικής τεχνολογίας στο Ακρωτήρι Θήρας. Η περίπτωση των δύο αγγείων με εγχάρακτο σημείο Γραμμικής Α Γραφής**

Di Salvo Federico, Sapienza University of Rome, Department of Science of Antiquities **Spinning Technology in Classical Attica: The Iconographic Evidence**

Κολαΐτη Ελένη, Μετ/γος Μηχανικός, ΕΜΠ, Δρ Γεωαρχαιολογίας, Εθνικό Ίδρυμα Ερευνών, University of Nottingham, Εταιρεία Μελέτης Αρχαίων Ακτογραμμών – AKTES, Μουρτζάς Νίκος, Δρ Γεωλόγος, University of Nottingham, Εταιρεία Μελέτης Αρχαίων Ακτογραμμών - AKTES **Οι αρχαίες λαξευτές τάφροι αμπελοκαλλιέργειας της Πάρου, Αντιπάρου και των γύρω νησίδων (Κυκλάδες)**

Μαυροφρύδης Γιώργος, Αρχαιολόγος, Πανεπιστήμιο Αιγαίου, Γκόρας Γιώργος, Επίκουρος Καθηγητής, Γεωπονικό Πανεπιστήμιο Αθηνών, Πετανίδου Θεοδώρα, Καθηγήτρια, Πανεπιστήμιο Αιγαίου **Μελισσοκομική Τεχνολογία στην Αρχαία Ελλάδα**

Ραυτοπούλου Στέλλα, Αρχαιολόγος, Εφορεία Αρχαιοτήτων Ανατολικής Αττικής, Κοντονίκα Γεωργία, Αρχαιολόγος, Εφορεία Αρχαιοτήτων Αιτωλοακαρνανίας-Λευκάδας, Τσώνος Ηρακλής, Αρχαιολόγος, Εφορεία Αρχαιοτήτων Ανατολικής Αττικής **Καλλιέργειες και καλλιεργητικές μέθοδοι στην Αττική κατά την Κλασική Εποχή**

Πέμπτη, 21 Νοεμβρίου 2024

9η Συνεδρία: Αρχαίοι Μηχανικοί, Κινητικότητα και Πολιτισμική Διάδραση, Καινοτομία –Τεχνολογία

Αντωνόπουλος Παναγιώτης, Δρ Εικονικής Πραγματικότητας στην Εκπαίδευση, Στεφανάκης Μανόλης, Καθηγητής, Πανεπιστήμιο Αιγαίου, Φωκίδης Εμμανουήλ, Αναπληρωτής Καθηγητής, Πανεπιστήμιο Αιγαίου **Αναβιώνοντας την τεχνολογία του παρελθόντος μέσω της εμβυθιστικής εικονικής πραγματικότητας: η περίπτωση των φρυκτωριών**

Βογιατζής Σωτήρης, Δρ Αρχιτέκτων, ΕΜΠ **Καινοτομία και Αναζητήσεις στην Οικοδομική του 8ου μ.Χ. Αιώνα. Η Παναγία Καταπολιανή στην Πάρο**

Κακόγιαννος Ιωάννης, Πανεπιστήμιο Δυτικής Αττικής, Βασιλειάδου Σουλτάνα, Επίκουρη Καθηγήτρια, Πανεπιστήμιο Δυτικής Αττικής **The Concept of Innovation in Ancient Greek Technology and its Influence on the Evolution of Technology over the Centuries**

Μουτουσίδου Ουρανία, ΑΠΘ, Τοκμακίδης Κωνσταντίνος, Καθηγητής, Τμήμα Αγρονόμων Τοπογράφων Μηχανικών, ΑΠΘ **Ancient Greek Scientists (600 B.C. - 600 A.D.) on the Concepts of Space and Time: A Geographical Approach Based on Biographies**

Μπελογιάννη Μαρία, Δρ Αρχαιολόγος, Τμήμα Ιστορίας και Αρχαιολογίας, ΕΚΠΑ **Η πρόσληψη της «τεχνοφιλίας» των αρχαίων Ελλήνων από μαθητές και μαθήτριες της Δευτεροβάθμιας Εκπαίδευσης**

Πετράκης Βασίλης, Επίκουρος Καθηγητής, Τμήμα Ιστορίας και Αρχαιολογίας, ΕΚΠΑ **Mycenaean Palatial Technoscapes: Eclectic Palatial Interest in Craft Production in the Late Bronze Age Aegean (1400-1200 BCE)**

10η Συνεδρία: Στρατιωτική τεχνολογία

Γιαννακός Κωνσταντίνος, Δρ Πολιτικός Μηχανικός, Γ.Γ. ΕΔΑ-ΒυΤ **Μαρτυρίες για επιρροές μυκηναϊκής οικοδομικής και αμυντικής τεχνολογίας στην Τροία VI περί το 1400 π.Χ.**

Γιαννόπουλος Θεόδωρος, Επίκουρος Καθηγητής, Σχολή Ανθρωπιστικών & Κοινωνικών Επιστημών, Ανοικτό Πανεπιστήμιο Κύπρου **Η Στρατιωτική τεχνολογία στα τέλη της Εποχής του Χαλκού στο Αιγαίο: Οι ταφές πολεμιστών της βορειοδυτικής Πελοποννήσου και η σχέση τους με την πτώση των μυκηναϊκών ανακτόρων**

Μπάκας Σπυρίδων, Αρχαιολόγος, Πανεπιστήμιο Βαρσοβίας, Πολωνία, Κατσίκης Δημήτριος, Αρματοποιός αρχαίων όπλων, MSc, Πανεπιστήμιο Wageningen, Ολλανδία **Πανοπλία των Δενδρών. Προσεγγίσεις στην επιχειρησιακή της λειτουργία**

Μπέλλας Ιωάννης, Δρ Αρχαιολόγος, ΑΠΘ **Το Τόξο: Ένα έξυπνο όπλο στον αρχαίο ελληνικό κόσμο. Χρήση, κατασκευή και ιδιότητες**

Φάκλαρης Παναγιώτης, Καθηγητής, Τμήμα Ιστορίας και Αρχαιολογίας, ΑΠΘ **Iron Arms and Armour from Macedonian Graves**

Σταματοπούλου Βασιλική, Δρ Αρχαιολόγος, Εφορεία Αρχαιοτήτων Πόλης Θεσσαλονίκης, Πανεπιστημιακή Ανασκαφή Βεργίνας, Τομέας ακρόπολης και τειχών **Οπλιτικές ασπίδες με προσαρτήματα από σίδηρο. Αναζητώντας τον οπλισμό της εκστρατείας του Μ. Αλεξάνδρου**

11η Συνεδρία: Οικονομία –Ενέργεια –Τυποποίηση

Brysbaert Ann, University of Leiden, Faculty of Archaeology. Netherlands Institute at Athens **Η εργασία και το κόστος της κατά την Ύστερη Εποχή του Χαλκού στην Αργολίδα, Ελλάδα**

Μουλλού Δωρίνα, Δρ Αρχαιολόγος, Εφορεία Αρχαιοτήτων Ανατολικής Αττικής / Ελληνικό Ανοικτό Πανεπιστήμιο (ΕΑΠ), Ζερεφός Στέλιος, Δρ Αρχιτέκτων Μηχανικός, Σχολή Εφαρμοσμένων Τεχνών, ΕΑΠ, Μπαλαφούτης Θάνος, Δρ Αρχιτέκτων Μηχανικός, ΕΑΠ, Τοπαλής Φραγκίσκος, Καθηγητής, Σχολή Ηλεκτρολόγων Μηχανικών και Μηχανικών Υπολογιστών, ΕΜΠ, Δούλος Λάμπρος, Αναπληρωτής Καθηγητής, Σχολή Εφαρμοσμένων Τεχνών, ΕΑΠ **Περί Λύχνων Αφάς: αρχαιολογικές και φωτομετρικές προσεγγίσεις**

Νιαουνάκης Μιχαήλ, Δρ Φυσικός, ΕΜΠ, European Patent Office **Reuse and Recycling in the Greek World**

Παπαγεωργιάδου Χαρίκλεια, Διευθύντρια Ερευνών στο Ινστιτούτο Ιστορικών Ερευνών, Εθνικό Ίδρυμα Ερευνών **Κερματίων μεταμορφώσεις. Από τα σφάλματα παραγωγής στις μεθόδους ελέγχου**

12η Συνεδρία: Μεταλλευτική, Μεταλλοτεχνία, Εγγειοβελτιωτικά έργα

Jeffreys Rosemary, Independent Researcher, London **Methods of Gilding in Late Classical and Hellenistic Greece**

Τιμοθέου Γιαννάκης, Αρχαιολόγος, ΥΠΠΟ **Αρχαιολογικές ενδείξεις εξόρυξης σιδήρου στα Γλυκά Νερά Αττικής**

Λώλος Γιάννης, Αναπληρωτής Καθηγητής, Τμήμα Ιστορίας, Αρχαιολογίας & Κοινωνικής Ανθρωπολογίας, Πανεπιστήμιο Θεσσαλίας **Αρχαία εγγειοβελτιωτικά έργα των Ιστορικών Χρόνων (από την Αρχαϊκή έως τη Ρωμαϊκή Περίοδο) στον Ελλαδικό Χώρο**

ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ ΣΗΡΑΓΓΩΝ και ΥΠΟΓΕΙΩΝ ΕΡΓΩΝ
Εκλογές

Οι εκλογές για την ανάδειξη του νέου Διοικητικού Συμβουλίου και της νέας Εξελεγκτικής Επιτροπής διεξήχθησαν την 30^{η} Οκτωβρίου 2024. Στην πρώτη συνεδρίαση του νέου Διοικητικού Συμβουλίου έγινε η σύστασή του σε σώμα ως ακολούθως:

Διοικητικό Συμβούλιο

Πρόεδρος	ΑΝΔΡΕΑΣ ΜΠΕΝΑΡΔΟΣ
Αντιπρόεδρος	ΜΑΡΙΛΙΑ ΜΠΑΛΑΣΗ
Γενικός Γραμματέας	ΔΗΜΗΤΡΙΟΣ ΑΛΙΦΡΑΓΚΗΣ
ΤΑΜΙΑΣ	ΧΡΥΣΟΘΕΜΙΣ ΠΑΡΑΣΚΕΥΟΠΟΥΛΟΥ
Εκδότης	ΠΑΥΛΟΣ ΝΟΜΙΚΟΣ
Μέλη	ΝΙΚΟΛΑΟΣ ΡΟΥΣΣΟΣ
	ΒΑΣΙΛΕΙΟΣ ΜΑΡΙΝΟΣ
Αναπληρωματικό Μέλος	ΔΗΜΗΤΡΗΣ ΓΕΩΡΓΙΟΥ

Εξελεγκτική Επιτροπή

ΠΑΡΑΣΚΕΥΗ ΓΙΟΥΤΑ-ΜΗΤΡΑ
ΙΩΑΝΝΗΣ ΦΙΚΙΡΗΣ

ΕΥΑΓΓΕΛΟΣ ΠΕΡΓΑΝΤΗΣ

Διαδικασία ψηφοφορίας στο MS Roof Garden, Μοναστηράκι

International Society for Soil Mechanics and Geotechnical Engineering

ISSMGE News
www.issmge.org/news

TC219 Seminar on Resilience Evaluation in Geotechnical Engineering

Wei Guo / TC219 / 11-11-2024

TC219 Seminar Series on Resilience Evaluation in Geotechnical Engineering

Multi-hazard resilience assessment of critical infrastructure

Dr Sotirios Argyroudis, CEng, MICE, FHEA
Associate Professor (Reader) in Infrastructure Engineering
Sotirios.Argyroudis@brunel.ac.uk

Abstract

Our critical infrastructure is exposed to multiple hazards, some of which are exacerbated by the effects of climate change. Their failure can lead to significant cascading events and disruptions across communities. Therefore, assessing the resilience of infrastructure assets to extreme events is paramount for maintaining their functionality. Infrastructure operators need practical tools and metrics to assess vulnerabilities and resilience, enabling them to rapidly restore services and minimize disruptions. This lecture will present examples of the impacts of natural hazards on critical transport infrastructure and introduce a framework for multihazard resilience assessment, including fragility and restoration models. Methods for developing fragility functions will be presented and challenges in modeling combined hazards will be discussed. Examples of fragility analysis for different hazards (e.g., floods, scour, seismic actions) based on numerical modeling will be presented for geotechnical assets, such as bridge foundations, abutments, embankments, and tunnels. Additionally, restoration models for flood-affected bridges will be presented, along with resilience assessment examples.

About the speaker

Dr Sotirios Argyroudis is Associate Professor at Brunel University London, UK, and cofounder of the www.metaInfrastructure.org initiative. With over 22 years of experience in disaster risk and resilience assessment of critical infrastructure (including bridges, tunnels, embankments, slopes, retaining walls, highways/railways, ports, and airports) exposed to multiple hazards (e.g. earthquakes, floods, wildfires) and climate change effects he is leading expert in his field. He holds degrees in Civil Engineering and Geology and a PhD in Geotechnical Earthquake Engineering. He has published over 150 scientific articles in journals, conferences, and books with over 3,700 citations (h-index 30, Google Scholar). He has won and participated in several research projects and is currently the deputy scientific coordinator of the Horizon/UKRI ReCharged project. He is in the top 2% of most highly cited scientists for 2021, 2022, and 2023, according to the Elsevier/Stanford list. Fellow of the Higher Education Academy, UK, and member of the Institution of Civil Engineers (UK), CEng, MICE. Deputy Editor of ICE Proceedings Bridge Engineering (Emerald Publishing). Vice-chair of IABSE TG1.8 "Design Requirements for Infrastructure Resilience and member of the ISSMGE TC202 on Transportation Geotechnics. In 2017 he was awarded the European Commission's Marie-Sklodowska-Curie postdoctoral fellowship.

Event details

Friday, Nov. 1, 2024, 2:00 to 4:30 p.m., School of Civil Engineering, Tianjin University

Link to download the PPT

The 11th ERTC10-SC7-NEN Webinar on the Second Generation of Eurocode 7 - Dynamic Ground properties and seismic design (Eurocode 8)

ISSMGE Secretariat / ERTC10 / 13-11-2024

I would like to invite you to join our webinar organised jointly by **ISSMGE ERTC10**, **CEN/TC 250/SC7**, and the **Dutch Standardisation Institution (NEN)**. The **registration is now open** at the link provided below, and participation is **free of charge**: https://ec7-dynamic-ground.nen-evenementen.nl/

Date and time: Wednesday, **11 December 2024, 15:00-17:00** (CET)

The webinar will cover the subject of **dynamic ground properties and seismic design**, showing the interrelation of **Eurocode 7** and **Eurocode 8** regarding those aspects. Our Experts representing CEN TC250 subcommittees SC7 and SC8, who worked on the development of the 2nd generation of those standards, will explain:

- Main changes for seismic design of geotechnical structures in the next generation Eurocodes.
- What we can find on relevant ground properties in the new EN 1997-2.
- Practical implications using design examples for typical geotechnical structures.

The detailed **agenda** includes:

1. Introduction to **dynamics in EN 1997-1** - Adriaan van Seters, Fugro, The Netherlands
2. Overview of Eurocode 8 part 5 - **Main changes and basis of earthquake design for geotechnical structures** - Prof. Alain Pecker, École des Ponts ParisTech, France
3. **Ground properties for dynamic and seismic design** - Prof. Sebastiano Foti, Politecnico di Torino, Italy
4. **Shallow and pile foundations** with examples of application - Dr António Araújo Correia, LNEC, Portugal
5. **Retaining structures** with an example application - Prof. Luigi Callisto, Sapienza Università di Roma, Italy
6. Q&A session

This probably will be our last webinar from the **series dedicated to the 2nd generation of Eurocode 7**, as over last four years, we have covered all the most relevant subjects and developments from our new design standard.

COMPSAFE2025

Francesca Ceccato / TC103 / 18-11-2024

Dear all,

TC103 is co-organizing a mini-symposium at COMPSAFE2025 entitled "Numerical Simulation in Geomechanics and Geodisasters" you contributions are welcome.

The conference is in Kobe (Japan) in July 1st-4th 2025.

Deadline for abstract submission is January 15, 2025.

Please check the website for more info: https://www.compsafe2025.org/index.html

TC211 Live Zoom Presentation on "Insights in Geosynthetic-Reinforced Pile-Supported Embankments"

ISSMGE IT Administrator / TC211 / 25-11-2024

ISSMGE TC211 will be holding an on-line ground improvement presentation on "***Insights in Geosynthetic-Reinforced Pile-Supported Embankments***" that will be presented by ***Dr. Suzanne van Eekelen***.

The presentation will be made on Zoom (link= *https://utsmeet.zoom.us/j/89658918418)* at ***9:00 AM Central European Time*** (***UTC 8:00 am)*** *of* ***Friday 29 November2024***, and the audience will have the opportunity to ask questions at the end of the presentation.

A further description of the presentation and a short biography of the speaker are in the attached presentation flyer.

Please share this invitation along with the presentation flyer to your network, colleagues and any other persons who may be interested in attending this very interesting topic.

We look forward to seeing you all on the day.

XVIII European Conference on Soil Mechanics and Geotechnical Engineering, 26-30 August, 2024; Location: Lisbon, Portugal

Amit Srivastava / TC206 / 28-11-2024

WS8 workshop entitled Observational Method (OM): From Analysis to Data Interpretation and New Eurocodes. The workshop was split into four sessions, the first, was run by TC220 The Second Session was organised by TC206 and TC220. The third session was run by TC206 in conjunction with ERTC7 and TC103. The fourth session was run by TC206 with CEN/TC 250/SC7 (Eurocode 7).

International Society for Rock Mechanics and Rock Engineering

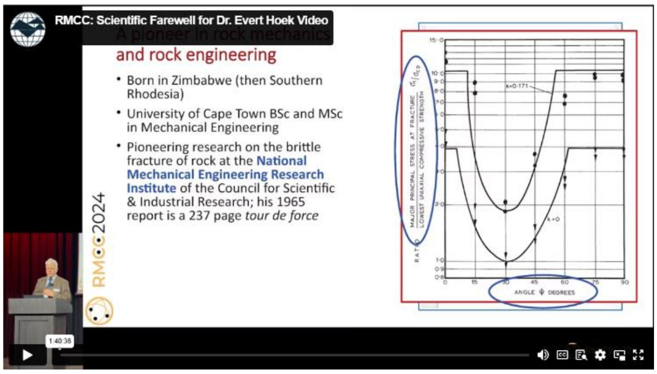
ISRM

News

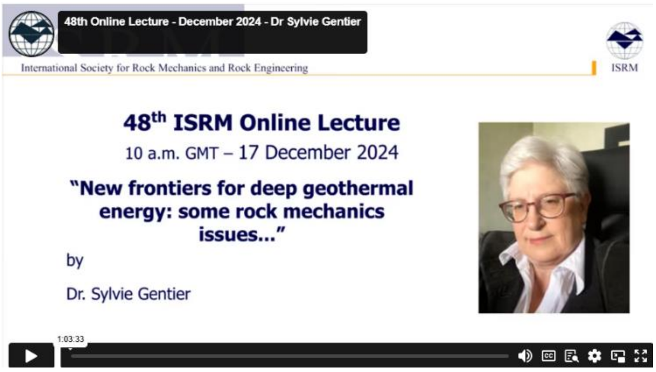
https://www.isrm.net

Scientific farewell for Dr Evert Hoek

ISRM publishes the scientific farewell for Dr Evert Hoek, which was held at the first International Rock Mass Classification Conference in Oslo at the end of October 2024. ISRM thanks Professors Vassilis Marinos, Leandro Alejano, and John Harrison for their contributions, sister society-IAEG, and NGI.



https://isrm.net/page/show/1751



https://isrm.net/page/show/1752

The John Hudson Rock Engineering Award

In June 2019, the ISRM Board decided to institute the ISRM John Hudson Rock Engineering Award to honour the memory of Professor John Hudson, the ISRM president from 2007 to 2011.

The award may be conferred upon ISRM Corporate or Individual members or a group of individuals, the first nominee being an ISRM individual member.

The John Hudson Rock Engineering Award is conferred by the ISRM President on a biennial basis, in the 1st and the 3rd year of each ISRM Presidential tenure period, in recognition of one or more of the following achievements in engineering practice:

- developing an outstanding rock engineering project;
- designing and/or completing an outstanding rock engineering project;
- contributing to solving important practical rock engineering problems;
- effectively introducing to current rock engineering practice new and important technologies;
- promoting good practices with innovative technologies and management to reduce time and cost of a rock engineering project;
- promoting good practices with innovative technologies and management to enhance health

Full details on the award are given in the Guideline for the John Hudson Rock Engineering Award.

Recipients of the Award

Year	Recipient	Country	Title
2020	3GSM GmbH	AUSTRIA	Photogrammetric 3D models from drone imagery for improved rock mass characterization
2022	Christine Detournay	USA	Contributing to solving important practical rock engineering problems Video
2024	Yufang Zhang	CHINA	Research and application of ultra-high and large energy-grade flexible protective structure for high position rockfalls on the Chengdu-Kunming Railway Video

Conference program of the 1st ISRM Commission Conference on Estimation of Rock Mass Strength and Deformability 2024-11-08

The program of the ISRM Specialized Conference 1st ISRM Commission Conference on Estimation of Rock Mass Strength and Deformability has been released.

The conference will be held in Lima, Peru, on 6 December. Click here to go to the conference program.

ISRM Workshop on Soft Rocks (ISRM-WSR2025) – bulletin No. 1 2024-11-08

The ISRM Workshop on Soft Rocks will take place in Porto, Portugal, 15-16 May 2025, organised by the ISRM Commission of Soft Rocks, the Faculty of Engineering of the University of Porto (FEUP), the China University of Mining and Technology, Beijing, the Chinese Society for Rock Mechanics and Engineering (CSRME) and the Portuguese Geotechnical Society (SPG).

Click here to download the Bulletin No. 1.

For more information, click here to visit the Workshop website.

News

https://about.ita-aites.org/news

Scooped by ITA-AITES #127, 26 November 2024

California water agency set to vote on $141 million for Delta tunnel | USA

5 longest underwater tunnels around the world and their significance

Ancient meets modern as a new subway in Greece showcases archaeological treasures

Metro Vancouver prepares to dig tunnel under Stanley Park | Canada

Rail tunnel in Odisha's Koraput gets advanced ballastless tracks | India

The incredible £35m tunnel to protect European city from 'once-in-a-thousand-year' flood | Denmark

New contract awarded for SRL | Australia

After years of uncertainty, HS2 is back for good | UK

Türkiye completes vital rail tunnel drilling for Asia – Europe freight traffic

Swedish nuclear repository approved

Overcoming challenges in horizontal directional drilling – a geotechnical engineer's perspective

Wednesday, 11th December 2024,
[in-person] Institution of Civil Engineers, One Great George Street, Westminster, London SW1P 3AA
This lecture can be watched online (Click here)

Event Information:

Horizontal directional drilling (HDD) is a trenchless method commonly used for pipeline and cable installation. It is ideally suited to crossings beneath natural and man-made obstacles and offers substantial cost, safety and environmental benefits. Despite the wide use of HDD, there remain concerns regarding project risk in certain situations. Key to HDD success is good management of the drilling fluid and the avoidance of excessive mud loss.

Fundamental risks in HDD arise from pressure build-up in-bore leading to hydrofracturing of the ground, heave of the overburden and mud loss – either to formation, subsurface infrastructure or up to the surface. Poor cuttings transport is a main trigger for bore blockage, leading to potential hydro fracture and the manifestation of the hazards associated with these risks.

In this lecture, a case study involving HDD bores for cable landfall of an offshore windfarm is discussed. The aforementioned risks associated with mud loss are most severe in this type of HDD where drilling starts at a clifftop and descends to punchout in the seabed. In-bore pressures before punchout are elevated by the hydrostatic head of the drilling fluid from the clifftop entry pit. Other geotechnical challenges encountered onsite will be discussed, along with the analysis of rare annular pressure monitoring data which provided valueble insights into the behaviour of cuttings in the bore. This lecture concludes with some lessons learnt, recommendations to minimise the risks of hydro fracture and bore blockage, and advice to other young engineers interested in this field.

Speaker:

Serena Che is a senior geotechnical engineer at Geotechnical Consulting Group (GCG). She joined GCG after she completed her MSc in Soil Mechanics at Imperial College. She has also been a science, technology, engineering, and mathematics (STEM) ambassador since 2021.

Serena has worked closely with developer and contractor clients on various energy, infrastructure and building projects within the UK and internationally. Her work has a focus on early stage optioneering as well as advising clients on a range of geotechnical risks throughout the project lifecycle.

From 2022 to 2023, Serena took up a technical advisory role as the on-site geotechnical engineer for an offshore wind developer for their cable landfall horizontal directional drilling (HDD) works for an offshore windfarm. During her site work, she contributed to overcoming several interesting geotechnical and drilling-related challenges. She recently published and presented a paper related to her site work in the European Conference on Soil Mechanics and Geotechnical Engineering (ECSMGE 2024).

www.geosyntheticssociety.org

News

10 Minutes With... Beth Gross November 4, 2024

Top tips for new engineers from a geotechnical engineer with nearly 40 years in the business features in the latest edition of our *'10 Minutes With…'* series. **Read More »**

GeoJeopardy – advancing education through entertainment November 7, 2024

Debuting on the IGS conference scene this year, the GeoJeopardy competition tests the knowledge of young engineers on a range of geosynthetics topics in a **Read More »**

Transportation Geosynthetics Explored At Lisbon Conference November 14, 2024

Presentations on the environmental advantages of using geosynthetics in transport projects were shared at a Portugal conference. The joint event by the IGS Technical Committee **Read More »**

Hurry – GeoAsia9 Bids Close Soon November 18, 2024

Just a few weeks remain to register your interest in hosting one of the region's flagship geosynthetics conferences. The 9th Asian Conference on Geosynthetics (GeoAsia9) **Read More »**

Register for I-95 Bridge Collapse Webinar November 20, 2024

A major geosynthetics repair project that went on to win a regional IGS Corporate Case Study competition will be explored at an upcoming webinar. IGS **Read More »**

News
https://www.britishgeotech.org/news

2024 Fleming Award Shortlist Announced 09.11.2024

The BGA is pleased to announce the shortlisted entries for the 2024 Fleming Award. The finalists will present at the Fleming Award event on 3 December 2024, when a judging panel will select the winner.

The BGA Shortlisting Panel were impressed by the variety of projects put forward and the great work that has been undertaken by the applicants. The three projects and teams selected to present at the event are:

https://www.britishgeotech.org/2024-fleming-award-shortlist-announced/

WEBINAR - Hydropower Plant and battery coupling: advantages and challenges

ETIP Hydropower will host a webinar titled **"Hydropower Plant and Battery Coupling: Advantages and Challenges"** on December 12, 2024, from 15:00 to 16:30 CET. This session will address the integration of battery technologies with hydropower plants, examining their impact on energy efficiency, operational flexibility, and sustainability.

The webinar will feature:

- **Jean-Louis Drommi,** an expert engineer at Electricité de France, Hydro Engineering Center. He manages all electrical aspects of hydro projects both at design stage and maintenance. He develops innovation project such as variable speed, hybrid solution, flexibility improvement. He has been working at Electricité de France since 1987, in Hydro and Nuclear Division.

- **Eduardo Prieto Araujo,** a Serra Húnter Associate Professor with the Electrical Engineering Department, UPC. In 2021, he was a Visiting Professor with the Automatic Control Laboratory, ETH Zürich. In 2022, he co-founded eRoots, which is a spin-off company of CITCEA-UPC, focused on the analysis of modern power systems. His research interests include renewable generation systems, control of power converters for HVdc applications, interaction analysis between converters and power electronics-dominated power systems.

Registration is open here: https://attendee.gotowebinar.com/register/723401028994704477

ꕥ ꕥ

ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ ΤΕΧΝΙΚΗΣ ΓΕΩΛΟΓΙΑΣ

http://www.eetg.gr

Εσπερίδα στο πλαίσιο των εορτασμών για την 60η επέτειο από την ίδρυση της Διεθνούς Ένωσης για την Τεχνική Γεωλογία και το Περιβάλλον

Ήταν μια σπουδαία βραδιά για την Ελληνική Επιτροπή Τεχνικής Γεωλογίας!

Με αφορμή την 60ή επέτειο της Διεθνούς Ένωσης Τεχνικής Γεωλογίας και Περιβάλλοντος (IAEG) διοργανώσαμε μια βραδιά στη Σχολή Πολιτικών Μηχανικών του Εθνικού Μετσόβιου Πολυτεχνείου (ΕΜΠ), υποδεχόμενοι πολλά μέλη της Επιτροπής μας, συναδέλφους και φίλους, καθώς και πολλούς νέους επαγγελματίες και φοιτητές.

Μας τίμησαν με την παρουσία τους η Κοσμήτορας της Σχολής Πολιτικών Μηχανικών του ΕΜΠ, Καθηγήτρια Ελένη Βλαχογιάννη και ο Αναπληρωτής Κοσμήτορας της Σχολής Μηχανικών Μεταλλείων και Μεταλλουργών του ΕΜΠ, Καθηγητής Σπύρος Παπαευθυμίου.

Επίτιμοι προσκεκλημένοι μας ήταν ο Πρόεδρος της Διεθνούς Ένωσης Τεχνικής Γεωλογίας και Περιβάλλοντος, Επίκουρος Καθηγητής Βασίλειος Μαρίνος, ο Πρόεδρος της Γεωλογικής Εταιρείας Ελλάδος, Δρ Αθανάσιος Γκανάς, ο Διευθύνων Σύμβουλος της Ελληνικής Αρχής Γεωλογικών & Μεταλλευτικών Ερευνών (Ε.Ε.Γ.Μ.Ε.), κ. Διονύσιος Γκούτης και ο Αντιπρόεδρος του Συλλόγου Ελλήνων Γεωλόγων κ. Ευάγγελος Σπυρίδωνος.

Καλωσορίσαμε εκπροσώπους των σχολών Τεχνικής Γεωλογίας από τα περισσότερα μεγάλα ελληνικά ιδρύματα. Την Καθηγήτρια Μαρία Σταυροπούλου από το Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών, τον Αναπληρωτή Καθηγητή Γεώργιο Παπαθανασίου από το Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης, τον Αναπληρωτή Καθηγητή Νικόλαο Δεπούντη από το Πανεπιστήμιο Πατρών, τον Καθηγητή Κωνσταντίνο Λουπασάκη από τη Σχολή Μηχανικών Μεταλλείων και Μεταλλουργών του ΕΜΠ και τον Επίκουρο Καθηγητή Βασίλειο Μαρίνο από τη Σχολή Πολιτικών Μηχανικών του ΕΜΠ.

Κεντρικό σημείο της βραδιάς ήταν η απονομή του τίτλου του επίτιμου μέλους σε πέντε σημαντικότερα μέλη της επιτροπής μας σε αναγνώριση της συνεχούς και σημαντικής συμβολής τους στον τομέα της Τεχνικής Γεωλογίας. Ο ομότιμος Καθηγητής Γεώργιος Κούκης, ο Αναπληρωτής Καθηγητής ε.τ. Δημήτριος Ρόζος, ο ομότιμος Καθηγητής Νικόλαος Σαμπατακάκης, ο ομότιμος Καθηγητής Γεώργιος Τσιαμπάος και ο ομότιμος Καθηγητής Βασίλειος Χρηστάρας.

Η σύνοδος ολοκληρώθηκε με δύο επετειακές ομιλίες. «60 χρόνια συμβολής της IAEG στην Τεχνική Γεωλογία και το όραμα για το μέλλον» από τον Πρόεδρο της IAEG, Επίκουρο Καθηγητή Βασίλειο Μαρίνο και "Ο ρόλος της Τεχνικής Γεωλογίας στο σχεδιασμό και την κατασκευή φραγμάτων στην Ελλάδα" από τον Τεχνικό Γεωλόγο MSc, Δημοσθένη Ντάλια.

Εκφράζουμε την ειλικρινή μας ευγνωμοσύνη στους χορηγούς μας. Εδαφομηχανική Α.Ε. και Τάσος Μπασδέκης - Κατασκευές και Γεωτεχνική και Γιώργος Κριτσωτάκης - Γεωμελέτη και Κατσουλάρης Τάσος.

Η βραδιά έκλεισε με ένα δείπνο με την παρέα συναδέλφων και φίλων! Μέχρι την επόμενη συνάντησή μας!

Berkeley
UNIVERSITY OF CALIFORNIA

Civil & Environmental Engineering

Short course Series on Geotechnical Earthquake Engineering

UC Berkeley Faculty and colleagues (Bray, Zekkos, Athanasopoulos-Zekkos, Abrahamson, Sitar, Kayen, Travasarou) are offering again the online modular short course Series on **Geotechnical Earthquake Engineering**. The course focuses on key concepts and recent advances in geotechnical earthquake engineering and is offered in three modules in January, February, and March 2025. More information can be found here. The course was offered earlier in 2024 and was very well received (95% of participants would recommend the course to a colleague), but we have also made improvements based on participants' feedback.

In the first short course module, engineering seismicity is reviewed with a focus on characterizing and selecting design ground motions and seismic site response analyses. In the second short course module, soil liquefaction is explored. Field and laboratory observations of the cyclic response of soils are discussed. Simplified liquefaction triggering procedures are presented. Focus is placed on the effects of liquefaction through evaluation of the residual shear strength of liquefied material and liquefaction-induced ground displacements and their effects on structures. Mitigation techniques are presented. In the third short course module, seismic considerations related to seismic slope stability, dams, levees, embankments and retaining systems are presented. Question and answer sessions provide opportunities to discuss selected concepts in greater detail. Each attendee will be given course notes that support the lectures.

We are accommodating participants in all time zones by making the recorded lectures available online through an intranet for one month following the completion of each course module. Each attendee will be given course notes that support the lectures and we are also offering PDHs for those that use them.

More information, and registration for this course can be found here: https://www.geoengfdn.org/geotechnical-earthquake-engineering as well as in this leaflet.

If you have any questions, feel free to contact me. I would appreciate it if you could pass this e-mail to anyone who may be interested.

Dimitrios Zekkos, Ph.D., P.E.
http://www.dimitrioszekkos.org
Professor, University of California at Berkeley

ΔΙΑΚΡΙΣΕΙΣ ΕΛΛΗΝΩΝ ΓΕΩΤΕΧΝΙΚΩΝ ΜΗΧΑΝΙΚΩΝ

AARHUS UNIVERSITY

Department of Civil and Architectural Engineering

Πρόδρομος Ψαρρόπουλος
Otto Mønsted Visiting Professorship

A warm welcome to Dr Prodromos PSARROPOULOS, who is the new Otto Mønsted Visiting Professor in our Department.

Dr Psarropoulos comes to us from National Technical University of Athens (NTUA), Greece. He is a structural and geotechnical engineer specializing in geotechnical earthquake engineering, soil dynamics, and dynamic soil-structure interaction. We welcome him and look forward to benefitting from his extensive expertise within the quantitative assessment of various geohazards and the optimal design or construction of various challenging engineering structures - both onshore and offshore.

Teaching in the School of Rural, Surveying and Geoinformatics Engineering, National Technical University of Athens, he has lately focused on more advanced topics, such as remote sensing, artificial intelligence, and route-optimization techniques - mainly applied on lifelines within the sectors of transportation, telecommunications, and energy.

At the Department of Civil and Architectural Engineering, Aarhus University, we are pleased to facilitate his three-month stay, with the goal to enhance the collaboration between Aarhus University and NTUA and continue to strengthen our strategic research objectives through the integration of external expertise.

Otto Mønsteds Fond

(https://www.linkedin.com/feed/update/urn:li:activity:7265257676371021824)

Κατερίνα Ζιωτοπούλου
Plenary Keynote Lecture at the 17th Pan-American Conference

Congratulations to our own Professor Katerina Ziotopoulou, for her Plenary Keynote Lecture "Performance-based Assessment of Liquefaction-induced Downdrag on Piles" at the 17th Pan-American Conference in La Serena, Chile. This presentation highlighted research performed at the UC Davis Center for Geotechnical Modeling between 2018 and 2022 as well as follow-on numerical modeling. The data is fully curated at NHERI DesignSafe under PRJ-2828. Check it out if you are interested. hashtag#UCDavisGeotechnics

As a bonus, this was also Katerina's first official engagement as a Board Member of the Geo-Institute of ASCE.

UC Davis Center for Geotechnical Modeling

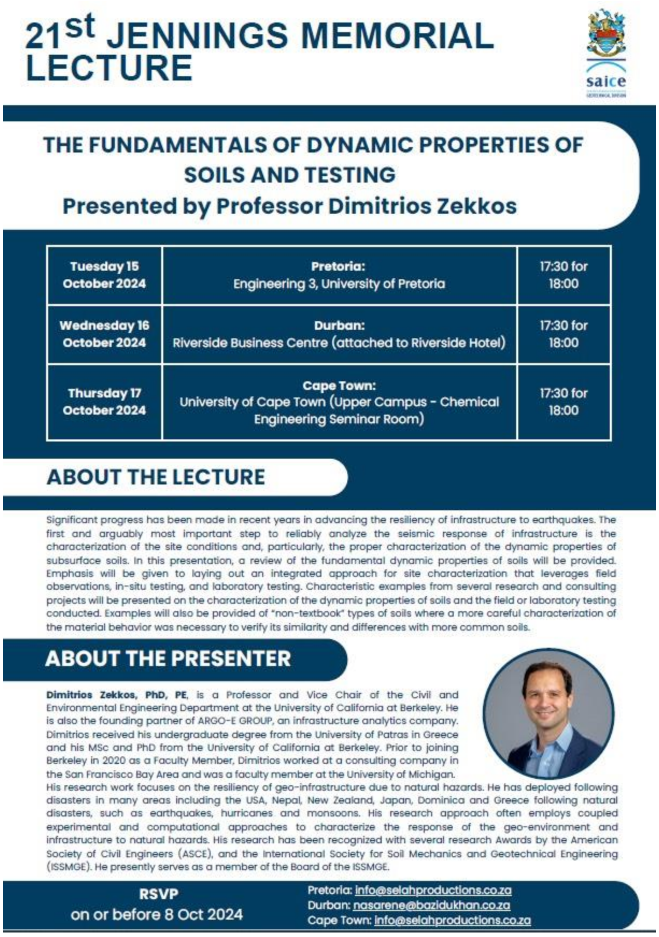
My presentation covered work published in these papers with Sumeet Kumar Sinha and Bruce Kutter: https://shorturl.at/Ljsmg, https://shorturl.at/vKwFx, https://shorturl.at/XMUG6, https://shorturl.at/zH5co

Data and metadata are published in NHERI DesignSafe PRJ-2828 https://lnkd.in/gM3X-kQ2 and https://lnkd.in/gaUS72Tx

Δηνλητριος Ζέκκος selected as the 21st Jennings Memorial Lecturer by the South African Institution of Civil Engineers

Dimitrios Zekkos was selected as the 21st Jennings Memorial Lecturer by the Geotechnical Division of the South African Institute of Civil Engineers. The Jennings lecture is the annual honorary lecture series of the Geotechnical Engineering Division, where one international speaker is invited to give a lecture in several places in the country.

Dimitrios lecture will be on the "Fundamentals of dynamic properties of soils and testing" and will include a lecture at the University of Pretoria in Johannesburg on October 15, in Durban on October 16 and in Cape Town on October 17. He will also visit Universities such as the University of Pretoria and the University of Cape Town, meeting with professionals and have the opportunity to visit various places within the country.



(Oct 20, 2024, https://geotechnical.berkeley.edu/news/dimitrios-zekkos-selected-21st-jennings-memorial-lecturer-south-african-institution-civil)

Άντα Αθανασοπούλου - Ζέκκου awarded Interdisciplinary Climate and Equity Seed Grant

Prof. Adda Athanasopoulos-Zekkos is a coPI on a Interdisciplinary Climate and Equity Seed Grant, that will focus on developing new methods for accurately integrating equity in flood risk management. Dr. Anna Serra-Llobet is the PI and brings expertise in flood risk management policies, environmental planning, floods after fire, residual risk of extreme floods, and nature-based solutions for flood risk management.

The Seed Grant awarded from the UC Berkeley's Office of the Vice Chancellor for Research, is meant to *"support the formation of interdisciplinary teams to prepare for external funding opportunities to advance innovative and integrative interdisciplinary understandings and approaches to the study of Climate and Environmental Equity."*

The multi disciplinary team also incudes Prof. Danielle Rivera and Prof. Matt Kondolf from the College of Environmental Design, Prof. Chris Ansell from Political Science, Prof. Kenichi Soga from CEE and Gabriela Paredes, a PhD student in Geosystems.

More information is provided here.

(Sep 18, 2024, https://geotechnical.berkeley.edu/news/athanasopoulos-zekkos-awarded-interdisciplinary-climate-and-equity-seed-grant)

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

Για τις παλαιότερες καταχωρήσεις περισσότερες πληροφορίες μπορούν να αναζητηθούν στα προηγούμενα τεύχη του «περιοδικού» και στις παρατιθέμενες ιστοσελίδες.

1st ISRM Commission Conference on Estimation of Rock Mass Strength and Deformability, 6 December 2024, Lima, Peru, www.slrmes.org

4th Asia-Pacific Conference on Physical Modelling in Geotechnics ACPMG 2024, 11 – 13 December 2024, Abu Dhabi, United Arab Emirates, https://tc104-issmge.com/acpmg-2024

The Third Vietnam Symposium on Advances in Offshore Engineering Interdisciplinary & Integrated Solutions for Sustainable Offshore Infrastructure, 11-12 December 2024, Hanoi, Vietnam, https://vsoe2024.sciencesconf.org

cs ଷ୨

1° Ρουμανο-Ελληνικό Σεμινάριο επί Σεισμικής και Γεωτεχνικής Μηχανικής
27 Μαρτίου 2025, Βουκουρέστι, Ρουμανία

Με ιδιαίτερη χαρά σας ανακοινώνουμε το πρώτο Ρουμανο-Ελληνικό Σεμινάριο επί Σεισμικής και Γεωτεχνικής Μηχανικής που θα διεξαχθεί στις 27 Μαρτίου 2025 στο Βουκουρέστι της Ρουμανίας.

Η εκδήλωση αποτελεί προϊόν συνεργασίας που έχει καλλιεργηθεί τα τελευταία χρόνια μεταξύ της ΕΕΕΕΓΜ και της αντίστοιχης Ρουμανικής Επιστημονικής Εταιρείας.

Στο σεμινάριο συμμετέχουν με παρουσιάσεις τα μέλη μας:

- Γιώργος Γκαζέτας, Ομότιμος Καθηγητής ΕΜΠ
- Κυριαζής Πιτιλάκης, Ομότιμος Καθηγητής ΑΠΘ
- Γιώργος Μπελόκας, Επίκουρος Καθηγητής ΠΑΔΑ

ενώ από Ρουμανικής πλευράς οι συνάδελφοι:

- Radu Văcăreanu, Καθηγητής Technical University of Civil Engineering, Bucharest
- Loretta Batali, Καθηγήτρια Technical University of Civil Engineering, Bucharest
- Christian Arion, Καθηγητής Καθηγητής Technical University of Civil Engineering, Bucharest

Η εκδήλωση θα εστιάσει σε κοινά ζητήματα που αφορούν τον τρόπο αντιμετώπισης προβλημάτων σεισμικής και γεωτεχνικής μηχανικής στις δύο χώρες και στην εφαρμογή του επερχόμενου Ευρωκώδικα 7 – 2η γενιά, ενώ αναμένεται να δώσει ευκαιρίες για συναντήσεις μεταξύ μελών των δύο επιστημονικών εταιρειών δημιουργώντας ευκαιρίες για περαιτέρω συνεργασία.

Σχεδιάζεται δε ήδη και η επόμενη αντίστοιχη εκδήλωση που θα διεξαχθεί αυτή τη φορά στην Ελλάδα.

cs ଷ୨

ROCSCIENCE INTERNATIONAL CONFERENCE 2025, April 6-8, 2025, Sydney, Australia, www.rocscience.com/events/rocscience-international-conference-2025

cs ଷ୨

4th International Conference on TRANSDISCIPLINARY MULTISPECTRAL MODELLING AND COOPERATION FOR THE PRESERVATION OF CULTURAL HERITAGE
Addressing World Challenges
7-9 April 2025, Athens, Greece
https://www.tmm-ch.com

Innovative scientific methodologies and challenging projects marking future trends in the protection of cultural heritage, have initiated a universal conversation within a holistic approach, merging competence from the scientific fields of architecture, civil engineering, surveying engineering, materials science and engineering, information technology and archaeology, as well as heritage professionals on restoration and conservation, stakeholders, industry representatives and policy makers. The combined utilization of digital documentation technologies with innovative analytical and non-destructive techniques, numerical, computational and 3D techniques, archaeometric and archaeogene methods, supports the creation of a transdisciplinary multispectral modeling towards the sustainable preservation of cultural heritage. Innovation is enhancing and revealing a critical dimension of the preservation of cultural heritage along with social participation and communication.

The National Technical University of Athens interdisciplinary team "Protection of monuments" [Prof. A. Moropoulou, Prof. M. Korres, Prof. A. Georgopoulos, Prof. C. Spyrakos, Ass. Prof. C. Mouzakis], scientific responsible for the Holy Aedicule's rehabilitation of the Holy Sepulchre in Jerusalem, and the Technical Chamber of Greece, in collaboration with the Hellenic network transferring the advanced and interdisciplinary knowhow for sustainable preservation of Cultural Heritage responding to great technical and societal challenges, established at the Technical Chamber of Greece under the completion of EDICULA and RESPECT projects in 2024, in collaboration with international and Greek Organisations and Universities, organize the 4th TMM_CH International Conference on "Transdisciplinary Multispectral Modelling and Cooperation for the Preservation of Cultural Heritage: Recapturing the World in Conflict through Culture, promoting mutual understanding and Peace", on 7-9 April 2025 in Athens, Greece, opening future opportunities in the original agora of our technological and democratic roots.

The Conference is organized by the National Technical University of Athens in cooperation with the Technical Chamber of Greece, counting the auspices of H.E. the President of the Hellenic Republic, M Katerina Sakellaropoulou, and the benedictions bestowed by His All Holiness, Ecumenical Patriarch, Bartholomew I of Constantinople, His Beatitude Archbishop Hieronymus II of Athens and All Greece, and the three Christian leaders of the Status Quo in the Holy Sepulchre in Jerusalem and the Holy Land.

Distinguished scientists and representatives of the National Geographic Society, the Cultural Heritage Finance Alliance, the International Council of Monuments and Sites ICOMOS, the Organization of World Heritage Cities OWHC, the European Society for Engineering Education SEFI, the European Construction Technology Platform ECTP, the International Federation of Surveyors FIG, the International Committee CIPA Heritage Documentation, the World Monuments Fund, AHEPA Hellas and other major International and European Organizations, Associations, networks Universities and Research Centers in the field of cultural heritage preservation, participate in the International Steering and Scientific Committees which had successfully organized the 1st, 2nd and 3rd TMM_CH Conferences in 2018, 2021 and 2023.

The conference will be held at the Eugenides Foundation in hybrid format. On-site attendance and oral presentation is required.

Further to the achievements of the previous TMM_CH Conferences, the latest developments in research and innovation that identify novel trends to build an interdisciplinary approach to conservation and holistic digital documentation of cultural heritage is attempted at the 4th TMM_CH. The utilization and reuse of monuments, historic cities and sites, forms the framework of a sustainable preservation of cultural heritage, in accordance with the principles of circular economy; in terms of respect and protection of values, materials, structures, architecture and landscape; with an informed society, able to participate effectively in the policies that will design and implement the new strategies required.

Sharing knowledge, experiences, and recommendations about sustainable cultural heritage approaches and practices at a moment of world challenges to be addressed, new dynamics are established towards future changes.

TOPICS

- Emblematic works as source of innovation and transdisciplinarity
- Resilience to Climate Change, Natural Hazards and Pandemic Risks - Biosafety
- Novel Educational Approach for the Preservation of Cultural Heritage
- Preserving Compatibility, the Materiality and Integrity of Structures and Architectural Authenticity
- Advanced Non-Destructive and Structural Techniques for Diagnosis, Redesign and Health Monitoring
- Earthquake and structural rehabilitation
- Digital Heritage: a holistic approach
- Artificial Intelligence in Cultural Heritage
- Archaeology - Archaeometry – Archaeogene - Honorary Special Session in memoriam Nikos Zacharias
- Bridging Heritage Stakeholders, Art, Science and Industry – Cultural Heritage preservation and society - Intellectual Property Rights
- Dialogue between religious monuments, preservation works and values
- Transdisciplinary dialogue for World Heritage at risk and conflict
- Green and blue deal for local and regional Sustainable Development
- Historic cities and centers: New Reuse and preservation strategies applying Circular Economy
- Tourism, sustainable revival through Cultural Heritage and environmental assets
- Cultural heritage preservation addressing energy challenges
- The New European Bauhaus creative and interdisciplinary initiative
- Rebranding the World in conflict through Culture, mutual understanding and Peace

☙ ❧

PMGEC LEBANON 2025 Pan Mediterranean Geotechnical Engineering Conference 2025, April 28 – 30, 2025, Phoenicia Beirut IHG, Lebanon https://pmgec-leb.com/

GEOTECHNICS REIMAGINED, May 21-23, 2025, Bruges, Belgium, https://dfi-events.org/dfi-effc25

World Tunnel Congress 2025 "Tunnelling into a sustainable future – methods and technologies", 9-15 May 2025, Stockholm, Sweden, www.wtc2025.se

ISFOF 2025 5th International Symposium on Frontiers in Offshore Geotechnics, June 9-13, 2025, Nantes, France, https://isfog2025.univ-gustave-eiffel.fr

GeoAsia - 8th Asian Conference on Geosynthetics, 10-13 June 2025, Brisbane, Australia, https://geoasia8.org

EGRWSE-2025 6th International Conference on Environmental Geotechnology, Recycled Waste Materials and Sustainable Engineering, June 11-14, 2025, Vigo, Spain, https://egrwse2025.webs.uvigo.es/

EUROCK 2025 - ISRM European Rock Mechanics Symposium Expanding the underground space - future development of the subsurface - an ISRM Regional Symposium, 16-20 June 2025, Trondheim, Norway, https://eurock2025.com

3rd International Conference on Energy Geotechnics - Implementing the Energy Transition, 17-20 June 2025, Paris, France, Kamelia Atefi-Monfared, catefi@yorku.ca

6th International Conference GEE2025: Charting the path toward the future Geotechnical Engineering Education July 2-4 2025, Nancy, France, https://gee2025.sciencesconf.org/

5ICGE & 3ICESE 5th International Conference on Geotechnical Engineering-Iraq & 3rd International Conference on Engineering Science & Energy, 1–3 July 2025, 3 July 2025, Komar University, Sulymaniyah, Iraq, https://icge.tech

ISGSR2025 9th International Symposium for Geotechnical Safety and Risk, 24th – 27th August 2025, Oslo, Norway, www.isgsr2025.com

EUNSAT2025
5th European Conference on Unsaturated Soils
1 to 3 September 2025, Lisbon, Portugal
https://eunsat2025.tecnico.ulisboa.pt

EUNSAT2025, supported by TC106 of ISSMGE, will cover all topics related to UNSATURATED SOILS AND ROCKS, includeing Environmental Geotechnics, Sustainable Geotechnical Design, Energy Geotechnics, Multiscale Modelling and Nano-Micro Technology, Linear infrastructures, Landslides and Climate Stresses.

Considering Unsaturated Soils natural link to Bio-Inspired Technology such as Nature-based Solutions and Biocementation, among other topics, the organization has decided to create special sessions related to Biotechnology in Geotechnical Engineering, BGE, and offer a summer course mainly dedicated to PhD students.

BGE - Biotechnology in Geotechnical Engineering

The sessions of BGE are organized in parallel to EUNSAT2025 aiming to be the embryo of a new series of conferences in this field. Participants in EUNSAT2025 and BGE are free to join any session of the two events.

The papers of EUNSAT2025 on BGE topics will be selected for presentation in the dedicated sessions, and they will be published in a dedicated section of the digital proceedings of EUNSAT2025 named as BGE.

Topics

Abstracts on any topic related to unsaturated soils and rock mechanics are welcome, covering topics on traditional geotechnical engineering applications, sustainability in Geotechnical Engineering, environmental problems (engineered barriers to protect the environment, the reuse of waste materials, tailings and mine waste, etc), climate stresses under climate change scenario, energy geotechnics, historic sites, geo-education and bio-inspired technologies in Geotechnics (nature-based solutions, root reinforcement, bio-cementation, fungi reinforcement, hydrophobic materials, among others).

Authors outside unsaturated soils community are welcome to present their papers on Biotechnology on Geotechnical Engineering.

Case studies and practical cases are mostly welcome.

Contact
Email: info@eunsat2025.tecnico.ulisboa.pt
Tel. (+351) 21 8418422

Symposium International pour le 70ème anniversaire du pressiomètre / International Symposium for the 70th Anniversary of the Pressuremeter, 2nd to 5th of September 2025, LUXEMBOURG, https://isp8-pressio2025.com

TKZ2025 XXI Technical Dam Control International conference, 09-12 September 2025, Chorzów, Poland https://tkz.is.pw.edu.pl/en/

EUROGEO Technical Challenges and Environmental Imperatives for the 21st Century, 15-18 September 2025, Lille, France, https://eurogeo8.org

TRANSOILCOLD 2025 7th International Symposium on Transportation Soil Engineering in Cold Regions, September 17-20, 2025, Incheon, Korea, www.transoilcold2025.org

2025 AIGTAS IWLSC 3rd International Workshop on Landslides in Sensitive Clays, September 28th to October 2nd, 2025, Quebec, Canada www.iwlsc2025.ca

GEOTECH ASIA 2025 - GEOVADIS: The Future of Geotechnical Engineering, October 7th to 10th, 2025, Goa, India, https://www.geotechasia.org

Urban GeoEngineering 5th AsRTC6 "Urban GeoEngineering" Symposium, 23rd & 24th of October 2025, Taipei, Taiwan, www.asrtc6urbangeoengineering2025.com/index.html

17th International Conference on Geotechnical Engineering 8th International Symposium on Geohazards, December 4-5, 2025, Lahore, Pakistan, https://17icge-8isg.com

https://wtc2026.ca

On behalf of the Canadian Tunnelling Association and the 2026 World Tunnel Congress Organizing Committee, I'm pleased to extend my warmest greetings and invite you to take part in this not-to-be-missed event, which will take place from May 15 to 21, 2026, in Montreal, Quebec, Canada.

Montreal is an island at the confluence of the St. Lawrence and Ottawa rivers. Steeped in history yet at the same time a dynamic technological crossroads, Montreal holds THE top spot as a host city for international congresses in America, for many reasons: its legendary safety, its cultural dynamism (more than 30 languages are spoken here), its world-renowned gastronomy, not to mention underground Montreal and its 33 km-long pedestrian network.

The event will be held at the Palais des congrès de Montréal, one of the world's most renowned convention and exhibition centers, thanks to its event technologies, ultramodern spaces and exceptional organization services. The site features a vast exhibition area showcasing new technologies, original products and services related to underground construction. The exhibition, technical program and state-of-the-art conference setting will encourage interaction and the exchange of ideas.

The conference theme, "Connecting communities through underground infrastructure", addresses the vital role the tunnelling industry plays in connecting our communities through underground infrastructure. This enables the industry to build underground networks of transportation, water and sanitation, utilities and energy that cross, connect and unite cities, regions and continents.

WTC 2026 aims to bring together our international community of tunneling practitioners to share their experience and knowledge to make our projects safer, more economical, more resilient and more sustainable. It will not only generate considerable benefits for the tunnelling industry in Montreal, the province of Quebec and Canada as a whole, but will also promote Canadian expertise.

The scientific program, technical sessions and social activities will enable delegates to participate in exchanges, acquire new knowledge and establish new contacts with professionals from all over the world.

☙ ❧

21st International Conference on Soil Mechanics and Geotechnical Engineering Geotechnical Challenges in a Changing Environment, 14 – 19 June 2026, Vienna, Austria, www.icsmge2026.org/en

☙ ❧

Eurock 2026
Risk Management in Rock Engineering - an ISRM Regional Symposium
14-19 June 2026, Skopje, Republic North Macedonia

Contact Person Name

Prof. Milorad Jovanovski

Email jovanovski@gf.ukim.edu.mk

☙ ❧

ISFMG 2026 12th International Symposium on Field Monitoring in Geomechanics, 06 -10 August 2026, Indian Institute of Technology Indore, India, https://sites.google.com/view/isfmg2026/home

☙ ❧

International Conference on
Advances and Innovations in Soft Soil Engineering 2026
24-26 August 2026, Delft, Netherlands

As global land development expands into coastal regions, offshore reclamation areas, and wetlands, the geotechnical challenges posed by soft soils are becoming more critical. These soils, including highly sensitive clays, marine silty clays, organic soils, peats, loose sands, and dredged soils, are known for their high compressibility, water content, and complex mechanical properties, making construction projects in such areas problematic. To address these challenges, soft soil engineering is evolving with innovative technologies and approaches.

This conference, organised under the auspices of the ISSMGE Technical Committee 214 on "Foundation Engineering for Difficult Soft Soil Conditions", will showcase the latest developments in testing, modelling, monitoring and construction and improvement techniques for soft soils. It will provide a platform for researchers, engineers, and industry professionals to exchange expertise and discuss how these innovations can be applied to address modern construction challenges in soft soil environments.

Contact Information

Contact person: Stefano Muraro, s.muraro@tudelft.nl

☙ ❧

X Latin American Congress on Rock Mechanics
26 - 28 Aug, 2026, Brsasilia, Brazil

Contact Person: Marcos Massao Futai, Brazilian Committe of Rock Mechanics

☙ ❧

13th International Conference on Geosynthetics (13 ICG)
13-17 September 2026, Montréal, Canada
www.13icg-montreal.org

The 13th International Conference on Geosynthetics (ICG) 2026, hosted by the North American Chapter of the International Geosynthetics Society (**IGS-NA**), is themed "Legacy, Evolution & Revolution in Geosynthetics." The theme reflects the many transitions occurring in the field, in our shared responsibility to climate and society, and in how we respond to the challenges and opportunities presented to us by these transitions.

☙ ❧

International Symposium Preservation of Monuments & Historic Sitew, 16 – 18 September 2026, Athens, Greece https://tc301-athens.com

☙ ❧

6th International Conference on Information Technology in Geo-Engineering JTC2 Conference
13-16 October 2026, Oslo, Norway

The 6th International Conference on Information Technology in Geo-Engineering (6th ICITG) will be an arena to discuss all topics related to the ongoing digital transformation in Geo-Engineering. Case studies of IT in Geo-Engineering, integration of digital systems (Scan2BIM, BIM2FEM, etc.), benchmark datasets, information modelling, monitoring technology and artificial intelligence are some of the key topics of the 6th ICITG. It is organized under the auspices of the Joint Technical Committee 2 (JTC2) on "Representation of Geo-Engineering Data" of the Federation of International Geo-Engineering Societies (FedIGS).

Contact: Joint Technical Committee 2 (JTC2), Norwegian Geotechnical Institute, Graz University of Technology, georg.erharter@ngi.no

☙ ❧

ARMS14
14th Asian Rock Mechanics Symposium - ARMS14, an ISRM Regional Symposium
22-26 November 2026, Fukuoka, Japan

Contact Person Name
Yasuhiro Mitani mitani@doc.kyushu-u.ac.jp
Telephone +81 92 8023399
Address 744, Motooka, Nishi-ku Fukuoka Japan

☙ ❧

16th International Congress on Rock Mechanics Rock Mechanics and Rock Engineering Across the Borders
17-23 October 2027, Seoul, Korea

Scope

The scope of the Congress will cover both conventional and emerging topics in broadly-defined rock mechanics and rock engineering. The themes of the Congress include but not be limited to the following areas:

- Fundamental rock mechanics
- Laboratory and field testing and physical modeling of rock mass
- Analytical and numerical methods in rock mechanics and rock engineering
- Underground excavations in civil and mining engineering
- Slope stability for rock engineering
- Rock mechanics for environmental impact
- Sustainable development for energy and mineral resources
- Petroleum geomechanics
- Rock dynamics
- Coupled processes in rock mass
- Underground storage for petroleum, gas, CO2 and radioactive waste
- Rock mechanics for renewable energy resources
- Geomechanics for sustainable development of energy and mineral resources
- New frontiers & innovations of rock mechanics
- Artificial Intelligence, IoT, Big data and Mobile (AICBM) applications in rock mechanics
- Smart Mining and Digital Oil field for rock mechanics
- Rock Engineering as an appropriate technology
- Geomechanics and Rock Engineering for Official Development Assistance (ODA) program
- Rock mechanics as an interdisciplinary science and engineering
- Future of rock mechanics and geomechanics

Our motto for the congress is "Rock Mechanics and Rock Engineering Across the Borders". This logo embodies the interdisciplinary nature of rock mechanics and challenges of ISRM across all countries and generations.

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Earth from space: Massive landslide dams Canadian river, trapping endangered fish on the wrong side

A recent landslide along the banks of a river in British Columbia completely dammed the waterway, leading to evacuation warnings and potentially dooming an endangered fish population trapped on the wrong side of the debris.

Satellite photos of the Chilcotin River taken by Landsat 9 before the landslide (July 16) and after the landslide (Aug. 1) how the river swelled up after being dammed. (Image credit: NASA Earth Observatory/Wanmei Liang/Landsat)

Striking new satellite imagery shows a Canadian river quickly swelling in size after a massive landslide completely dammed the waterway. The obstruction may have also doomed an endangered salmon population by preventing the individuals that survived the sudden damming from reaching their spawning grounds upriver.

The massive landslide occurred late on July 30 near Farwell Canyon on the southern bank of the Chilcotin River — a 150-mile-long (240 kilometers) tributary of the Fraser River. The landslide took place around 14 miles (22 km) upstream from where the Chilcotin joins the Fraser, dumping roughly 640 million cubic feet (18 million cubic meters) of earth and rock across the waterway and completely blocking its flow, according to an emergency statement from the British Columbia government.

Within less than 48 hours, the river had swelled significantly, breaking its banks at several points and forming a debris-filled lake behind the blockage, images from NASA's Earth Observatory show. The stretch of the Chilcotin between the landslide and the Fraser River was left almost completely dry.

Regional authorities quickly issued evacuation orders for residents living close to the banks downstream of the blockage, fearing that the rocky dam would eventually break and release a surge that could cause flash flooding or trigger further landslides downstream. It is unclear how many people were evacuated.

On Aug. 5, part of the dam finally broke, unleashing a torrent of water that violently raced through the previously emptied riverbed. Despite the water flowing at more than 12,000 cubic feet (3,500 cubic meters) per second, the surge of water did not cause any major damage.

However, the landslide will likely have a major impact on the river's resident sockeye salmon (Oncorhynchus nerka), most of which were likely downriver of the landslide when it occurred, according to a statement from the Tŝilhqot'in Indigenous nation.

Before Aug. 5, no water could flow through the debris left behind by the landslide. (Image credit: Province of British Columbia)

Not only did some of the fish likely die after being stranded and suffocating in the dried-up section of the river, but any survivors that were in the Fraser River will now have a much harder time reaching their spawning grounds in Taseko Lake — around 45 miles (72 km) upstream of the remaining obstruction, according to NASA's Earth Observatory.

The International Union for the Conservation of Nature (IUCN) Red List of Threatened Species currently lists sockeye salmon as "least concern" due to rising numbers worldwide, but the Taseko population is listed as "endangered" by the Committee on the Status of Endangered Wildlife in Canada and was already experiencing record low levels of spawning before the landslide occurred. As a result, Tŝilhqot'in conservationists are worried about the population's future survival prospects.

Subsequent satellite images released by NASA's Earth Observatory show that the change in the Chilcotin River's flow has caused the water to pick up large amounts of sediment from the river bed, turning the waterway and the Fraser River yellow-brown. Although this effect will be temporary, the changes in water quality could further affect freshwater species downriver.

This is not the first time a landslide has impacted the Chilcotin River. The Tŝilhqot'in people named the area surrounding the waterway Nagwentled, meaning "landslides across the river" in the Athabaskan language, according to NASA's Earth Observatory. However, this is one of the most significant obstructions along the river in recent times.

(Harry Baker / Live Science, August 27, 2024, https://www.multibriefs.com/briefs/iaeg/landslide.pdf)

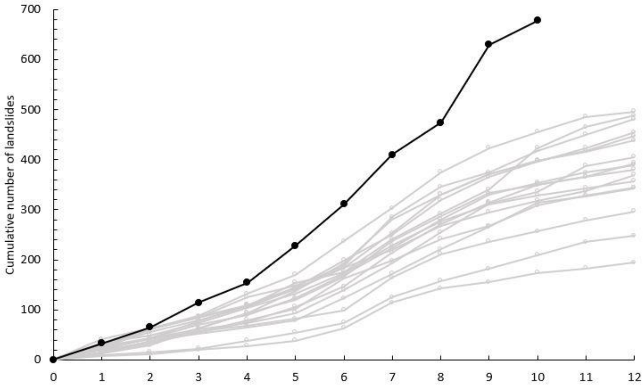
Fatal landslides in 2024 to the end of October

The total of 49 fatal landslides, which have claimed 145 lives. This represents the second highest total for October in my dataset.

I have now collated my initial dataset for fatal landslides that occurred in October 2024. As always, this will be subject to some modification as I work through the data, but I can provide a good indication of the likely numbers now.

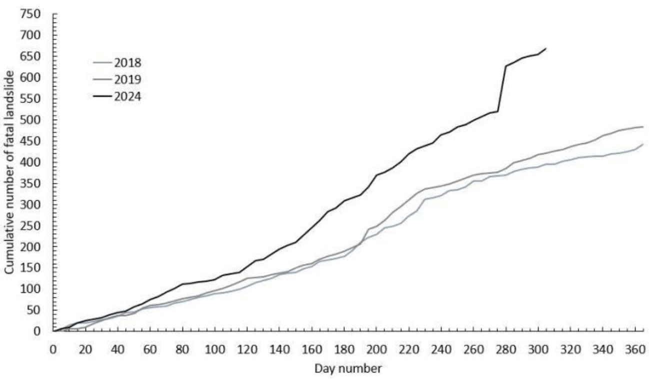
In October 2024, I have recorded 49 fatal landslides globally, which have claimed 145 lives. As expected, the monthly total is down from the Northern Hemisphere summer months – this is the lowest monthly total since April. However, this is still the second highest October total in my dataset, beaten only by the total for 2005. Thus, even as the Northern Hemisphere monsoon season has abated, the number of fatal landslides has remained unusually high.

As a consequence, 2024 continues to break all previous records for landslide occurrence. This is the monthly cumulative total graph, with previous years in light grey:-



The cumulative total number of fatal landslides by month in 2024 (in black), with previous years (in grey). Author's own data.

The annual pattern is better shown with pentad (five day) data. As usual, I have included two more typical years for reference:-



The cumulative total number of fatal landslides by pentad in 2024. Author's own data.

The data shows that 2024 continues to run at an exceptionally high rate, even if the average daily number has started to reduce.

In terms of specific events, there were two mass fatality landslides. On 3 October, 19 people were killed by a landslide at Donja Jablanica in Bosnia and Herzegovina, whilst on 23 October, 20 people were killed by a landslide at Sitio Purok B, in Talisay in the Philippines. Both of these events were channelised debris flows. I have recorded several other landslides in the Philippines in October, triggered by two tropical cyclones, and several landslides in India, Brazil and Indonesia.

To the end of October, I have recorded 679 fatal landslides in 2024, which have claimed 4,460 lives (excluding landslides triggered by earthquakes).

(Dave Petley / The Landslide Blog-Eps., 4 November 2024, https://eos.org/thelandslideblog/october-2024-fatal-landslides)

An unnatural disaster—the 2021–2024 landslide at Nordic Waste, Denmark

Kristian Svennevig, Marie Keiding, Samuel Paul Jackson & François Noël

Abstract

The 2021–2024 Nordic Waste Landslide, located near the village of Ølst in East Jutland, Denmark, was a significant geohazard event, occurring within a former clay pit that had been repurposed as a landfill for polluted soil. This study provides a first analysis of the landslide's development, characteristics, and causative factors. The slow-to-moderate-moving landslide gained public attention in December 2023 when it protruded beyond the landfill area, threatening to reach Ølst and dispense pollutants to large downstream watercourses. We analyzed the landslide's evolution and causative factors utilizing aerial imagery, digital elevation models (DEMs), satellite data, and field observation. The landslide's evolution can be categorized into two distinct phases driven by two modes of soil deposition. In Phase 1, spanning 2021 to spring 2023, the landslide developed due to gradual vertical soil aggradation on the gently sloping surface of the former clay pit. In Phase 2, from spring 2023 to January 2024, the landslide developed rapidly due to substantial soil dumping on the western slope of the clay pit, forming two earthflows that moved east, forcing acceleration in most of the Phase 1 landslide. The Phase 2 landslide encompassed approximately 1.2 million cubic meters of soil, accounting for over half of the total soil deposited at Nordic Waste between 2015 and 2023. After the practice of dumping soil at the edge of the clay pit ended the landslide slowed down, eventually stopping by late January 2024. This was while the water table was at a record high and still increasing, pointing to soil deposition, and not elevated water table, as the main preconditioning factor. Runout modelling indicated the landslide was best replicated using a Voellmy friction angle of atan(μ) = 2.9°. However, even in a worst-case modelling scenario, assuming an unrealistically low atan(μ) of 1.7°, the landslide did not reach inhabited areas in Ølst. From a landslide point of view, our findings emphasize the need for land-use planning and regulatory frameworks of landfills to take slope instability into account. Furthermore, they highlight the need for increased public awareness, and for educating decision-makers and oversight authorities into the risks associated with landslides.

Introduction

In early December 2023, reports reached the public of a large landslide (herein termed the Nordic Waste Landslide) developing within a landfill situated in a former clay pit, on a hill near the village of Ølst in East Jutland, Denmark (56.383347, 10.078353) (Fig. 1). Soil deposition in the landfill commenced in 2015, and from 2018 onwards, the site was operated by the company Nordic Waste. It served as a repository for various grades of contaminated soil intended for permanent storage and remediation purposes. The massive development of the Nordic Waste Landslide gained public attention during December 2023, when the landslide progressed out of the area of Nordic Waste and threatened a public road and the nearby creek Alling Å. This posed a serious risk of the landslide damming the creek and releasing large amounts of pollutants into the nearby fjord and sea. Furthermore, fear arose that the landslide would progress northward towards Ølst 400 m away.

On December 19th, Nordic Waste declared that they were no longer able to handle the situation and abandoned the site, abdicating responsibility to the local municipality (Randers Kommune). On the 19th of January Nordic Waste filed for bankruptcy. On the same day, the holding company behind Nordic Waste, USTC Group, published a press release in Danish stating that the event was a natural disaster and that "The event in Ølst has demonstrated that climate change is significant and that we do not have the necessary knowledge to predict the consequences" (USTC 2024)—presumably addressing an anomalously wet 2023 in Denmark.

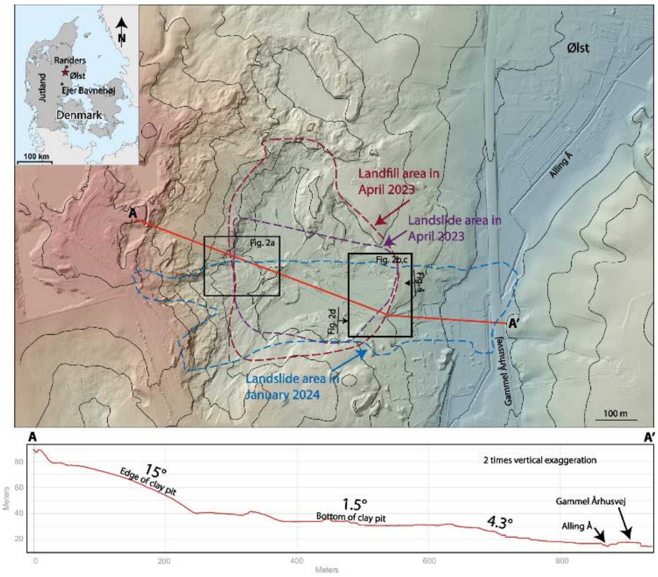


Fig. 1 LiDAR DEM and hillshade from 2015, after clay excavation ended and before large-scale landfill activity started showing the pre-landfill morphological setting. The areas of the landfill in April 2023 and the landslide in April 2023 and January 2024 are indicated. The position of subsequent detail figures are shown. The vertically exaggerated cross-section A-A′ demonstrates the overall slope towards the east of the topography in the clay pit with the slope angle indicated

In this paper, we present a preliminary analysis of the landslide at Nordic Waste based on aerial images, digital elevation models (DEMs) satellite data (optical and InSAR) and fieldwork in the area. Furthermore, we implement a runout model of the landslide and briefly discuss key findings and implications. Our analysis focuses on the landslide from an observational morphological perspective. Geotechnical, environmental and other similar perspectives are out of our scope, but the present work may serve as a basis for further such efforts.

….

Svennevig, K., Keiding, M., Jackson, S.P. *et al.* An unnatural disaster—the 2021–2024 landslide at Nordic Waste, Denmark. *Landslides* (2024). https://doi.org/10.1007/s10346-024-02394-7

https://link.springer.com/article/10.1007/s10346-024-02394-7

Patterns of fatal landslides in Shaanxi Province, China

A new paper (Lian et al. 2025) suggests that recent attempts to reduce loss of life in this part of NW China may have had some effect.

China is a highly landslide-prone country, but the distribution of failures is not even in time and space. One of the most landslide-prone areas in Shaanxi province, in the northwest of the country. Thus, understanding patterns of fatal landslides there is key to reducing landslide risk nationally.

Back in 2021, the People's Daily tweeted this video of a landslide destroying a transmission tower in Shaanxi:-

(https://x.com/PDChina/status/1445856136159240195?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1445856136159240195%7Ctwgr%5E0c910070c4f26bb2377c195055c2f78e6e46c284%7Ctwcon%5Es1_&ref_url=https%3A%2F%2Feos.org%2Fthelandslideblog%2Ffatal-landslides-shaanxi-province)

To that end, a new paper (Lian *et al.* 2025) in the *Journal of Asian Earth Sciences* is most welcome. This research has focused on the construction of a fatal landslide database for the Shaanxi province between 1996 and 2018, and then uses this to examine trends in time and space. Landslides triggered by earthquakes are not included in the analysis.

The headline is that there were 332 fatal landslides in this period, claiming 1,132 lives. Of these, about 85% were triggered by "natural factors" mostly rainfall, with the remainder being anthropogenic. The rainfall-induced failures mostly occurred in the summer months, reflecting seasonal rainfall, whilst the anthropogenic landslides were more evenly distributed through the year.

One really interesting aspect of this study is the temporal pattern of landslides, and its relationship with attempts to reduce losses from disasters. Lian *et al.* (2025) note that the Shaanxi provincial government enacted five yearly provincial disaster reduction plans, covering 2001-2005, 2006-2010, etc. Thus, they have looked at the number of fatal landslides in five year blocks. The average numbers of landslides per year are as follows:

Period	Average number of landslides per year
1996-2000	8.0
2001-2005	16
2006-2010	22
2011-2015	7.4
2016-2018	5.3

Thus, a credible case can be made that the number of fatal landslides has fallen in more recent years, a pattern that is seen in other parts of China too. During this period there has been a tremendous amount of landslide research undertaken in China, more so than in any other country, and considerable effort has been focused on disaster risk reduction. However, the statistics show that there is still a long way to go, and climate change is likely to make this even harder in the coming decades.

Lian *et al.* (2025) highlight that there are some locations that remain as particular landsldie hotspots, most particularly *"Yan'an and Yulin cities (in northern part of the province) and An'kang city (in southern part of the province)"*. Additional efforts will be needed to reduce losses in those areas.

Reference

Lian, B. et al. 2025. Spatiotemporal variations of non-seismically fatal landslides in Northwest China: A case study from Shaanxi province. Journal of Asian Earth Sciences, **277**, 106389. https://doi.org/10.1016/j.jseaes.2024.106389

(Dave Petley / Eos – THE LANDSLIDE BLOG , 15 November 2024, https://eos.org/thelandslideblog/fatal-landslides-shaanxi-province)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ & ΑΝΤΙΣΕΙΣΜΙΚΗ ΜΗΧΑΝΙΚΗ

Διεθνής ερευνητική ομάδα ρίχνει «Φως» με σύγχρονα τεχνολογικά μέσα στις αιτίες του καταστροφικού σεισμού του 1956, στην Αμοργό

Τον Ιούλιο του 1956 συνέβη στην Αμοργό ο μεγαλύτερος σεισμός στην Ελλάδα κατά τον 20ο αιώνα, ενώ τον διαδέχθηκε το μεγαλύτερο τσουνάμι των τελευταίων δύο αιώνων στη Μεσόγειο. Η πηγή τους παρέμενε αινιγματική και το ερώτημα ποιο ρήγμα ευθυνόταν για τον σεισμό αυτό, ταλάνιζε τους επιστήμονες για χρόνια. Μια διεθνής ερευνητική ομάδα έδωσε την απάντηση χρησιμοποιώντας εξοπλισμό τελευταίας τεχνολογίας, τονίζει το ΑΠΕ-ΜΠΕ.

Ο σεισμός της Αμοργού σημειώθηκε στις 9 Ιουλίου 1956, στον υποθαλάσσιο χώρο μεταξύ Αμοργού και Σαντορίνης. Το μέγεθός του κυμάνθηκε μεταξύ 7,2 και 7,8 Ρίχτερ. Η ακριβής θέση και το βάθος του αποτέλεσαν αντικείμενο συζήτησης, καθώς εκείνη την εποχή είχαν εγκατασταθεί μόνο λίγα σεισμόμετρα. Λίγα λεπτά αργότερα, ακολούθησε ένας δεύτερος σεισμός, πιο κοντά στη Σαντορίνη. Και οι δύο δονήσεις είχαν ως αποτέλεσμα 53 νεκρούς και πολλές ζημιές. Επίσης, λίγα λεπτά μετά την πρώτη δόνηση, ένα τσουνάμι πλημμύρισε τις περισσότερες από τις κοντινές ακτές με κύματα ύψους μερικών μέτρων. Δύο βοσκοί σκαρφαλωμένοι στα βράχια κατά μήκος της νότιας ακτής του νησιού της Αμοργού, έγιναν αυτόπτες μάρτυρες ενός κύματος ιδιαίτερα ψηλού, τουλάχιστον 20 μέτρων. Το νησί της Αστυπάλαιας πλημμύρισε επίσης με κύματα ύψους δέκα μέτρων.

Εξήντα οκτώ χρόνια μετά τον καταστροφικό αυτό σεισμό, μια διεθνής ομάδα με ερευνητές από το Geoazur-Universite Cote d' Azur, το Institut de Physique du Globe de Paris, το Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών, το εργαστήριο Γεωλογίας της Ecole Normale Superieur de Paris και το εργαστήριο Vicorob του Πανεπιστημίου της Girona, εντόπισε έπειτα από πολυετή έρευνα το ρήγμα που προκάλεσε τον σεισμό, αλλά και τη μετακίνηση που έγινε στον υποθαλάσσιο πυθμένα.

Το 2015, η διεθνής ωκεανογραφική αποστολή χαρτογράφησε τον θαλάσσιο πυθμένα μεταξύ της Σαντορίνης και της Αμοργού αποκαλύπτοντας τρία κύρια ρήγματα που βρίσκονται περίπου 700 μέτρα κάτω από την επιφάνεια της θάλασσας. Το 2022, η επόμενη αποστολή με το γαλλικό ωκεανογραφικό σκάφος Europe αναχώρησε από το Ηράκλειο της Κρήτης και κατευθύνθηκε προς τα ρήγματα αυτά. Συγκεκριμένα τμήματα των ρηγμάτων χαρτογραφήθηκαν σε πολύ υψηλή ανάλυση μικρότερη από ένα μέτρο, από ένα αυτόνομο υποβρύχιο όχημα βαθέων υδάτων (AUV IdefX), το οποίο μπόρεσε να καταδυθεί και να ταξιδέψει κοντά στον βυθό.

Έναν χρόνο μετά, σε νέα αποστολή με το ίδιο ερευνητικό σκάφος, η επιστημονική ομάδα είχε μαζί της ένα υποβρύχιο ρομποτικό όχημα, το Ariane, το οποίο ήταν εξοπλισμένο με κάμερες που επέτρεπαν στους επιστήμονες να παρατηρήσουν τον βυθό της θάλασσας σε 4K. Όπως λέει χαρακτηριστικά στο ΑΠΕ-ΜΠΕ η καθηγήτρια του Τμήματος Γεωλογίας και Γεωπεριβάλλοντος του ΕΚΠΑ, Παρασκευή Νομικού, η οποία συμμετείχε στην αποστολή και στη δημοσίευση, το ρομποτικό όχημα «ήταν ουσιαστικά τα μάτια του επιστήμονα». Ο στόχος ήταν να διερευνηθούν εκτενέστερα τα τμήματα των ρηγμάτων που είχαν επιλεγεί και να εντοπιστεί η πηγή αυτών των μεγάλων γεγονότων.

Δεν είναι η πρώτη φορά που θαλάσσιοι γεωλόγοι εντοπίζουν σεισμικά ρήγματα στον πυθμένα της θάλασσας με ρομποτικά οχήματα. Αυτό έχει επιτευχθεί στην Καραϊβική και στην Ιαπωνία για τους σεισμούς του 2004 και του 2011, αντίστοιχα, που προκάλεσαν τσουνάμι. Εδώ, όμως, αναζητήθηκε το ρήγμα ενός παλαιότερου και λιγότερο τεκμηριωμένου σεισμού και τσουνάμι, των οποίων η πηγή παρέμενε αινιγματική.

Όπως διαπιστώθηκε κατά την έρευνα, η μετακίνηση του υποθαλάσσιου πυθμένα κατά τη διάρκεια του μεγάλου αυτού σεισμού ήταν κατ' ελάχιστον εννιά μέτρα και σε ορισμένα σημεία έφτανε ακόμα και τα 16 μέτρα. «Πρόκειται για πολύ μεγάλη μετακίνηση, αλλά δικαιολογείται για έναν σεισμό που «ακούμπησε» τα 7,8 Ρίχτερ», παρατηρεί η κ. Νομικού.

Σύμφωνα με την ανάλυση των δεδομένων, το ρήγμα που ενεργοποιήθηκε κατά τον σεισμό ήταν το ρήγμα της Αμοργού. Η κ. Νομικού περιγράφει ότι «μελετήσαμε και τα τρία ρήγματα, προκειμένου να βρούμε σημάδια ενεργοποίησης, τα οποία να μας δείχνουν ποιο ήταν υπεύθυνο για τον σεισμό. Το μόνο που είχε σημάδι ενεργοποίησης ήταν το ρήγμα της Αμοργού».

Επίσης, οι ερευνητές εντόπισαν ότι το τσουνάμι προκλήθηκε από τη μεγάλη μετακίνηση του ρήγματος και όχι από υποθαλάσσιες κατολισθήσεις, όπως υποστηρίχθηκε κατά το παρελθόν. Τα αποτελέσματα της έρευνας δημοσιεύθηκαν στο περιοδικό «Communications Earth & Environment» του ομίλου Nature.

Η έρευνα εντάσσεται στο πρόγραμμα «AMORGOS», που χρηματοδοτείται από το Εθνικό Ίδρυμα Ερευνών της Γαλλίας και γαλλικά ερευνητικά ιδρύματα και θα συνεχιστεί μέχρι το 2029. Επόμενος στόχος της έρευνας, σύμφωνα με την κ. Νομικού, είναι να μελετηθεί η συνέχεια του ρήγματος στον χερσαίο χώρο και η μετακίνησή του.

(ΤΕΝΙΚΟ ΕΠΙΜΕΛΗΤΗΡΙΟ ΕΛΛΑΔΑΣ, ΗΛΕΚΤΡΟΝΙΚΗ ΚΑΘΗΜΕΡΙΝΗ ΕΝΗΜΕΡΩΣΗ, ΤΕΥΧΟΣ 2907, 1 Νοεμβρίου 2024, https://portal.tee.gr/portal/page/portal/INFO_TEE/INFO_2024/11_24/NEWSLETTER20241118.pdf)

Large seafloor rupture caused by the 1956 Amorgos tsunamigenic earthquake, Greece

Frédérique Leclerc, Sylvain Palagonia, Nathalie Feuillet, Paraskevi Nomikou, Danai Lampridou, Paul Barrière, Alexandre Dano, Eduardo Ochoa, Nuno Gracias & Javier Escartin

Abstract

In the Mediterranean Sea, the probability that a large earthquake-triggered tsunami will occur in the coming decades is high. Historical tsunami database informs us on their geographical occurrence but their sources, i.e., the faults that slipped during earthquakes and displaced the seafloor to generate tsunamis, are often unknown. Here we identify the submarine rupture of the Amorgos earthquake that on July 9, 1956, triggered the largest mediterranean tsunami in the past two centuries. Using submarines, we explored major normal faults in the epicentral area, and discovered a large surface rupture along the 75-km long Amorgos fault. The 9.8-16.8-m large seafloor offset is compatible with a Mw7.5 event. This finding prompts a reassessment of the largest (≥20 m) tsunami wave origin, previously attributed to earthquake-triggered submarine mass-wasting. It demonstrates that tsunami source can be determined several decades after an event, a key information to better assess future seismic and tsunami hazards.

The 1956 earthquake and tsunami The Amorgos earthquake occurred on July 9, 1956, offshore Santorini and Amorgos (Cyclades, South Aegean Sea), along the Hellenic Volcanic Arc. It was recorded by a small number of seismometers, enabling seismologists to determine a magnitude of 7.2–7.812, depending on the authors. Several epicenters were obtained[13] that located the earthquake between 5 and 20 km south of Amorgos island (Fig. 1). Its hypocentral depth, recognized to be poorly constrained14 and debated15, varies between 10 km and 45 km and was recently re-evaluated at ~25 km13, that is, at the Moho depth of the Hellenic arc[16]. The main shock was followed by a series of aftershocks. The first aftershock, called the twin earthquake, had a magnitude estimated between 6.0 and 7.2, and occurred only 13min later, closer to Santorini (Fig. 1) and probably deeper (40–95 km), possibly along the subduction plate boundary[13]. The main shock caused severe damage to the surrounding islands, subsequently enhanced by the twin shock, especially in Santorini[17]. More than 3200 buildings were damaged, including ~500 that were completely destroyed; in addition, 54 people were killed in Santorini, and 100 people were injured.

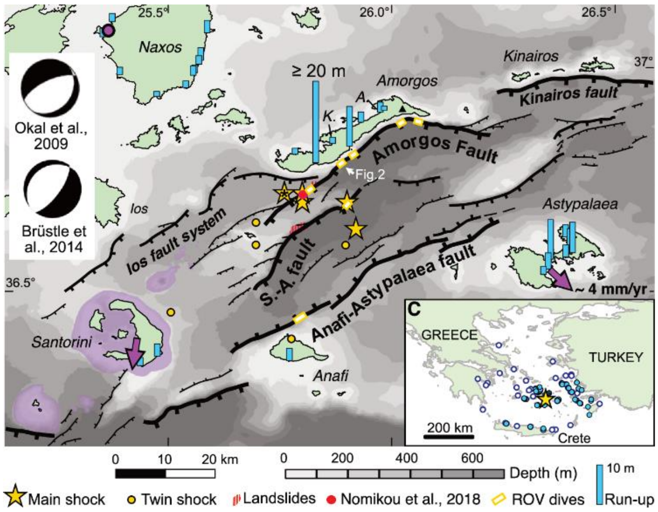


Fig. 1 | Seismotectonic map in the epicentral area of the July 9th, 1956 earthquake. Several epicenters for the main shock (star) and twin shock (dot) are represented, as summarized in Brüstle et al.[13], with two proposed focal mechanism[13,14] calculated for the epicenter marked with a star and an asterisk. Main faults are represented by black lines, with thicker traces for longer and taller faults, and are modified from previous works[19,29,33]. S.-A. fault: Santorini-Amorgos fault. Portions of faults explored with the ROVs during the AMORGOS-23 cruise are localized by yellow and white rectangles. Submarine landslides identified[25] are in dashed red, while the observation[19] of a probable fault mirror associated with the 1956 event along the Amorgos fault is a red dot. Measured run-ups[14] of the 1956 tsunami are represented as blue bars. In the inset, other tsunami observations of the 1956 event are located by blue[14] and white[20] dots. Light purple areas are onshore and offshore volcanoes. The purple arrows on Astypalaea and Santorini show their relative displacements southeastward and southwestward, respectively, at a rate of ~4mm/yr, with respect to central Aegean (Naxos)[31]. Mount Kroukelos on Amorgos is denoted by a black triangle. The two archeological sites that demonstrate long-term subsidence of the northern coast of Amorgos[18] are located in Katapola (K.) and Aegiali (A.).

…

DOWNLOAD PDF https://www.nature.com/articles/s43247-024-01839-0.pdf

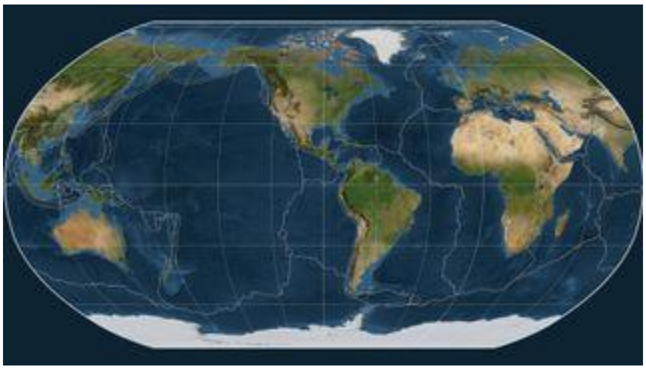
Communications Earth & Environment **volume 5**, Article number: 663 (2024)

https://www.nature.com/articles/s43247-024-01839-0

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΓΕΩΛΟΓΙΑ

When did plate tectonics begin?

Earth surface is covered with rigid plates that move, crash into each other and dive into the planet's interior. But when did this process begin?



A depiction of Earth's tectonic plates. While we know where the plates are now and into the distant past, we don't know when the process first began. (Image credit: Yarr65 via Shutterstock)

It's one of many unique things about Earth: Unlike every other known planet in the universe, Earth's surface is made up of rigid plates that shift, crash into each other and dive into the planet's interior.

But when did Earth's surface splinter into tectonic plates? And when did those plates start moving? It's an important question because plate tectonics seems to fuel the evolution and complexity of life.

Surprisingly, geologists don't have a good answer for when plate tectonics emerged, and estimates range from 700 million years ago to before 4 billion years ago, when Earth was still in its infancy.

The oldest unambiguous evidence of modern plate tectonics dates to the Neoproterozoic (1 billion to 541 million years ago), Robert Stern, a geoscientist at the University of Texas, Dallas, told Live Science. That's when the geological record reveals plentiful ophiolites — bits of oceanic crust shoved onto continents — and blueschists, which are metamorphic rocks that form in subduction zones, or areas where the plates collide and dive into the planet's interior. Subduction is a feature of plate tectonics, so these widespread rocks show with certainty that plates were crashing into and sliding under one another.

But many geologists think Stern's view is too conservative.

Critics agree that rocks indicative of plate tectonics became widespread for the first time 700 million to 900 million years ago. But these rocks could have existed earlier and been wiped away by time, they suggest.

For example, the Indian subcontinent collided with southern Asia a mere 55 million years ago, and many of those rocks have already eroded away, said Mark Harrison, a professor emeritus of geoscientist at UCLA. "The Tibet-India collision isn't over yet," Harrison told Live Science. If the evidence of tectonics is disappearing even as a plate-to-plate collision is occurring, what hope is there of finding these same rocks from the much more distant past?

Stern argues that there is evidence for a little episode of subduction 1.8 billion years ago that didn't quite take, bolstering his viewpoint that if there had been plate tectonics consistently before about 800 million years ago, it would be clearer in the rock record. (Other scientists see this blip as evidence that plate tectonics was well underway by then.)

Many researchers put the transition to plate tectonics much earlier. There are numerous signs of some kind of geologic shift during the Archean Eon (4 billion to 2.5 billion years ago), with estimates of exactly when ranging from 2.5 billion to 3.8 billion years ago. For example, at least one ophiolite preserved today dates back 2.5 billion years.

Another line of evidence is in the chemistry of the crust. If the crust is brand-new volcanic rock, its chemistry will look much like the mantle from whence it came. If it is remelted and recycled by plate tectonics, this chemistry shifts. An influential 2012 study found that more crust began to be recycled around 3 billion years ago. This could mark the shift to subduction destroying and reworking crust, said study co-author Chris Hawkesworth, an emeritus professor of geosciences at the University of St. Andrews in the U.K..

Research on zircons — minerals that survive even when the rocks around them melt and reform — suggests that Earth's crust shifted earlier, around 3.8 billion years ago. "We start to see zircon structures that start to look more and more like what we see in subduction zones today," study author Nadja Drabon, an Earth and planetary scientist at Harvard University, told Live Science. Crust also became shorter-lived around that time, again suggesting the recycling process of subduction.

But does this transition reflect true plate tectonics? Zircon research published in 2023, which investigated the magnetic field conditions on Earth when the minerals formed, suggests that these grains more or less stayed where they were made until 3.4 billion years ago, hinting that landmasses weren't on the move until that point.

It's possible that different aspects of plate tectonics emerged at different times, Drabon noted. Perhaps subduction started 3.8 billion years ago, but it took time for the continents to start drifting around the globe.

A newer and more controversial idea suggests that Earth developed plate tectonics in the Hadean (4.5 billion to 4 billion years ago). This idea springs from increasing evidence that the newborn Earth was a surprisingly modern-looking place with oceans and continents — a conclusion drawn from zircon research and the chemistry of Earth's oldest surviving rocks. Some studies of Earth's oldest zircons, which date to this mysterious period of geologic history, found that they look remarkably like zircons that form in volcanic arcs over subduction zones today. And theoretical modeling shows it's possible for plate tectonics to exist in Hadean conditions, Jun Korenaga, a professor of Earth and planetary sciences at Yale University, told Live Science.

Every piece of evidence for each of these origin stories comes with weaknesses. For instance, the vast majority of very old zircons come from one location, the Jack Hills in Australia, and might not represent what was happening on the rest of the planet. The oldest rocks might also be weird — perhaps they're still hanging around today because they weren't like all the other rocks on ancient Earth. And you don't want to get in the middle of computer modelers when they're arguing about assumptions of the state of the mantle 4 billion years ago.

"It's shocking to realize there's no consensus view on when [plate tectonics] started," Jesse Reimink, a geoscientist at The Pennsylvania State University told Live Science.

(Stephanie Pappas / LIVESCIENCE, 4 November 2024, https://www.livescience.com/planet-earth/geology/when-did-plate-tectonics-begin?)

୧ ୭

Did plate tectonics give rise to life? Ground-breaking new research could crack Earth's deepest mystery

Emerging evidence suggests that plate tectonics, or the recycling of Earth's crust, may have begun much earlier than previously thought — and may be a big reason that our planet harbors life.

Plate tectonics may have played a larger role in the evolution of life on Earth than we previously thought. (Image credit: Nicholas Forder)

Earth's surface is a turbulent place. Mountains rise, continents merge and split, and earthquakes shake the ground. All of these processes result from plate tectonics, the movement of enormous chunks of Earth's crust.

This movement may be why life exists here. Earth is the only known planet with plate tectonics and the only known planet with life. Most scientists think that's not a coincidence. By dragging huge chunks of crust into the mantle, Earth's middle layer, plate tectonics pulls carbon from the planet's surface and atmosphere, stabilizing the climate. It also pushes life-fostering minerals and molecules toward the surface. All of those factors add up to a place where life thrives from ocean abysses to towering peaks.

But researchers don't know why or when plate tectonics started, making it hard to determine how essential this process was to the evolution and diversification of life. Some think plate movement fired up as little as 700 million years ago, when simple multicellular life already existed. Others believe only single-celled organisms reigned when Earth's plates first cracked apart.

In fact, as new methods allow scientists to look ever-deeper into the past, some are now arguing that plate tectonics emerged very soon after Earth's formation — perhaps predating life itself. If this hypothesis is true, it may suggest that even the most primitive life evolved on an active planet — and that means plate tectonics could be an essential ingredient in the search for alien life.

"The only way we can reliably see a long-term history is on our own planet," said Jesse Reimink, a geoscientist who studies early Earth history at The Pennsylvania State University. "We really need to understand the life cycle of a planetary body before we can do a lot with the exoplanet data."

Destruction of evidence

Only Earth has jigsaw-like tectonic plates that crash together and pull apart like bumper cars. The other rocky planets in the solar system have a single, rigid shell of crust — a geological arrangement that scientists call "stagnant lid" or "single lid" tectonics.

In plate tectonics, pancake-like chunks of brittle crust and upper mantle ride on the hotter, more mobile mantle below. New crust forms at midocean ridges, where gaps between separating plates create space for magma from the mantle to rise. In a geologic balancing act, dense oceanic crust is destroyed at subduction zones, where one plate slides under another. The oldest known bit of oceanic crust, located in the Mediterranean, dates to just 340 million years ago, making it far too young to be useful for pinpointing when plate tectonics arose.

At Thingvellir National Park in Iceland, the rift between the North American and Eurasian tectonic plates is visible. (Image credit: Mlenny via Getty Images)

Continental crust is lighter than oceanic crust and floats above the destruction wrought by subduction. But still, very little remains from Earth's early days, and what is left is eroded and warped. Fewer than 7% of rocks on the surface today are older than 2.5 billion years. Go back before 4.03 billion years, to the Hadean eon, and the rock record has completely vanished. The first half billion years of Earth's life left not a single bit of basalt behind.

Because of this constant planetary recycling, the oldest incontrovertible evidence of plate tectonics — rocks formed solely in subduction zones — dates back only around 700 million years. Another strong bit of evidence, pieces of oceanic crust pushed up on continental crust during subduction initiation, emerged globally around 900 million years ago. In this geological time frame, multicellular animals, such as sea sponges and comb jellies, were just emerging.

Some geoscientists think plate tectonics has been operating only since that time. But more suspect that plate tectonics emerged earlier, in the Archean eon, which ran from 4 billion to 2.5 billion years ago. The evidence is based largely on chemical analyses of rocks. For example, around 3 billion years ago, there are hints of an increasing amount of crust melted and reformed rather than forming directly from mantle rocks. Around 3.8 billion years ago, a shift in the chemistry of Earth's oldest minerals suggests a change from a stable, long-lived crust to a shorter-lived, more modern-looking crust, perhaps indicating the start of subduction. Though there is no single agreed-upon date, the Archean looks promising as a time when big geological changes were happening on Earth.

"It points to a really important transition," said Nadja Drabon, an Earth and planetary scientist at Harvard University who led the study indicating the switch to shorter-lived crust.

A handful of sand

Whenever tectonics began, geoscientists agree that it probably helped fuel the evolution and complexity of life.

"There could be billions of planets with some kind of primitive life, but the ability to build a radio transmitter or launch a rocket ship requires a certain set of circumstances which are only likely to happen on a planet that has plate tectonics and both oceans and continents," Robert Stern, a geoscientist at the University of Texas at Dallas, told Live Science.

In prehistoric animals, plate tectonic activity has been tied to faster rates of evolution, probably because geological movements split up habitats and create new niches for life to evolve.

The coelacanth's evolution was likely driven in part by plate tectonics, past research suggests. (Image credit: loonger via Getty Images)

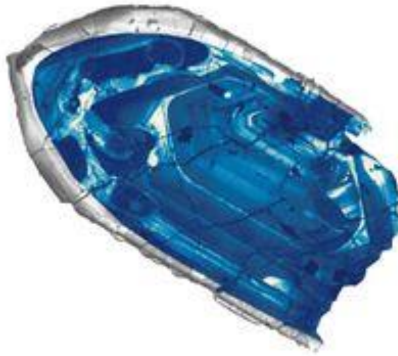
Plate tectonics also may have enabled life to recover from devastating mass extinctions. For instance, at the end of the Permian period, a mass extinction driven by carbon-dioxide-spewing volcanic eruptions killed off 90% of species on Earth. Life on the planet ultimately recovered because weathering of continental rocks breaks down carbon-bearing minerals and washes them into the ocean, where marine organisms turn them into reefs and shells that become limestone and are eventually subducted back into the planet's interior. When the atmosphere goes haywire, tectonics gradually shifts Earth back into an environment that's more conducive to life.

While nearly all geoscientists agree with the idea that, without plate tectonics, life on Earth might be limited to primitive organisms, a small group of researchers is now suggesting that plate tectonics could have emerged even earlier — perhaps contributing to the origin of life itself by bringing minerals that support life from the planet's interior to the crust.

This is tricky territory, pushing researchers back before 4 billion years ago, into the Hadean eon. The only direct evidence of the first 500 million years of Earth's existence is the presence of zircons, minerals that survive melting at mantle temperatures and pressures. Though the rocks once containing these minerals have melted away, the zircons — which are smaller than grains of sand — remain.

"They're teeny-tiny, and we just throw the kitchen sink at them trying to get every last little piece of information we can get from them," Drabon told Live Science.

These zircons from the Hadean are sparse; all of them found worldwide could likely fit in a thimble. Yet this handful has shown that Earth had an ocean as early as 4.4 billion years ago — just 200 million years after the planet formed and not long before the ancestor of all life today existed. By as early as 600 million years after Earth formed, according to a study published in June, the planet had both land and fresh water.



A 4.4 billion-year-old zircon from Jack Hills, Australia. Because zircons don't melt at mantle temperatures, they provide a snapshot of early Earth that resists destruction. (Image credit: John Valley, University of Wisconsin-Madison)

To some researchers, this suggests Earth's crust may have been recycling in the Hadean. Water weakens the crust, creating the potential for breakage and thus subduction, said Jun Korenaga, a geophysicist at Yale University. Because water is necessary for plate tectonics, the question becomes, "Why can't we have plate tectonics if we had surface water?" Korenaga said.

In experimental work published in 2023, researchers melted rocks at high pressures and found that conditions that mimic subduction create rocks similar to Earth's oldest rocks. Korenaga also argues that plate tectonics is the only effective way to reduce the amount of carbon dioxide in early Earth's atmosphere from the levels found on Venus to the more moderate concentrations that existed by the beginning of the Archean on Earth.

Intriguingly, another important event happened during the Hadean that makes Earth undeniably different from its rocky neighbors: About 100 million years after Earth first coalesced, a planet-size body slammed into it, thoroughly shattering and melting both bodies and flinging off the material that would become the moon. A paper published earlier this year modeled this impact and found that the mixing of the two bodies could have created plumes of hot material in Earth's mantle that may have kicked off subduction around 200 million years later.

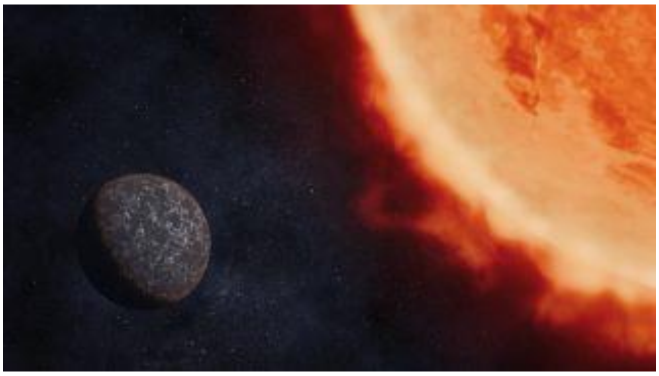
"Why is Earth the only rocky planet to have plate tectonics?" said Qian Yuan, lead author of that paper and a postdoctoral fellow in geodynamics at the California Institute of Technology. "I think the moon-forming giant impact could be the main factor."

But not everyone is convinced by this story. A Hadean start to plate tectonics is an intriguing idea, T. Mark Harrison, a professor emeritus of geoscience at UCLA, told Live Science, but the evidence is still fairly minimal. He worries that geoscientists on all sides of the issue are overconfident in their claims. "But the last thing we need is a new form of groupthink based on, literally, a thimble-full of sand grains," Harrison wrote in an article with the appropriately blunt title "We don't know when plate tectonics began."

Life on other worlds

If plate tectonics fuels life, or even just complex life, the search for other organisms among the stars may lead humanity to a geologically active planet.

Unfortunately, we can't yet detect plate tectonics on far-off exoplanets, said Tobias Meier, an expert on mantle dynamics at the University of Oxford. But in 2021, Meier and his team used thermal data and computer modeling to determine that the rocky exoplanet LHS 3844 b, which sits 49 light-years from Earth, might have an active mantle and moving crust.



Researchers suspect exoplanet LHS 3844b, located 49 light-years from Earth, may also have plate tectonics. (Image credit: NASA, ESA, CSA, Dani Player (STScI))

LHS 3844 b isn't likely to host life. It orbits very close to its star and has no atmosphere. Half of the planet is in permanent daylight, with a temperature of 1412 degrees Fahrenheit (767 degrees Celsius), while the other is a frigid minus 429 F (minus 273 C) at night. It's this temperature difference between the two sides of the planet that drives mantle motion in LHS 3844 b, Meier and his colleagues reported in 2021. If real, that version of plate tectonics looks nothing like Earth's. But it shows the diversity of planetary geology that could lurk elsewhere in the cosmos.

"In the end, understanding what causes tectonics and whether it could operate on different planets will help us understand whether these planets will be habitable," Meier said.

More powerful telescopes such as the James Webb Space Telescope may lead to better hints of exoplanet geology in the near future. But Earth's close neighbors deserve scrutiny, too, said Craig O'Neill, a geophysicist at Queensland University of Technology in Australia. Venus is right next door, and it's still controversial whether it had tectonics in the past. Understanding its current, single-lid geology could help scientists figure out why the two planets' fates diverged, and whether plate tectonics may explain why one planet hosts life and the other likely doesn't.

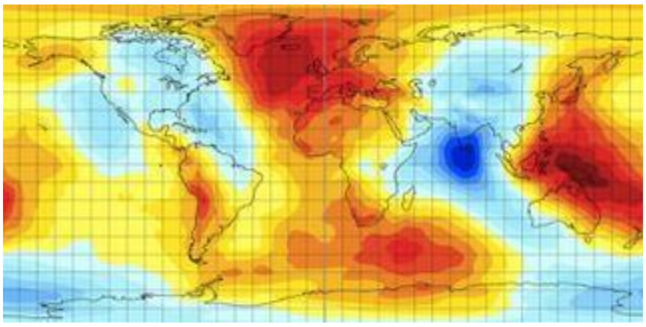
"A lot of the development of where we're going to go in plate tectonics is going to come from looking up," O'Neill told Live Science, "rather than navel-gazing in."

(Stephanie Pappas / LIVESCIENCE, 8 November 2024, https://www.livescience.com/planet-earth/geology/did-plate-tectonics-give-rise-to-life-groundbreaking-new-research-could-crack-earths-deepest-mystery)

Indian Ocean gravity hole: The dent in Earth's gravitational field created by the death of an ancient ocean

The Indian Ocean "gravity hole" is a region where Earth's mass is reduced, leading to weak gravitational pull, lower-than-average sea levels and a puzzle scientists have only just begun to solve.

The Indian Ocean "gravity hole" is the site of the deepest dent in Earth's gravitational field. It's a circular ocean region with a gravitational pull that's so weak, sea levels are 348 feet (106 meters) lower there than elsewhere on Earth. Discovered in 1948, the origins of this giant gravity hole — or geoid low, as it is technically called — remained a mystery until recently.



A map showing how water elevation and distribution would change due to gravity if the effects of tides and currents were removed. (Image credit: European Space Agency)

QUICK FACTS
Name: Indian Ocean geoid low
Location: Laccadive Sea, southwest of India
Why it's incredible: The huge gravity hole formed on the site of a prehistoric ocean.

The hole spans 1.2 million square miles (3.1 million square kilometers) and sits 746 miles (1,200 km) southwest of India. Various theories have tried to explain its existence since geophysicists first detected its trace, but the answer only came in 2023 with a study published in the journal Geophysical Research Letters. Researchers used 19 computer models to simulate the motion of Earth's mantle and tectonic plates over the past 140 million years, and then teased out the scenarios giving rise to a geoid low similar to the real-life one.

The study indicated that the Indian Ocean gravity hole formed after the death of an ancient ocean called Tethys, which existed between the supercontinents Laurasia and Gondwana. Tethys sat on a chunk of Earth's crust that slipped beneath the Eurasian plate during the breakup of Gondwana 180 million years ago. As this happened, shattered fragments of the crust sank deep into the mantle.

Around 20 million years ago, as these fragments landed in the lowermost regions of the mantle, they displaced high-density material originating from the "African blob" — a compact bubble of crystallized magma, 100 times taller than Mount Everest, that is trapped beneath Africa. Plumes of low-density magma rose to replace the dense material, diminishing the overall mass of the region and weakening its gravity.

Scientists are yet to confirm these model predictions with earthquake data, which could help to verify the existence of low-density plumes beneath the hole. Meanwhile, researchers are realizing more and more that Earth's magma is full of strange blobs, including some that were thought to be missing and have turned up in unexpected places.

And it's not just Earth — explorations of Mars, too, have revealed blobs of all shapes and sizes lurking below the planet's surface.

(Sascha Pare / LIVESCIENCE, November 22, 2024, https://www.livescience.com/planet-earth/rivers-oceans/indian-ocean-gravity-hole-the-dent-in-earths-gravitational-field-created-by-the-death-of-an-ancient-ocean)

How the Indian Ocean Geoid Low Was Formed

Debanjan Pal, Attreyee Ghosh

Abstract

The origin of the Earth's lowest geoid, the Indian Ocean geoid low (IOGL) has been controversial. The geoid predicted from present-day tomography models has shown that mid to upper mantle hot anomalies are integral in generating the IOGL. Here we assimilate plate reconstruction in global mantle convection models starting from 140 Ma and show that sinking Tethyan slabs perturbed the African Large Low Shear Velocity province and generated plumes beneath the Indian Ocean, which led to the formation of this negative geoid anomaly. We also show that this low can be reproduced by surrounding mantle density anomalies, without having them present directly beneath the geoid low. We tune the density and viscosity of thermochemical piles at core-mantle boundary, Clapeyron slope and density jump at 660 km discontinuity, and the strength of slabs, to control the rise of plumes, which in turn determine the shape and amplitude of the geoid low.

Key Points

- Employing time dependent global mantle convection models since the Cretaceous we simulate the origin of the enigmatic Indian Ocean geoid low
- Plumes forming along the edges of the African Large Low Shear Velocity province (LLSVP) control the regional geoid in the Indian Ocean
- These plumes, in turn are generated by lower mantle Tethyan slabs that perturb the African LLSVP

Plain Language Summary

The origin of the deepest geoid on Earth, the Indian Ocean geoid low (IOGL), is debated. Several competing hypotheses exist, amongst which, a recent study employing tomography models suggested that hot anomalies at mid to upper mantle depths are crucial in generating this elusive feature. Assimilating plate motion in global mantle convection models from the Mesozoic till the present day, we attempt to trace the formation of this geoid low. We show that flow induced by downwelling Tethys slabs perturbs the African Large Low Shear Velocity province and gives rise to plumes that reach the upper mantle. These plumes, along with the mantle structure in the vicinity of the geoid low, are responsible for the formation of this negative geoid anomaly. Exploring a wide model parameter space, such as the density and intrinsic viscosity of the thermochemical piles, Clapeyron slope and density jump at 660 km depth, strength of slabs, we show that plumes are integral in generating the IOGL. The contribution of lower mantle Tethys slabs is secondary but also necessary in generating this geoid low.

First published: 05 May 2023,
https://doi.org/10.1029/2022GL102694,
https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2022GL102694

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

GEO-TRENDS REVIEW

Issue #29 - November 2024
www.mygeoworld.com/geotrends/issues/29-november-2024

- **ISSMGE Bulletin Vol 18, Issue 3, September 2024 has just been published**
ISSMGE **news**, 17 Oct 2024, Read More

- **PhD in the field of Geotechnical Engineering**
Julien Babarinde Koudoro, 20 Oct 2024, Read More

- **2024 INTERNATIONAL LIFETIME ACHIEVEMENT MEDAL (ILAM)**
ISSMGE **news,** 04 Sep 2024, Read More

- **Join CEEcareers now to find your next geotech job!**
CEEcareers **CEEcareers,** 14 Aug 2024, Read More

- **2025 Geo-Challenge Competition Rules Announced**
Beena Ajmera **Geo-Wall 2025,** 12 Sep 2024, Read More

- **Sophisticated numerical analysis in geotechnical design**
ISSMGE **TC103**, 23 Aug 2024, Read More

- **Cable Anchar Drilling**
Ramnath Layak, 11 Sep 2024, Read More

- **Use of PVC Sheet Piles as a Sustainable Solution for Containment**
Renato Cantagalli, **resource**, 09 Oct 2024, Read More

- **Athanasopoulos-Zekkos awarded Interdisciplinary Cli-mate and Equity Seed Grant**
UC Berkeley Geosystems Group, **news**, 06 Nov 2024, Read More

- **TC202 Executive Group member, Dist. Prof. Buddhima Indraratna, receives Australia's Sir John Holland Civil Engineer of the Year 2024!**
ISSMGE, **news**, 02 Oct 2024, Read More

- **Exploring New Depths: The Impact of Diamond Core Drilling on Modern Engineering**
Geoengineer.org, **news**, 09 Oct 2024, Read More

- **Dilatómetro Plano (DMT) - Generalidades, Usos y Aplicaciones**
Carlos Dempsin Burbano, **resource**, 11 Sep 2024, Read More

- **Announcing the Publication of the 2024 Geotechnical Business Directory**
GeoWorld, **news**, 27 Aug 2024, Read More

- **Optimizing Soil Improvement with PLAXIS: Techniques and Benefits**
Bentley Systems, **PLAXIS**, 13 Nov 2024, Read More

- **CPT Interpretation: Soil Behavior Type (SBT)**
Geoengineer.org, **CPT**, 14 Nov 2024. Read More

- **Bearing Capacity Calculator**
Ahmad Fahmi, **resource**, 04 Oct 2024, Read More

- **Global Geotechnical Engineering Software Industry to Witness Exponential Growth by 2032**
Geoengineer.org, **news**, 13 Sep 2024, Read More

- **ISSMGE Interactive Technical Talk Episode 20: Scour and Erosion (TC213)**
ISSMGE, **ISSMGE ITT**, 14 Oct 2024, Read More

- **Extension of New Dry Dock-II at Marine Dockyard**
PR. VIJAY, 04 Oct 2024, Read More

- **TC219 Seminar on Resilience Evaluation in Geotechnical Engineering**
ISSMGE, **TC219**, 10 Nov 2024, Read More

- **Site Inspection on Hiritano Highway, Papua New Guinea**
Issac Stanley, 03 Sep 2024, Read More

- **ECPMG 2024 proceedings are now available**
ISSMGE, **news**, 03 Oct 2024, Read More

- **Which software do you use for geotechnical data management?**
DCOdes.io, **survey**, 10 Oct 2024, Participate Now

- **Influence the Geotechnical Confidence Index Results for 2024 Q4!**
GeoWorld, Learn more

- **Light weight dynamic cone penetrometor, for testing and evaluating field bearing capacity**
NIYOMFURA EGIDE, 24 Aug 2024, Read More

- **Opening of Paper Submission to ICSE-12**
ISSMGE, **news**, 29 Oct 2024, Read More

- **ISSMGE Interactive Technical Talk Episode 19: Numerical Methods (TC103)**
ISSMGE, **ISSMGE ITT**, 23 Aug 2024, Read More

- **Richmond Homes Collapse: A Geotechnical Failure with Serious Implications**
Geoengineer.org, **news**, 20 Sep 2024, Read More

- **Dimitrios Zekkos selected as the 21st Jennings Memorial Lecturer by the South African Institution of Civil Engineers**
UC Berkeley Geosystems Group, **news**, 20 Oct 2024, Read More

- **Normas Técnicas Complementarias del Reglamento de Construcción del Distrito Federal para el Diseño y Construcción de Cimentaciones**
Rafael Ortiz hernandez, **resource**, 19 Sep 2024, Read More

International Journal of Geoengineering Case Histories

Latest Published Case History Papers

Monitoring and Process Control of Deep Vertical Vibratory Compaction Using Resonance Amplification *Massarsch, K.*

Compaction trials using deep vertical vibratory compaction in a hydraulic fill are reported. The compaction system consisted of a vibrator with variable frequency and a flexible, double Y-shaped probe. Openings in the probe reduced the dynamic weight and enhanced the probe-ground interaction. The co... Read More

MSE Wall Behavior during Large Truck Impact at High Speed against Barrier on Top of Wall *BRIAUD, J.*

Some 45 years ago the total number of annual deaths on US roadways was slightly over 50,000. In 2020, this number has been reduced to less than 39,000 even while the number of kilometers traveled has almost doubled. One of the major contributing factors to this life-saving improvement is the develop... Read More

Large Diameter TBM Tunnelling Beneath New Reclamation *Lee, S., Leung, C., Cheung, C., Wijesooriya, T., Schwob, A.*

The Tuen Mun-Chek Lap Kok Link (TMCLKL) project successfully completed a 14 m diameter slurry mix-shield tunnel boring machine (TBM) tunnelling in Alluvium, beneath a recently reclaimed land. The in situ clayey Marine Deposits and Alluvium were subject to ongoing consolidation and creep settlements ... Read More

Influence of Increased Confining Stress on Undrained Behavior of Tailings: A Case History at the Candelaria Mine *Robertson, P. K., Brouwer, K., Sully, T. E., Gagnon, A.*

Recent failures of mine tailings structures in Brazil have highlighted the importance of the undrained behavior of loose tailings. Loose, saturated tailings can experience significant and rapid strength loss if triggered to behave undrained under shear, and this process has been described as either ... Read More

Post-Liquefaction Free-Field Ground Settlement Case Histories *Olaya, F. R., Bray, J. D.*

Liquefaction-induced ground settlement is a complex process resulting from the combined effects of particle sedimentation and soil reconsolidation due to post-shaking dissipation of excess pore-water pressure. Current empirical models are based on a limited number of field case histories. Consequent... Read More

Probabilistic Assessment and Comparison of Scour Protections at Horns Rev 3 and Egmond aan Zee Offshore Wind Farms *Chambel, J., Fazeres-Ferradosa, T., Figueiredo, R., Rosa-Santos, P., Pinto, F. T.*

Offshore wind foundations have seen a remarkable growth in over the last three decades. Up to date, this growth has been mainly registered in North Sea locations, where water depths do not exceed 30 m and monopile diameters typically range between 4 to 9 m. In these cases, scour phenomena can be a m... Read More

Bridge Abutment Remediation – A Case Study *Sundaram, M., Sugawara, J., Sivakumar, S.*

Record-breaking rainfall events in parts of eastern Australia—particularly, most recently, in Queensland—resulted in severe flooding and property damage. Transport and Main Roads assets were not spared from destruction caused by these events. The severe rainfall and flooding resulted in ... Read More

Coastal Road Slope Collapses Behind a Retaining Wall Due to Scour and Erosion *Tsubokawa, R., Iida, Y., Ushiwatari, Y., Matsuda, T., Ochi, M., Miyatake, M., Sassa, S.*

The present study investigates the coastal road slope disasters that took place in December 2014 and in November 2021 in Hokkaido, Japan. The coastal disasters represent collapses behind the retaining walls under high wave conditions. The results of the field investigations demonstrate that the exte... Read More

IGS NEWSLETTER – November 2024

Κυκλοφόρησε το IGS Newsletter της International Geosynthetics Society με τα ακόλουθα περιεχόμενα:

Helping the world understand the appropriate value and use of geosynthetics

www.geosyntheticssociety.org/newsletters

- TC-S WORKSHOP: Sustainable Geosynthetic Solutions to Transportation Geotechnical Problems 19 November 2024, Sydney, Australia, READ MORE; REGISTER HERE
- GeoAsia8 Conference Topics Revealed REGISTER; READ MORE
- Diversity Spotlight At Next EuroGeo Conference REGISTER; READ MORE
- CORPORATE COMMITTEE GENERAL MEETING
  - Meeting Option #1: Wednesday, 13 November 2024
    Register
  - Meeting Option #2: Tuesday, 3 December 2024
    Register
- 10 Questions With… Vivi Anggraini READ MORE
- 10 Questions With… IGS India READ MORE
- Work Experience Success For Latest Job Shadowing Cohort READ MORE
- Geo-Disaster Solutions Examined At Italy Conference READ MORE
- Could Your Chapter Host GeoAsia 2029? READ MORE
- Watch The Latest IGS Videos
  - IGS 10 Minutes With ... Sandra Pouliot READ MORE
  - 10 Minutes With… Beth Gross READ MORE

- Businesses – Share Your Sustainability Success Stories READ MORE, SUBMIT HERE
- 13th International Conference on Geosynthetics
- Upcoming Events
  - 5th International Conference on Transportation Geotechnics (ICTG2024) READ MORE
  - IGS Accredits Geotechnical Frontiers Conference REGISTER, READ MORE
  - IV Romanian Conference on Geosynthetics (GeoSint 2025) 3 – 4 April 2025, in Bucharest, Romania. READ MORE
  - GeoAsia 8 10-13 June 2025, in Brisbane, Australia. www.geoasia8.org
  - EuroGeo 8 15-18 Sept 2025, in Lille, France. www.eurogeo8.org
- Calendar of Events

Deep Foundations Institute

Deep Foundations
www.nxtbook.com/dfi/DEEP-FOUNDATIONS/november-december-2024

Highlights of the Nov/Dec Issue

- Cover Story — Low Carbon Initiatives at Euston Station
- Should the Industry Care About Scope 3?
- Enhancing Deep Foundation Practices in DOT Projects
- Contract Documents of The Future
- Future Forward: Industry Roundtable
- Member Profile: PennDOT Engineer Sarah McInnes, P.E., Loves What She Does
- Foundations for a Sustainable Future: Carbon Footprint Calculated for Driven Pipe Piles
  Micropiles and Helical Piles
- Legally Speaking: Playing Catch Up: The Purpose and Value of Geotechnical Baseline Reports

ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ ΕΕΕΕΓΜ (2023 – 2026)

Πρόεδρος	:	Μιχάλης ΜΠΑΡΔΑΝΗΣ, Δρ. Πολιτικός Μηχανικός, ΕΔΑΦΟΣ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Α.Ε. mbardanis@edafos.gr, lab@edafos.gr
Α' Αντιπρόεδρος	:	Σταυρούλα ΚΟΝΤΟΕ, Δρ. Πολιτικός Μηχανικός, Αναπληρώτρια Καθηγήτρια Τμήμα Πολιτικών Μηχανικών Πανεπιστήμιο Πατρών skontoe@upatras.gr
Β' Αντιπρόεδρος	:	Νίκος ΚΛΗΜΗΣ, Δρ. Πολιτικός Μηχανικός, Καθηγητής Τμήμα Πολιτικών Μηχανικών, Πολυτεχνική Σχολή, Δημοκρίτειο Πανεπιστήμιο Θράκης nklimis@civil.duth.gr, nsklimis@gmail.com
Γενικός Γραμματέας	:	Γιώργος ΜΠΕΛΟΚΑΣ, Δρ. Πολιτικός Μηχανικός, Επίκουρος Καθηγητής Τμήμα Πολιτικών Μηχανικών Σχολή Μηχανικών Πανεπιστημίου Δυτικής Αττικής gbelokas@uniwa.gr, gbelokas@gmail.com
Ταμίας	:	Γιάννης ΖΕΥΓΩΛΗΣ, Δρ. Μηχανικός Μεταλλείων - Μεταλλουργός, Αναπληρωτής Καθηγητής Σχολή Μεταλλειολόγων - Μεταλλουργών Μηχανικών ΕΜΠ izevgolis@metal.ntua.gr
Έφορος	:	Τάσος ΑΝΑΣΤΑΣΙΑΔΗΣ, Δρ. Πολιτικός Μηχανικός, Καθηγητής Τμήμα Πολιτικών Μηχανικών Αριστο-Τελείου Πανεπιστημίου Θεσσαλονίκης anas@civil.auth.gr
Μέλη	:	Γιώργος ΝΤΟΥΛΗΣ, Πολιτικός Μηχανικός, ΕΔΑΦΟΜΗΧΑΝΙΚΗ Α.Ε.- ΓΕΩΤΕΧΝΙΚΕΣ ΜΕΛΕΤΕΣ Α.Ε. gdoulis@edafomichaniki.gr Μαρίνα ΠΑΝΤΑΖΙΔΟΥ, Δρ. Πολιτικός Μηχανικός, Αναπληρώτρια Καθηγήτρια Σχολή Πολιτικών Μηχανικών Ε.Μ.Π. mpanta@central.ntua.gr Χρήστος ΤΣΑΤΣΑΝΙΦΟΣ, Δρ. Πολιτικός Μηχανικός, ΠΑΝΓΑΙΑ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Ε.Π.Ε. editor@hssmge.gr, ctsatsanifos@pangaea.gr
Αναπληρωματικά Μέλη	:	Δημήτρης ΠΙΤΙΛΑΚΗΣ, Δρ. Πολιτικός Μηχανικός, Αναπληρωτής Καθηγητής Τμήμα Πολιτικών Μηχανικών Αριστοτελείου Πανεπιστημίου Θεσσαλονίκης dpitilakis@civil.auth.gr Χρήστος ΣΤΡΑΤΑΚΟΣ, Πολιτικός Μηχανικός, NAMALAB Α.Ε. stratakos@namalab.gr Χάρης ΛΑΜΑΡΗΣ, Πολιτικός Μηχανικός, ΧΑΡΗΣ Π. ΛΑΜΑΡΗΣ ΚΑΙ ΣΥΝΕΡΓΑΤΕΣ ΙΚΕ h.lamaris@lamaris.gr Πρόδρομος ΨΑΡΡΟΠΟΥΛΟΣ, Δρ. Πολιτικός Μηχανικός prod@central.ntua.gr
Εκδότης	:	Χρήστος ΤΣΑΤΣΑΝΙΦΟΣ, Δρ. Πολιτικός Μηχανικός, ΠΑΝΓΑΙΑ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Ε.Π.Ε. editor@hssmge.gr, ctsatsanifos@pangaea.gr

ΕΕΕΕΓΜ

Τομέας Γεωτεχνικής
ΣΧΟΛΗ ΠΟΛΙΤΙΚΩΝ ΜΗΧΑΝΙΚΩΝ
ΕΘΝΙΚΟΥ ΜΕΤΣΟΒΙΟΥ ΠΟΛΥΤΕΧΝΕΙΟΥ
Πολυτεχνειούπολη Ζωγράφου
15780 ΖΩΓΡΑΦΟΥ

Τηλ. 210.7723434
Τοτ. 210.7723428
Ηλ-Δι. secretariat@hssmge.gr ,
geotech@central.ntua.gr
Ιστοσελίδα www.hssmge.org (υπό κατασκευή)

«ΤΑ ΝΕΑ ΤΗΣ ΕΕΕΕΓΜ» Εκδότης: Χρήστος Τσατσανίφος, τηλ. 210.6929484, τοτ. 210.6928137, ηλ-δι. ctsatsanifos@pangaea.gr, editor@hssmge.gr, info@pangaea.gr

«ΤΑ ΝΕΑ ΤΗΣ ΕΕΕΕΓΜ» «αναρτώνται» και στην ιστοσελίδα www.hssmge.gr