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Women in Engineering
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ΑΡΘΡΑ

Understanding fatal landslides at global scales

In our new open access paper, published in Natural Hazards (Fidan et al 2024) we seek to understand further patterns of fatal landslides

Dave Petley

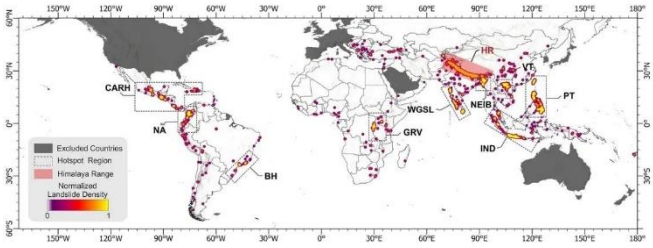
Over a long period of time, I collected data on landslides that kill people around the world – work that started on a whim but became very interesting. My two most cited papers are on this topic.

Due to the pressures of my leadership career, I stopped this data collection in 2016, although I have no restarted and am collecting data for 2024 that is already proving to be interesting. But work continues on our original dataset, especially in combination with other open access sources of data.

We have just published the latest version of these analyses in the journal Natural Hazards (Fidan *et al.* 2024), work that has been led by Seçkin Fidan from Ankara University in Turkey. This uses the data that was described in Froude and Petley (2018), which is the global dataset for the period from 2004 to 2016 inclusive. The interesting aspect of this new piece of work is that it looks patterns of fatal landslides against other potential factors, such as climate, population density and per capita GDP. The paper is open access, so you can take a look for yourself.

In line with my work with Melanie Froude (Froude and Petley 2018), one aspect of this study is to compare landslides that were triggered by "natural" processes (i.e. rainfall) from those triggered by human activities (mining, road construction and suchlike). In both cases most fatal landslides occur in the mountains of areas that are either tropical or temperate in terms of climate. The map in this diagram from the paper, which plots landslide density for the parts of the world most affected by such events:-

The global distribution of fatal landslide density for those parts of the world worst affected by such events. Credit: Fidan et al. (2024)



The map identifies the major hotspot areas, most notably the Himalaya range, but a number of other regions as well.

But most interestingly, natural and anthropogenic landslides have quite different characteristics. So, for example, fatal landslides triggered by natural variables generally tend to occur in the highest portions of the topographic profile (i.e. at higher elevations in the mountain chain), where there is less human disturbance. Local slope gradients tend to be steep.

On the other hand, anthropogenic fatal landslides cluster at much lower elevation on slopes in which the local gradients are less steep, but human intervention is higher.

There is much more work to do on these datasets, especially in light of continued changes to climate, the land surface and the population on a global and regional scale. I'm hoping to be able to post about fatal landslides in the early part of 2024 in the near future.

References

Froude M.J. and Petley D.N. 2018. Global fatal landslide occurrence from 2004 to 2016. *Natural Hazards and Earth System Science* **18**, 2161-2181. https://doi.org/10.5194/nhess-18-2161-2018

Fidan, S., Tanyaş, H., Akbaş, A. *et al.* 2024. Understanding fatal landslides at global scales: a summary of topographic, climatic, and anthropogenic perspectives. *Natural Hazards* (2024). https://doi.org/10.1007/s11069-024-06487-3

(Dave Petley / THE LANDASLIDE BLOG, 4 March 2024, https://eos.org/thelandslideblog/fatal-landslides-1)

Fatal landslides in 2024 to date

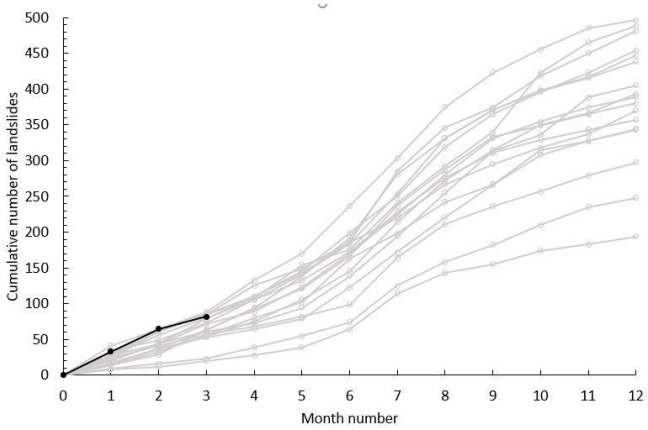
A quick analysis of fatal landslides in 2024 to date indicates that the totals so far are higher than would be expected.

Dave Petley

I have been looking at my data for fatal landslides in 2024, a resumption of work that I have been doing for many years but that fell into abeyance for a while as I developed my leadership career.

As of today, I have recorded 82 landslides that have caused loss of life in 2024, with 583 deaths.

It is interesting to compare this with previous years. The graph below shows monthly totals for fatal landslides back through the dataset, which includes the years 2003 to 2019 – note that this is a longer dataset than was reported in Froude and Petley (2018), and 2024. Clearly month 1 in January, month 2 is February, etc.:-

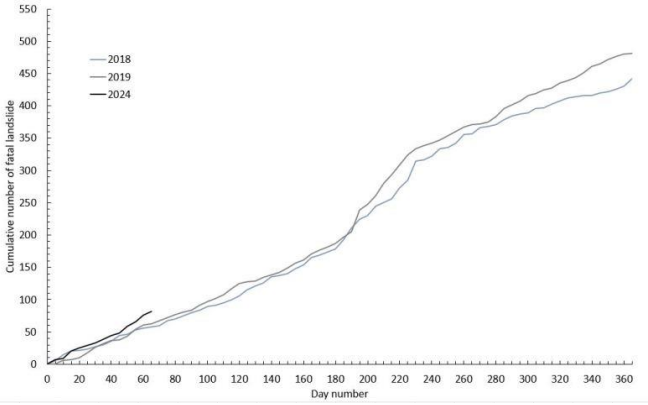


Fatal landslides for the period 2003 to 2019 (grey lines), plus 2024 to date in black.

The 2024 total for March is for the first 11 days of the month, so this total will rise substantially over the next two weeks.

The data show that 2024 has totals that are at, or near to, the top of the historic distribution. Indeed, the total at the end of February (65) was the highest total recorded over the entire study period. If there is another 12 landslides in March this year (over and above the current cumulative total of 82 fatal landslides), which seems likely, then it will set the record for March too. I should add that this year's total does not include landslides triggered by the January 2024 earthquake in Japan, which triggered fatal failures. I will account for this separately in due course, if the data is available.

Another way to look at this data is by looking at pentads – five day blocks – and again plotting with time. The graph below shows this data for 2018, 2019 and 2024:-



Fatal landslides plotted by pentad for 2018, 2019 and 2024.

The pentad graph also shows that 2024 is experiencing a high level of fatal landslides compared with most previous years. The next job is try to understand why – is this because of the current El Nino event, for example, which has changed rainfall patterns? Or is it just a random variation? Or perhaps it's an anthropogenic effect?

To understand that, further analysis is going to be needed. Where have they occurred? What was the trigger?

Considerable interesting work to do!

Reference

Froude, M. and Petley, D.N. 2018. Global fatal landslide occurrence from 2004 to 2016. *Natural Hazards and Earth System Sciences* **18**, 2161-2181.

(Dave Petley / THE LANDSLIDE BLOG, 12 March 2024, https://eos.org/thelandslideblog/fatal-landslides-1-2)

GNS Science Landslide Planning Guidance

A brilliant new set of planning guidelines to manage landslide risk in New Zealand has much wider applicability.

Dave Petley

Shallow landslides in New Zealand Credit: Dave Petley

New Zealand is a country with a severe level of landslide hazard, resulting from a combination of the tectonic setting, the geology, the climate and the impact of human activities. It is estimated that landslides cost the country NZ$250 million per annum, and there has been a host of high profile landslide incidents in recent years, including severe damage to major roads and the main railway line from the 2016 Kaikoura Earthquake and huge numbers of landslides triggered by Cyclone Gabrielle in February 2023.

To manage the risk, GNS Science has released a new version of its Landslide Planning Guidance, which is available online. GNS Science has also released a very good video to introduce the guidelines:-

https://www.youtube.com/watch?v=UVU3bOygT9U

There is also an online webinar that provides further detail about the Landslide Planning Guidance:-

https://www.youtube.com/watch?v=c8JpLhAV2j0&t=4s

Whilst the guidance is clearly specific to New Zealand, there is much here that is of use more widely. I would particularly recommend Chapter 4, which covers landslide susceptibility, hazard and risk analysis. Much of this work was developed in the aftermath of the Christchurch Earthquakes, and has been refined subsequently. It is the most brilliant exposition of practical landslide risk analysis that I have seen.

In addition, the planning tools section (chapter 6) is a really useful guide to management of the hazard, and thus reduction of risk. It has applicability much more widely, and this is supplemented in Chapter 7 with a set of examples.

In the week in which the Oso landslide in Washington State, USA is much in the news (tomorrow it will be a decade since that accident, which killed 43 people), this sort of document is immensely useful. It is worth remembering that a 1997 report for the US Army Corps of Engineers warned of "the potential for a large catastrophic failure". Despite this, new houses were constructed below the landslide that were subsequently destroyed, with significant loss of life.

Landslide Planning Guidance of the type produced by GNS Science can be a significant step towards reducing such incidents.

(Dave Petley / THE LANDSLIDE BLOG, 21 March 2024, https://eos.org/thelandslideblog/landslide-planning-guidance)

New Observational Material about Seismic and Non-Seismic Tsunamis in Greece and Surrounding Areas from 1900 to 2023

Ioanna Triantafyllou and Gerassimos A. Papadopoulos

Abstract: A new set of observations has been compiled for tsunamis occurring in Greece and in the surrounding areas from 1900 to 2023. A variety of information sources has been collected and examined, including scientific and press reports, books, eyewitness accounts, pictorial and video material, and tide-gauge records. New material was also collected during our field surveys in the islands of Cephalonia, Karpathos, and Kos. Our investigation included 26 distinct events and revealed several tsunamis. The majority of them have remained unknown so far in the tsunami community. Our compilation also included little-known events for which further documentation has been provided. Among others, of particular importance is the collection of new information about the well-known tsunami associated with the 9 February 1948 large earthquake in Karpathos Island as well as the unknown so far series of local but powerful tsunamis generated during the seismic crisis of very strong earth-quakes that destroyed the Ionian islands during August 1953. The new observational material collected is significant for the enrichment of existing tsunami catalogs with positive implications for better understanding the tsunami generation mechanisms and the assessment of tsunami hazards and risks.

1. Introduction

The region of Greece and the surrounding areas, including western Turkey (Figure 1), is characterized by the highest rate of tsunami generation in the Mediterranean Sea, e.g., [1]. Tsunamis in that region have been produced by various source types including earthquakes, volcanic eruptions, and landslides. Efforts to compile tsunami data for Greece and western Turkey have been made since the 1950s in the aftermath of the destructive large tsunami of 9 July 1956 (Figure 1), which was produced by an earthquake of moment magnitude Mw7.7 [2] in the South Aegean Sea [3–5]. The interest in cataloging tsunamis in the region under study continued in the 1980s, but it became systematic in the frame of several coordinated research projects funded by the European Commission (EC) from the beginning of the 1990s onwards [6]. Despite these efforts, increasing new tsunami data are revealed by the ongoing research.

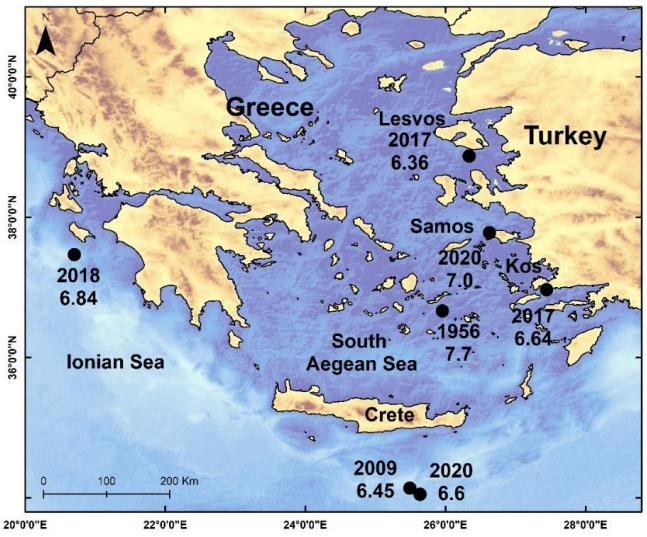


Figure 1. Map of epicenters (black circles) and moment magnitudes of the tsunamigenic earthquakes listed in Table 1. In addition, the epicenter of the large 1956 tsunamigenic earthquake, which is mentioned in the text, is also plotted. Magnitudes and epicenters are adopted from [2].

In this paper, we compiled new observational material that may imply the generation of seismic and non-seismic tsunamis occurring in Greece and in the surrounding areas in the time interval from 1900 up to 2023. However, the avail-able observational material does not always validate the characterization of an event of sea level disturbance as a "tsunami wave". Therefore, based on the collected material, we characterized each single event with a reliability index. Additionally, we assigned a respective tsunami intensity when sufficient observational data were available. Most of the identified tsunamis remained unknown or little-known so far to the tsunami community. In the last 15 years, several tsunamis have been reported in the region under study. Some of them have already been studied in specific papers (Table 1, Figure 1), and, therefore, our compilation did not include those tsunamis.

2. Tsunamigenic Sources in the Greek Region

In the Mediterranean and the connected seas, the tsunamigenic sources are distributed along certain zones ([23], Figure 2), which are controlled by the geodynamic setting and the geological features of the region. The highest tsunami potential is concentrated in the zones of the western and eastern Hellenic arc, numbered 9 and 10, respectively, i.e., along the active Hellenic Subduction Zone, where very large tsunamigenic earthquakes occurred in the past.

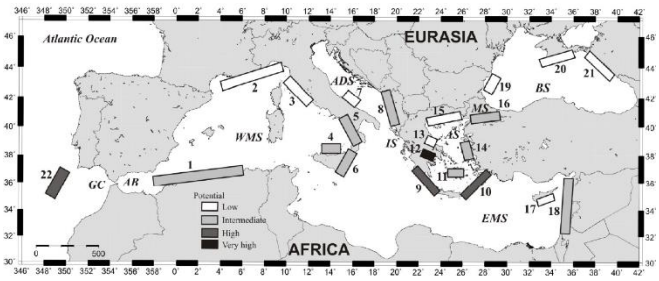


Figure 2. Tsunamigenic zones in the Mediterranean and the connected seas and their relative tsunami potential classification (after [23]): WMS = Western Mediterranean Sea, GC = Gulf of Cádiz, AB = Alboran Basin, EMS = Eastern Mediterranean Sea, AS = Aegean Sea, ADS = Adriatic Sea, IS = Ionian Sea, MS = Marmara Sea, BS = Black Sea. Zonation key: 1 = East Alboran Sea/North Algerian Margin Sea, 2 = Liguria and Côte d'Azur, 3 = Tuscany, 4 = Aeolian islands, 5 = Tyrrhenian/Calabria, 6 = Eastern Sicily and Messina Straits, 7 = Gargano, 8 = East Adriatic Sea, 9 =West Hellenic arc, 10 = East Hellenic arc, 11 = Cyclades, 12 Corinth Gulf, 13 = Maliakos Bay, 14 = East Aegean Sea, 15 = North Aegean Sea, 16 = Marmara Sea, 17 = Cyprus, 18 = Levantine Sea, 19 = Bulgaria, 20 = Crimea, 21 = East Black Sea, 22 = SW Iberia.

Of high tsunami potential is also the Corinth Gulf, zone 12 in Central Greece. The Corinth Gulf is a rapidly opening continental rift due to the N–S extensional field that tectonically dominates the area. The result of this process is a high seismicity rate, with the earthquakes taking place mainly along active fault zones trending about E–W. The tsunami rate in this zone is the highest in the entire region due to combined favoring factors, such as the high seismicity, the susceptibility to coastal and submarine landslides as well as the steep bathymetry. However, the tsunamis produced within the Corinth Gulf are local, frequently powerful, but incapable of propagating beyond the closed Gulf.

In the north Aegean Sea, the tsunami potential is low since the active tectonics of the area are characterized by strike-slip faults. Of particular interest is the area of the central Ionian Sea (IS), which is geographically situated between the tsunamigenic zones 8 and 9. In the map of Figure 2, the IS area is not categorized as a tsunamigenic zone. The reason is that no tsunami generation is known in the area, although

Table 1. List of tsunamigenic earthquakes that occurred in Greece and the surrounding areas from 2009 onwards. The respective tsunamis have been studied by several authors, as indicated in the column Ref. Key: h = hour, m = minute s = second, φ°N = latitude north, λ°E = longitude east, Mw = moment magnitude. Earthquake parameters have been adopted from [2].

Area	Date	Time h:m:s	φ°N	λ°E	M_w	Ref
Southeastern Crete Isl., Greece	1 July 2009	09:30:10	34.138	25.493	6.45	[7]
Lesvos Isl., East Aegean Sea	12 June 2017	12:28:39	38.874	26.339	6.36	[8]
Bodrum (western Turkey)-Kos Isl. (Greece), East Aegean Sea	20 July 2017	22:31:12	36.968	27.444	6.64	[9–12]
Ionian Sea, Greece, and Italy	25 October 2018	22:54:51	37.467	20.703	6.84	[13,14]
Southeastern Crete Isl., Greece	2 May 2020	12:51:09	34.05	25.64	6.6	[15–19]
Samos Isl. (Greece)-Western Turkey coast, East Aegean Sea	30 October 2020	11:51:34	37.78	26.63	7.0	[20–22]

it is characterized by very high seismicity. For example, in August 1953, a series of very strong earthquakes isolated the islands of Cephalonia, Ithaki, and Zakynthos and caused the worst seismic destruction in the modern history of Greece. Such earthquakes struck the area in previous centuries as well. The new observations collected and documented in this paper reveal that during the seismic crisis of 1953, local but powerful tsunamis were generated.

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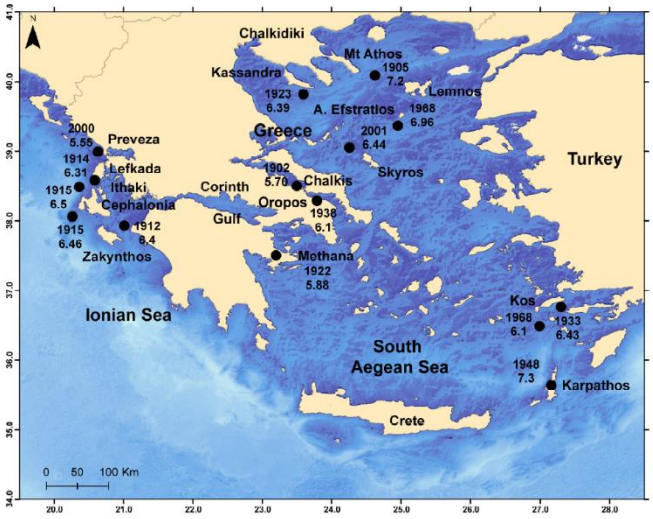

Figure 3. Map of epicenters (black circles) and moment magnitudes of tsunamigenic earthquakes examined in this paper. Magnitudes and epicenters are adopted from [2]. More details can be found in subsequent figures.

…

5. Discussion

The modern era of tsunami observations in the Mediterranean Sea started only about 15 years ago. In that period some tsunamis (Table 1) have been documented in digital tidegauge records and video shooting as well as by observations collected during post-event field surveys. For past tsunamis, a standard procedure for tsunami documentation is based on the collection of observational material from every source available, like scientific and press reports, archives, eyewitness accounts, photographs, and analog tide-gauge records.

An additional procedure is to perform retrospective field surveys in areas inundated by past tsunamis. The bulk of observations compiled in our study have been collected by following these procedures. However, observational material of such a kind is inhomogeneous and susceptible to many uncertainties. For example, usually, only rough estimations can be made about fundamental hydrodynamic features of tsunamis, such as the wave height, inundation distance, and run-up. For these reasons, the reproduction of relevant information found in the various sources examined has been made as faithfully as possible.

In some instances, the collected observations indicate event features that do not imply tsunami generation but other types of sea disturbances, e.g., standing waves or seaquakes. Therefore, an important issue is the characterization of a particular event as a real tsunami. Consequently, for each event examined, we assigned a tsunami reliability index. This practice may help future researchers to re-examine the characterization of past events.

Our observations compilation includes not only sizable but also small tsunamis, which is a practice that needs an explanation regarding its usefulness. This practice concentrated a consensus among the tsunami community involved in the compilation of the New European Tsunami Catalogue in the frame of EC-supported research projects since the beginning of the 1990s. The reason is two-fold. First, observations about small tsunamis may help in better understanding tsunami generation mechanisms. Second, the cataloging of small tsunamis is quite useful for studying the scaling of tsunami size with important implications for the tsunami hazard and risk assessment with statistical and probabilistic methods based on incomplete and uncertain tsunami catalogs, e.g., [53,54].

6. Conclusions

Previous tsunami data compilations, e.g., [1] for the study region and for the time interval extending from 1900 to 2000, list 39 events regardless of the type of tsunami sources. For example, a few meteotsunamis have also been included in such compilations. A more recent catalog [6] lists 23 events for the same region and time interval. The remaining 39 have been listed as Discarded Events since they have been either meteotsunamis or not well-documented events. In view of these considerations, we concluded that the contribution of new material for 26 sea disturbances, 21 of which have been tsunami events, is important and substantially enriches the catalog of tsunamis in the region of Greece.

Of particular significance is the new material collected for the powerful tsunami generated by the 9 February 1948 earthquake (Mw7.30) in Karpathos Isl. This tsunami is well-known from previous studies, e.g., [37]. However, tsunami numerical simulations [38] failed to reproduce adequately the observed wave heights and to dissolve the tsunami source type, i.e., seismic versus landslide. The new material collected complements the existing set of observations, provides a better basis for future simulation experiments, and may help to

clarify the tsunami generation mechanism. Of importance is also the new material collected for the tsunami phenomena associated with the sequence of very strong earthquakes that isolated the Ionian Sea islands in August 1953.

GeoHazards **2024**, 5, 233–254.
https://doi.org/10.3390/geohazards5010012

https://www.mdpi.com/journal/geohazards

Review:
On the horizontal thrust of a mass of sand
(G. Darwin, 1883)

Michael Bennett, P.E., M.ASCE (A.G.E.S., Inc., King of Prussia, PA)

In 1883, the British Empire stood unrivaled as the most powerful nation on Earth. The British Army and Royal Navy ensured that Queen Victoria's government dictated the terms of the world order, and the era known as the *Pax Britannica* was in full swing. The Union Jack flew atop flagpoles from Canada to Australia to India to Egypt, and it was little exaggeration to say that the British Empire even reigned supreme over time and space. It was during the 1880s that world leaders first defined universal systems of coordinates and time zones, and, not coincidentally, the UK wound up at the center of both systems via the Prime Meridian and Greenwich Mean Time. The Empire's power in 1883 was particularly visible in the era's scientific and technological gains, many of which came through London-based forums such as the Royal Society and the Institution of Civil Engineers, or ICE. The fruits of these advances were readily visible in the British capital. Since the mid-19th century, civil engineers had transformed London from the grim city of Dickens's novels into a modern metropolis with brick tunnels to carry sewage out to sea, embankments to control flooding on the River Thames, and a subway system to relieve urban congestion and speed travel (LTM 2024, Mann 2016).

IMAGE 1: Oxford Street, London, in the late 19th century. *Source: NPR (2015).*

One glum development in British science during the 1880s occurred in 1882 when one of the Isles' greatest-ever scientists, Charles Darwin, died. His impact on modern biology cannot be overstated, and his theory of evolution by natural selection – hugely controversial when he first introduced it – is now recognized as one of history's most important scientific discoveries. Somehow, Darwin found time to be the father both of natural selection and of 10 children, 7 of whom lived to adulthood. Victorian constraints on women's roles circumscribed what his surviving daughters, Elizabeth and Henrietta, were allowed to achieve, and little is known about Elizabeth's life, but Henrietta served ably as her father's editor and her mother's biographer. Her five surviving brothers also enjoyed successful careers. William became a respected banker, and Leonard spent years first in the British Army and then in the House of Commons. Horace founded the Cambridge Scientific Instrument Company, a prominent manufacturer of scientific equipment for generations, while Francis worked as his father's laboratory assistant and eventually became a leading plant physiologist (Berra 2013, Cambridge 2024).

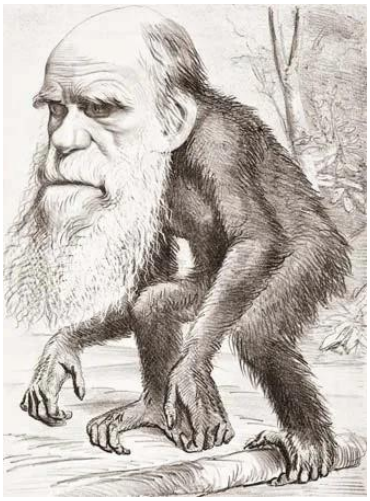

IMAGE 2: An 1871 cartoon satirizing Charles Darwin and his theory of evolution. *Source: Britannica Kids (2024).*

George, the second-oldest Darwin son, may have had the most unique career of the many distinguished and interesting paths taken by Charles and Emma Darwin's children. The polymathic George became renowned the world over as an expert on mathematics, astronomy, and tidal oceanography. Ironically, though, one of his most important contributions to scientific and engineering advancement may have come from a paper he presented to ICE in 1883 which languished for decades after its publication. The paper, entitled, "On the horizontal thrust of a mass of sand," only achieved widespread recognition when Karl Terzaghi encountered it during his pioneering research on soil mechanics in the 1910s. Terzaghi was so impressed with Darwin's work that, when he published his first major piece on the geotechnical behavior of sands in 1920, he cited his predecessor's 1883 ICE paper as a lonely bright spot in a largely unilluminated field of knowledge. Another geotechnical giant, Sir Alec Skempton, agreed with Terzaghi's high opinion of Darwin's 1883 write-up. In the 1960s, Skempton and two colleagues included Darwin's paper when they assembled a commemorative volume of prominent ICE papers on soil mechanics from the 1840s to the mid-1940s. Decades later, Sir Alec presented an overview of 35 of geotechnical engineering's most important early works at the 11th International Conference on Soil Mechanics and Foundation Engineering, held in 1985. Once again, Darwin's paper made Skempton's list (Darwin 1883, Skempton 1985, Terzaghi 1920).

Within his 1883 paper, George Darwin clearly followed the six steps of the research process which are colloquially known as the scientific method. Elementary and middle school students often learn these steps using the mnemonic "Pretty red heads eat animal crackers," signifying Problem, Research, Hypothesis, Experiment, Analysis, and Conclusion. In the late 1870s, Darwin identified his research problem when he noted that extant theories of lateral earth pressure failed to adequately explain the mechanics of sand behavior. It turned out that scant research had been done on the issue, leaving him little to review and next to nothing on which to base a hypothesis. Darwin therefore went directly from formulating his problem to beginning his experiments. He selected a sand with an angle of repose of roughly 35º – the internal

friction angle of soil, the analogous property in modern geotechnical practice, had yet to be defined – and assembling an apparatus to measure the sand's "thrust," now known as its active lateral earth pressure (Darwin 1883).

IMAGE 3: George Darwin in his early professional years.
Source: Amazon (2024).

Darwin's apparatus has long since been superseded but remains strikingly simple, ingenious, and technically sound. It consisted of a cubic wooden box measuring 14 inches high, 12 inches long, and 8.5 inches wide and having an open top. Three sides of the box were secured directly to the bottom, but the fourth was a door which could fall outward around a bottom hinge. As Darwin filled the box with sand before each of his experiments, he kept the door in place using an external bolt and a wire connecting the top of the door to a spring scale. Once Darwin had filled the box, he pulled the wire taut and carefully removed the bolt. He then gradually reduced the tension on the wire until the sand underwent active earth failure by pushing the door outward. At the instant (or, for less distinct cases, instants) the sand failed, Darwin noted the reading on the spring scale. Later, he used this reading to compute the force on the door at failure. Darwin minimized the influence on his results of friction between the sand and the wooden box by painstakingly gluing sand to the door. In modern geotechnical parlance, this meant that he set the interface friction angle, δ, between the sand and the box equal to the sand's internal friction angle, φ', making his results simpler to analyze (Darwin 1883).

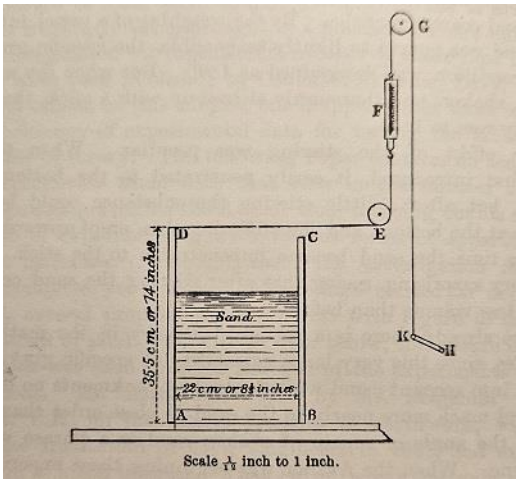

IMAGE 4: George Darwin's apparatus for measuring the active lateral earth pressure of sand in various states.
Source: Darwin (1883).

Next, Darwin spent months experimenting with the effect of the depth and configuration of the sand on its active lateral earth pressure at failure. During his experiments, Darwin assessed the behavior of sand placed in layers in the box in six distinct configurations. For the first two configurations, Darwin placed horizontal sand layers in the box. Darwin either placed the layers loosely without compaction (Series 1) or densified them by rodding after he placed them (Series 2). For the next two configurations, Darwin placed sand layers in the box at the sand's angle of repose and sloping either downward (Series 3) or upward (Series 4) from the box's door. For these states, he leveled the top of the sand after placement in the box. For the final two states, Darwin again placed the sand layers in the box at the sand's angle of repose and sloping either downward (Series 5) or upward (Series 6) from the box's door. For these states, however, Darwin did not level the top of the sand after placement in the box. Darwin performed several dozen tests using each configuration (Darwin 1883).

After finishing his tests, Darwin analyzed his experimental data by calculating regression functions for each of the six series. Francis Galton, the father of modern statistics, was only beginning to develop such regression techniques in the late 1870s as George Darwin toiled on his experiments. Francis, ironically, was George's half-cousin, and the family connection could have aided Darwin in his data analysis. He eventually determined that he could fit a regression function to the data from each configuration to express the tension in the cable at failure, T, in terms of the cube of the depth of sand in the box, l. 21st-century readers might find Darwin's derivation of the function somewhat tough to follow, which is understandable in hindsight. Both statistical regression and Mohr's circle were still being developed in the late 1870s, and modern geotechnical analyses lay decades away. However, Sir Alec Skempton noted in his presentation on landmark papers in early geotechnical engineering that Darwin's intricate cubic regression functions can be stream-lined using modern soil mechanics to $T = Ka \times \cos(\delta) \times l^3$, where Ka is the coefficient of active lateral earth pressure and T, δ, and l remain as defined previously (Gillham 2009, McCarty 1947, Skempton 1985).

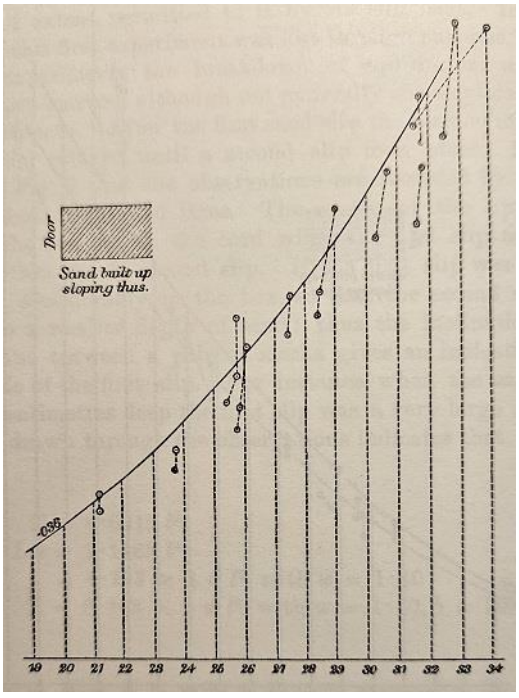

IMAGE 5: Plot of Darwin's regression function for his Series 4 data (sand layers sloping upward from door, top of sand leveled). The X-axis variable, l, is measured in cm.
Source: Darwin (1883).

Finally, Darwin analyzed the values of the Ka × cos (δ) coefficients from his six sand configurations. He first compared his coefficients from the four configurations involving level backfill against the door – 0.180 for Series 1, 0.132 for Series 2, 0.165 for Series 3, and 0.189 for Series 4 – to the active failure coefficients predicted for sand with an angle of repose of 35º by the Rankine (0.271) and Boussinesq (0.199) theories. Darwin quickly concluded that Rankine's coefficient was too much higher than his own results to be reliable and that, for his analyses, the theory could be "safely neglected." The disparity arises from the assumption in Rankine theory of zero friction between a retaining wall and the soil behind it – a faulty premise for assessing Darwin's experiments (Darwin 1883).

Darwin also noted that the difference between his and Boussinesq's coefficient values, while smaller, remained too large to "be fairly put down to errors of observation." He chalked this discrepancy up to the assumptions inherent in Boussinesq's theory and derived a new equation for the coefficient. Darwin assumed within his derivation that the horizontal pressure of a mass of sand could be estimated using a hydrostatic approximation and that the wedge of sand immediately behind the wall (or door) was supported entirely by sand-wall interface friction and the remainder of the mass of sand. From these premises, Darwin derived a new expression for the Ka × cos(δ) coefficient. He found that his equation gave values comparable to his experimental results not only for Series 1 through 4 but also for Series 5 and 6 – neither of which could be accurately evaluated using Rankine or Boussinesq theory (Darwin 1883).

Darwin then closed his analysis by examining the considerable difference in coefficient values between Series 1 and 2. He posited that the density of the sand was the primary driver of this difference, since moving tightly packed sand grains would require more energy than moving loose sand grains. "The coefficient of internal friction of sand is a function … not merely of the pressure then existing," Darwin concluded, "but also of the pressure and shaking to which at some previous period that portion of the mass of sand has been subjected." He thus simply yet elegantly recognized the influence of relative density and stress history on sand behavior, and both concepts remain fundamental to understanding the soil mechanics of sands nearly 150 years later. Darwin also concluded that, during his testing of dense sand layers in Series 2, the sand must have had to – in his words – "unsettle" during failure by rotating and briefly occupying a larger volume. Later experiments involving triaxial testing on dense sands would bear him out, and modern geoprofessionals refer to this phenomenon as dilatancy (Darwin 1883).

George Darwin noted that he had been "interrupted by other occupations" after finishing his regimen of lateral earth pressure experiments with sands and had taken his research no further; unfortunately for posterity, he never did. However, the published discussion of his write-up among members of ICE in 1883 reflects that Joseph Boussinesq himself extended Darwin's work just a bit further. Boussinesq back-calculated angles of repose for Darwin's loose Series 1 sand (37º) and dense Series 2 sand (43º) and thereby made explicit Darwin's implied conclusion that the sand's angle of repose was directly related to its relative density. This principle, modified to consider internal friction angle instead of angle of repose, remains a linchpin of geotechnical practice. Darwin's work would pay dividends again decades later when Karl Terzaghi began taking the next steps toward understanding the geotechnical behavior of sands and used Darwin's data to supplement his own experimental results. Clearly, and rather appropriately, George Darwin – son of the first champion of the theory of evolution – wound up playing a key role in the evolution of geotechnical engineering (Darwin 1883, Skempton 1985, Terzaghi 1920).

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https://geoinstitute.org/news/darwinian-link-geotechnical-engineering

9 of the longest underwater tunnels in the world

IE explores nine of the world's longest underwater tunnels — each a testament to engineering skill.

Travel down some of the world's longest underwater tunnels. Oleh_Slobodeniuk / iStock

- Underwater tunnels act like roads built underwater.
- Creating underwater tunnels poses unique engineering challenges.
- These examples highlight that underwater tunnels can serve purposes beyond transportation.

Numerous underwater tunnels have been constructed worldwide, serving as vital links in regional infrastructure.

Let's discover some of the world's longest underwater tunnels and see how they showcase human ingenuity.

1. Seikan Tunnel

Entrance to the Seikan Tunnel from the Honshu side. Bmazerolles / Wikimedia Commons

Linking Japan's Honshu and Hokkaido islands, the Seikan Tunnel is the world's longest undersea rail tunnel (by overall length). Its origin traces back to 1954, when ferries were the main form of transport between Honshu and Hokkaido.

However, when a devastating typhoon claimed 1,430 lives in the Tsugaru Strait in 1954, engineers sought a safer path and, considering unpredictable weather, built a tunnel instead of a bridge to link the islands.

This extensive tunnel was completed in 1988, stretching an impressive 33.46 miles (53.85 kilometers) and about 790 feet (240 meters) below sea level. The tunnel includes two stations: Tappi Kaitei on Honshu Island and Yoshioka Kaitei on Hokkaido Island. These stations are the first railway stations constructed under the sea and serve as emergency escape points in case of a disaster.

Today, the Seikan Tunnel mainly handles freight trains, making the tunnel a crucial hub for transporting agricultural goods via freight trains.

2. Channel Tunnel

The Channel Tunnel under construction. Tambo / Wikimedia Commons

The Channel Tunnel, nicknamed the Chunnel, spans 31.35 miles (50.49 kilometers) and links Folkestone, England, with Coquelles, France, underneath the English Channel at the Straits of Dover.

The UK and France agreed to create the Channel Tunnel in 1986, opting for a rail tunnel instead of a long bridge or a combination of road and rail to connect the two countries.

British Prime Minister Margaret Thatcher originally wanted a road tunnel rather than a railway service, possibly because cars "represented freedom and individualism." However, a road tunnel was deemed too dangerous — it would have been extremely difficult to rescue people trapped in a pileup 15 miles (24 kilometers) out at sea.

Construction began on both sides of the Straits of Dover in 1987–88, concluding in 1991, with the tunnel officially opening on May 6, 1994. Today, it carries more than 10 million passengers annually and more than 1.6 million trucks on its rail-based shuttle service.

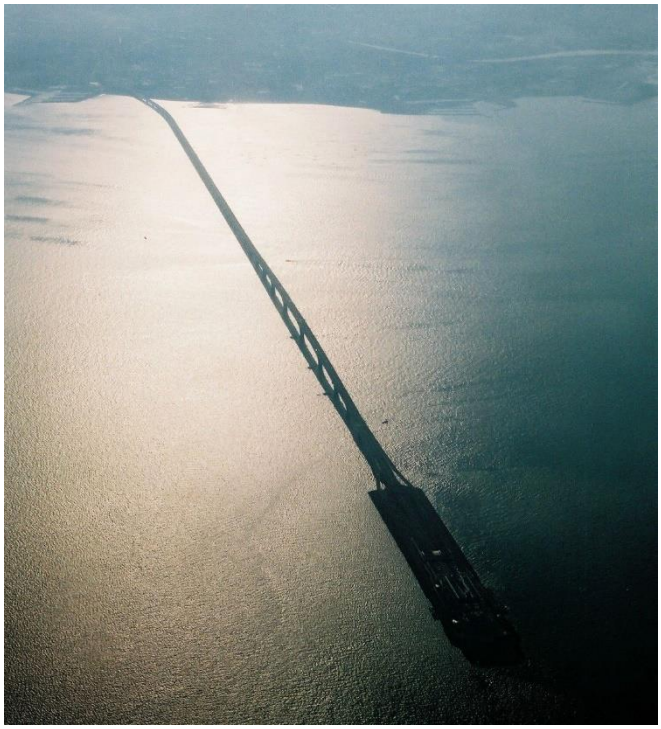
The design of the Channel Tunnel incorporates two single-track rail tunnels and one service tunnel, facilitating bi-directional traffic.

3. Tokyo Bay Aqua-Line

The Tokyo Bay Aqua-Line integrates road and rail through a 5.9-mile (9.6-kilometer) tunnel (with a total length of 14.7 miles, or 23.7 km) connecting Kawasaki and Kisarazu across Tokyo Bay in Japan. Opened on December 18, 1997, its route includes artificial island sections for a unique travel experience.

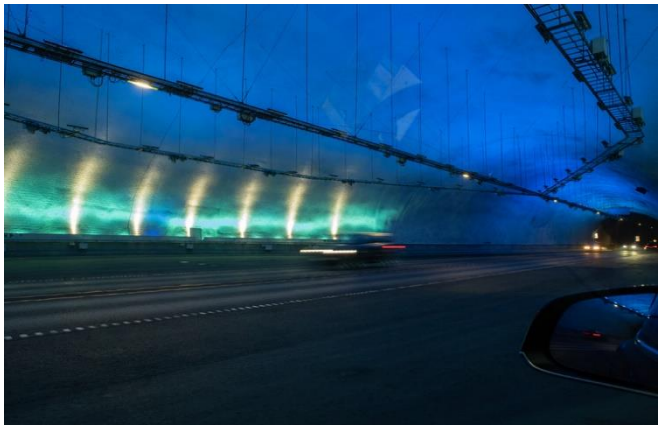
Comprising two 10-kilometer (2.6 miles)-long tunnels (Aqua Tunnel) beneath Kawasaki waters and a 5-kilometer (3.1 miles)-long bridge (Aqua Bridge) over Chiba waters, the expressway features two artificial islands, including "Umihotaru," which stands out as Japan's first marine rest area, strategically placed to transition the expressway from tunnels to bridges.

In addition, a tunnel ventilation tower named "Kazenotou" (Tower of Wind) is located on the artificial island in the midsection of the undersea tunnel. The pyramid-shaped Ukishima Ventilation Station near the tunnel entrance on the Kawasaki side complements the overall design.



A bridge section of the Tokyo Bay Aqua Line. Hideyuki KAMON / Wikimedia Commons

4. Ryfast Tunnel



Inside the Ryfast tunnel in Stavanger, Norway. Maurizio Fabbroni

Located in Rogaland County, Norway, the Ryfast Tunnel System consists of two tunnels with a combined length of 8.9 miles (14.3 kilometers) beneath the sea.

The system includes two dual-lane tunnels: the Solbakk or Ryfylke tunnel, running from Solbakk to the island of Hundvag in Stavanger, and the Hundvag tunnel, connecting Hundvag to an underground tunneled highway interchange with the E39 Eiganes tunnel. As a part of the European Route E39 highway, the Ryfast Tunnel connects the towns of Strand and Hjelmeland.

The construction of the tunnel system spanned a decade and involved excavating more than 88 million cubic feet (2.5 million cubic meters) of rock. Ryfast Tunnel holds the record as the world's deepest subsea road tunnel, reaching a maximum depth of 958 feet (292 meters) below sea level. Opened in 2020, the tunnel system serves as a replacement for the Høgsfjorden ferry crossing.

5. Eysturoyartunnilin

Underwater roundabout in the tunnel. Kristina Háfoss/Twitter

Opened in 2020, the Eysturoyartunnilin, known as the Eysturoy tunnel, spans an impressive 6.9 miles (11.2 kilometers) beneath the North Atlantic Ocean. It connects the two largest of the Faroe Islands, Streymoy and Eysturoy.

At its deepest point, this sub-sea passageway is 613.5 feet (189 meters) beneath the seabed. It features a unique network of three tubes; however, the most interesting part is the colorful intersection at its center—the world's first and only sub-sea roundabout, famously named the "jellyfish roundabout."

This underwater roundabout is a remarkable engineering feat and a feast for the senses, lit with captivating multicolored lights and featuring a sculpture and accompanying music.

6. Great Belt Bridge tunnel

Panoramic photo of the Great Belt Fixed Link (the East Bridge) taken from the Zealand side at sunset. TobiasKierk / Wikimedia Commons

The Great Belt Bridge, also known as the Great Belt Fixed Link, is a marvel of engineering that consists of two bridges and a tunnel connecting the Danish islands of Zealand and Funen.

The tunnel, formally called the East Tunnel, is a railway tunnel that stretches an impressive 4.98 miles (8.02 kilometers), making it the second longest bored tunnel in Europe, after the Channel Tunnel. The tunnel features 31 connecting tunnels utilized for installations and emergency escapes.

The Great Belt Tunnel has significantly improved transportation between Zealand and Funen. It has cut travel time by approximately an hour, boosting regional trade and tourism. The tunnel also plays a crucial role in connecting Denmark to mainland Europe.

7. Eiksund Tunnel

Situated in Møre og Romsdal county, Norway, the Eiksund Tunnel stretches more than 4.78 miles (7.68 kilometers) between the Norwegian mainland and Hareidlandet Island, off the Møre og Romsdal coast. The tunnel is part of a project that includes three tunnels and a bridge connecting several islands to the mainland. Operational since 2008, the tunnel

serves as a replacement for the ferry route that connected the islands of Hareidlandet and Ulstein.

Eiksund Tunnel on opening day. T.Müller / Wikimedia Commons

The construction of the Eiksund Tunnel was no small feat. Carved through the challenging geological formation of greenstone, which is prone to landslides, engineers employed rock bolting (a technique involving the insertion of steel bolts into drilled holes) to fortify the tunnel walls and prevent potential hazards.

The Eiksund Tunnel is a crucial transportation enhancement for the region. Slashing travel time between the two islands from around 45 minutes to just about 10, it not only facilitates efficient commuting but bolsters tourism and economic development in the surrounding area.

8. Qingdao Jiaozhou Bay Tunnel

The Qingdao Jiaozhou Bay Tunnel is an under-sea road tunnel located in eastern China's Shandong Province. This tunnel runs beneath Jiaozhou Bay, linking Huangdao District to the south with Shinan District to the north.

Construction began on December 27, 2006, and concluded five years later, with the tunnel opening in 2011. The 4.8-mile (7.8-kilometer) tunnel includes underground and undersea sections, with a sub-sea portion covering 2.45 miles (~3.93 kilometers). The tunnel reaches a maximum depth of 242.7 feet (73.96 meters), with a maximum water depth of 137.7 feet (~41.94 meters).

A second Qingdao Jiaozhou Bay Tunnel is currently under construction to enhance connectivity across Qingdao's coastal urban areas. The new 9.87-mile (~15.87-kilometer) tunnel will be longer than the Ryfast tunnel and have six lanes in both directions.

9. North Cape Tunnel

Named after the iconic North Cape on Magerøya island, the North Cape Tunnel is one of Norway's longest and northernmost subsea road tunnels. King Harald V of Norway inaugurated the North Cape Tunnel on June 15, 1999.

Located in Nordkapp Municipality in Troms og Finnmark county in the far north of the country, it spans the Magerøysundet strait, connecting the mainland of Norway with the town of Honningsvåg and the tourist attractions at the North Cape.

Stretching about 4.3 miles (6.9 kilometers) and 696 feet (212 meters) below sea level at its deepest point, the tunnel replaced the previous ferry route between Kåfjord village and Honningsvåg.

The mainland entrance to the North Cape Tunnel. Konrad Zielinski, / Wikimedia Commons

To combat the cold winters, the tunnel boasts automatic anti-freezing doors, locally known as "kuldeport." These doors automatically seal the tunnel mouths in winter, preventing any leaked water from freezing and creating a hazard. When traffic is heavier in the summer, the gates remain open.

And that's a wrap on today's engineering extravaganza!

(Sanjana Gajbhiye / INTERESTING ENGINEERING, Feb 21, 2024, https://interestingengineering.com/lists/9-longest-underwater-tunnels-the-world)

ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

Αγαπητά μέλη του Ελληνικού Συνδέσμου Γεωσυνθετικών Υλικών,

Ο ΕΣΓΥ επικοινωνεί μαζί σας για την ενημέρωση σχετικά με τις δράσεις μας και το υλικό που μπορείτε να βρείτε στην ιστοσελίδα του IGS.

Ημερίδα "Γεωσυνθετικά για Όπλιση Εδάφους", Απρίλιος 2023

Διοργάνωση ημερίδας με τίτλο "Γεωσυνθετικά για Όπλιση Εδάφους", στις 28/4/2023, στην Αθήνα (Αίθουσα Εκδηλώσεων ΤΕΕ).

Προσκεκλημένος ομιλητής ήταν ο κ. Pietro Rimoldi, Πολιτικός Μηχανικός, Πρόεδρος της Τεχνικής Επιτροπής του IGS για Ενίσχυση με Γεωσυνθετικά Υλικά (TC Reinforcement).

Τα βασικά θέματα που καλύφθηκαν αφορούσαν τη μελέτη γεωτεχνικών έργων με χρήση γεωσυνθετικών υλικών, στο πλαίσιο της έκδοσης του Ευρωκώδικα ΕΝ 1997-3.

Τη διάλεξη παρακολούθησαν πέραν των 60 εγγεγραμμένων συμμετεχόντων και δόθηκε βεβαίωση παρακολούθησης.

Στο περιθώριο της εκδήλωσης, τιμήθηκαν για την προσφορά τους οι προηγούμενοι πρόεδροι του συνδέσμου, κκ. Δ. Ατματζίδης, Ομότιμος Καθηγητής Παν. Πατρών και Δρ. Αν. Κολλιός.

Σχετική ενημέρωση από το site του IGS θα βρείτε στον ακόλουθο σύνδεσμο.

https://www.geosyntheticssociety.org/igs-greece-hosts-soil-reinforcement-seminar/

IGS Ambassadors Program, Οκτώβριος 2023

Διοργάνωση του προγράμματος IGS Ambassadors, σε συνεργασία με την ΕΕΕΕΓΜ, με προσκεκλημένο τον Καθ. Jorge Zornberg, University of Texas.

Ο Καθ. J. Zornberg έδωσε προσκεκλημένη διάλεξη με θέμα "Geosynthetic applications in railways and roadways", στο πλαίσιο του 9ου Πανελλήνιου Συνεδρίου Γεωτεχνικής Μηχανικής, 4-6 Οκτωβρίου 2023.

Σχετική ενημέρωση από το site του IGS θα βρείτε στον ακόλουθο σύνδεσμο.

https://www.geosyntheticssociety.org/jorge-zornberg-speaks-at-greece-conference-for-ambassadors-program/

Η μαγνητοσκοπημένη ομιλία του Καθ. J. Zornberg βρίσκεται στο κανάλι της ΕΕΕΕΓΜ, στον ακόλουθο σύνδεσμο.

https://www.youtube.com/watch?v=DvLQhMncBd8

IGS Leaflets – ΜΕΤΑΦΡΑΣΗ ΣΤΑ ΕΛΛΗΝΙΚΑ

Ολοκληρώθηκε από τα μέλη του IGS Greece η μετάφραση στα Ελληνικά των ενημερωτικών φυλλαδίων του IGS. Πιο συγκεκριμένα μεταφράστηκαν τα ακόλουθα κείμενα:

- Λειτουργίες Γεωσυνθετικών Υλικών
- Γεωσυνθετικά Υλικά σε Επιχώματα: Εφαρμογές & Οφέλη
- Γεωσυνθετικά Υλικά σε Σιδηροδρομικά Έργα: Εφαρμογές & Οφέλη
- Γεωσυνθετικά Υλικά σε Αντισεισμικές Εφαρμογές
- Γεωσυνθετικά Υλικά σε Πρανή επί Σταθερού Εδάφους
- Γεωσυνθετικά Υλικά σε Ανεπίστρωτες Οδούς
- Γεωσυνθετικά Υλικά σε Τοίχους: ΤΟΕ – Τοίχοι Οπλισμένου Εδάφους Εφαρμογές & Οφέλη
- Γεωσυνθετικοί Φραγμοί: Εφαρμογές & Οφέλη

Τα έγγραφα στα Ελληνικά βρίσκονται στον ακόλουθο σύνδεσμο.

https://library.geosyntheticssociety.org/educational-documents/

Sustainability eBook – ΜΕΤΑΦΡΑΣΗ ΣΤΑ ΕΛΛΗΝΙΚΑ

Ολοκληρώθηκε από τα μέλη του IGS Greece η μετάφραση στα Ελληνικά του Sustainability eBook του IGS.

Σχετική ενημέρωση από το site του IGS θα βρείτε στον ακόλουθο σύνδεσμο.

https://www.geosyntheticssociety.org/sustainability-ebook-now-in-greek/

Η μετάφραση του eBook στα Ελληνικά βρίσκεται στον ακόλουθο σύνδεσμο.

https://www.geosyntheticssociety.org/wp-content/uploads/2024/02/IGS_Ebook_Greek_FINAL.pdf

ΕΚΛΟΓΕΣ IGS

Έχει ξεκινήσει από τις 16/2/2024 η διαδικασία ηλεκτρονικής ψηφοφορίας για την ανάδειξη των μελών του Διοικητικού Συμβουλίου του IGS. Οι εκλογές ολοκληρώνονται στις 12/4/2024.

Η εφετινή ψηφοφορία έχει ιδιαίτερη σημασία για τον Σύνδεσμο και τη χώρα μας, καθώς ανάμεσα στους δέκα επτά (17) υποψηφίους, βρίσκεται ο Πρόεδρος του IGS-Greece, Καθ. Ιωάννης Μάρκου.

Ως μέλη του IGS-Greece θα έχετε λάβει το σχετικό email με τον σύνδεσμο ψηφοφορίας και τον μοναδικό κωδικό ασφαλείας (unique security code).

Σε περίπτωση που δεν έχετε λάβει το σχετικό email, παρακαλούμε επικοινωνήστε με τα μέλη του ΔΣ του IGS-Greece, ώστε να διευθετηθεί η σχετική αποστολή από τη γραμματεία του IGS.

Η διαδικασία ψηφοφορίας είναι απλή.

Επιλέγετε την/τον υποψήφια-ο της αρεσκείας σας, με σειρά προτεραιότητας.

Η/Ο 1η/ος υποψήφια-ος λαμβάνει 6 βαθμούς, η/ο 2η/ος 5 βαθμούς κοκ.

Επιβεβαιώνετε την/τις επιλογή-ές σας.

Σας προτρέπουμε θερμά να υποστηρίξουμε όλοι μαζί την υποψηφιότητα του Καθ. Ι. Μάρκου

Εκ μέρους του Δ.Σ. του Συνδέσμου,
Χρήστος Στρατάκος - Γραμματέας IGS Greece

http://www.igs-greece.gr/

International Society for Soil Mechanics and Geotechnical Engineering

ISSMGE News
www.issmge.org/news

5th ICTG Sydney - Early bird registration now open through July 31, 2024

ISSMGE Secretariat / TC202 / 15-03-2024

Early bird registration for ICTG 2024 is now available!

Secure your spot at the 5th International Conference on Transportation Geotechnics by registering before Wednesday, July 31, 2024, to enjoy exclusive early bird savings.

A big thank you to all authors who have already submitted their work and registered early. Your contributions are greatly appreciated and play a vital role in making this conference a success!

For more information click here.

ISSMGE Interactive Technical Talk Episode 15: Offshore Geotechnics (TC209)

ISSMGE IT Administrator / TC209 / 19-03-2024

The fifteenth episode of International Interactive Technical Talk has just been launched and is supported by TC209. Prof. Phil Watson, Elizabeth Palix, Prof. Zack Westgate and Dr. Christelle Abadie are discussing with Dr. Marc Ballouz about "Offshore Geotechnics".

Watch ISSMGE Interactive Technical Talks

Proceedings of 1st International Conference on Geotechnics of Tailings and Mine Waste

Roberto Cudmani / TC221 / 25-03-2024

PREFACE

The TC221 on Tailings and Mine Waste was launched by the ISSMGE in March 2020. Its purpose is to provide a platform to discuss, exchange, and disseminate scientific advances, expert knowledge, and practical know-how in all geotechnical engineering issues related to the design, construction, and closure of the earth structures required for the storage of waste materials resulting from mining processes. The First International Conference on Geotechnics of Tailings and Mine Waste (1-ICGTMW), held from 24 to 26 October 2023, in Ouro Preto, Minas Gerais, Brazil, with a focus on the geotechnical characterization, design, stability, construction, and monitoring of tailings dams and mining waste deposits is an important step towards fulfilling the purpose of the TC221.

Mining engineers conceive mining waste structures as part of the requirements imposed by the operation of mines and mineral exploitation. However, materials characterization, design, and stability analysis are primarily addressed by geotechnical engineers. The proper technical management of tailings and mining waste and decision-making depends on geotechnical engineering analyses. The wide range of challenging geotechnical topics covers different issues going from the evaluation of the complex hydro-mechanical behavior and the characteristic mechanical properties of these particular granular materials to the verification of the long-term stability for the closure stage.

Tailings dams and rock waste dumps belong to the largest and most complex modern earth structures. As large catastrophic failures have shown in the past, they pose a huge risk for the people and the environment, and for this reason, they demand the highest technical expertise and the best level of geotechnical engineering available. By bringing together geotechnical practitioners, experts, and researchers working in the field of tailings and mining waste as well as disseminating and improving the state of the art in this field, the 1-ICGTMW has significantly contributed to the sustainable development of the extractive industry.

Prof. Fernando Schnaid
Secretary TC221
Univ. Federal do Rio Grande do Sul, Brazil

Prof. Roberto Cudmani
Vice Chair TC221
Zentrum Geotechnik, Techn. Univ. of Munich

Dr. Ramón Verdugo
Chair TC221
CMGI Chile

Brazil, October 2023

Download of the proceedings

11th International Symposium on Field Monitoring in Geomechanics, September 2022

Amit Srivastava / TC206 / 26-03-2024

In the year 2022, the 11th International Symposium on Field Monitoring in Geomechanics was held at Imperial College London. Symposium themes included topics related to Tunnels and Underground Spaces, Bridges and Transport Infrastructure, Dams and Embankments, Slopes and Earthworks, Buildings and Foundations, Mining and Landfill, Environmental Monitoring, The Observational Method, Specifications and Standards.

The event was organized by TC220 Field Monitoring in Geomechanics Technical Committee of International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), in which TC206 Observational Methods committee members actively participated and conducted parallel workshop with the following program schedule:

- Introduction on I & M and Observational Method

- Contractual Issues
- OM Design and I&M
- I&M Quality in Practice

The program was concluded with Special Lectures, Technical Presentations, Young Engineers Paper Competition, Poster Sessions, Exhibitions, Workshops and Technical Tours, as well as a parallel non-technical program.

4th International Symposium on Machine Learning and Big Data in Geoscience, 2023

Amit Srivastava / TC206 / 26-03-2024

In the year 2023, dated 29th August 1st Sept., the 4th International Symposium of Machine Learning and Big Data in Geoscience & Geoengineering (ISMLG) was held at University College Cork, Ireland. The theme of the symposium was Data-centric solutions for reshaping the next generation geo-industries and the symposium was hosted by ISSMGE Technical Committee of Machine Learning & Big Data (TC309).

In the event, TC206 committee member actively participated and conducted special session 10 on the topic Back Analysis using Machine Learning for the Observational Method - Lessons Learnt and Future Directions

ISSMGE Interactive Talk TC206, 2023

Amit Srivastava / TC206 / 26-03-2024

In the year 2023, on 11th October 2023, the eleventh episode of International Interactive Technical Talk was launched by TC206. Duncan Nicholson, Tony O'Brien, Ying Chen and Anyang Yaw Michael with Dr. Marc Ballouz discussed about Observational Method. The recorded video can be accessed through the following youtube link:

https://www.youtube.com/watch?v=KqosqLK5-z4&t=4s

Smart Geotechnics Conference, 2023

Amit Srivastava / TC206 / 26-03-2024

In the year 2023, on 5th October, Ground Engineering (https://www.geplus.co.uk/) conducted 2nd Smart Geotechnics conference at Victoria Park Plaza, London. The main facus of the conference was to bring together experts working in the field of GE Instrumentation and Monitoring, geotechnical monitoring, data analysis and ground modeling etc. Special attention was on smart technologies, including the use of cloud computing and artificial intelligence.

During the event, TC206 committee member actively participated and provided inputs related to Smart Geotechnics that deals with sensors and Big Data; Feeds to Machine Learning and Real Time Back Analysis; Aligns with Observational Method.

Further details can be accessed through the following link: https://smartgeotechnics.geplus.co.uk/smartgeotechnics2023/en/page/home

NCE Tunnelling Conference - Debate discussion, 2023

Amit Srivastava / TC206 / 26-03-2024

In the year 2023, on 7th December, New Civil Engineer (NCE) conducted event that brought together the tunnelling community for an interactive and immersive day of case studies. Details can be accessed at (https://tunnelling.newcivilengineer.com/tunnelling2023/en/page/home).

The event included debate, future project updates and the celebration of achievements through award ceremony. The venue of the event was Hilton Bankside, London and it was harnessed for making new connections with project leads, gain insight into design and delivery innovations and understand the scope of future opportunities across sectors.

In the event, TC206 technical committee of ISSMGE actively participated and threw lights on Balancing Assurance and Observational Method in Tunnelling: Exploring Effectiveness and Challenges.

BGA Half-day Mini-Symposium on Observational Method, 2024

ISSMGE Secretariat / TC206 / 26-03-2024

British Geotechnical Association Event: Half-day Mini-Symposium on Observational Method (6th February 2024, London, UK)

The Observational Method (OM) in ground engineering is a continuous, managed, integrated process of design, construction control, monitoring and review that enables previously defined modifications to be incorporated during or after construction as appropriate (CIRIA R185, 1999) .

The OM has also been recognised by recent codes e.g. Eurocode. The OM process was introduced by Peck (1969) in his Rankine Lecture (Géotechnique, 19, No 2, 171 -187). The objective is to achieve greater overall economy without compromising safety. The method can be adopted from the inception of a project, or later if benefits are identified.

TC206 and TC220 are the Technical Committees of the International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE) dedicated to the Observational Method and Field Monitoring in Geomechanics respectively.

External Link

https://www.ice.org.uk/events/past-events-and-recordings/recorded-lectures/mini-symposium-on-the-observational-method

This mini-symposium presents three areas that they are currently collaborating on:

- Conditions that enable use of OM (speaker Professor Tony OBrien, Mott MacDonald).
- Real-time back analysis (speaker Dr Ying Chen, Typsa).
- Field monitoring to support the use of the OM (Daniele Fornelli, Geotechnical Observations)

3rd TC222 workshop on April 4th!

ISSMGE Secretariat / TC222 / 26-03-2024

We have the pleasure of inviting you to the third workshop of TC222 Geotechnical BIM and Digital Twins. The workshop will be digital on Teams and will be arranged on April 4th.

14:00 - 16.00 Paris | 8:00 - 10.00 New York | 20:00 - 22.00 Tokyo

The theme of the workshop is **Digital Standards for Geotechnical Data** with talks from Neil Chadwick (AGS Data Management WG) , Dan Ponti (DIGGS Steering Commitee), Jonas Weil (bSI IFC Tunnel Geosubgroup) and Mickaël Beaufils (OGC GeoScience DWG).

To attend, please sign up using this Forms link: https://forms.office.com/e/a1rSUWtkSA

A Teams meeting invitation will be sent shortly after signup.

We hope you have the time to attend!

Please feel free to share the invitation to your network, this workshop is open to all.

More information can be found here:
https://www.linkedin.com/events/issmgetc222onlineworkshop-digit7176517463373688833/

ISSMGE Interactive Technical Talk Episode 16: Geotechnical Aspects of Dykes and Levees and Shore Protection (TC201)

ISSMGE IT Administrator / TC201 / 28-03-2024

The sixteenth episode of International Interactive Technical Talk has just been launched and is supported by TC201. Dr. Norma Patricia Lopez Acosta, Dr. Hendra Jitno, Dr. Esther Rosenbrand and Dr. Cor Zwanenburg are discussing with Dr. Marc Ballouz about "Geotechnical Aspects of Dykes and Levees and Shore Protection".

Watch ISSMGE Interactive Technical Talks

ISRM International Society for Rock Mechanics and Rock Engineering

45th ISRM Online Lecture

The 45th ISRM online lecture was be delivered by Dr. Jonny Rutqvist, from USA. The lecture title is: "Coupled Processes Modeling in Energy Geosciences". It was broadcasted on March 21st at 10 A.M. GMT, from the Online Lecture's page.

Dr. Jonny Rutqvist is a Senior Scientist and Head of Hydrogeology Department, Energy Geosciences Division, at the Lawrence Berkeley National Laboratory (LBNL), Berkeley, California. He holds a PhD degree in Engineering Geology from the Royal Institute of Technology, Sweden. For over 30 years, Dr. Rutqvist's research has been focused on geomechanics and modeling of coupled thermal, hydraulic, mechanical, and chemical (THMC) processes in geological media. He developed the TOUGH-FLAC simulator for coupled multiphase fluid flow, thermal and mechanical processes analysis from the late 1990s. Since then the simulator has been further improved by himself and collaborators for a wide range of challenging geoscientific and geoengineering applications, including geologic carbon sequestration, nuclear waste disposal, geothermal energy extraction and underground energy storage.

Dr. Rutqvist is President of the ISRM Commission on Coupled Thermal-Hydro-Mechanical-Chemical Processes in Fractured Rock. He has authored over 250 peer-reviewed journal papers and is a four-time recipient of the American Rock Mechanics Association (ARMA) Awards.

The lecture will remain online. As usual, the attendees can ask questions to the lecturer by e-mail during the subsequent five days. All online lectures are available on this page.

News

https://www.isrm.net

New ISRM Suggested Method video 2024-03-01

A video for Determining Mode I Static Fracture Toughness using Semi-Circular Bend Specimens was prepared by the Laboratorio de Mecánica de Rocas of the Universidad da Coruna.

Follow the link to read their bios and register at the ISRM Young Members Seminar series page.

45th ISRM Online Lecture by Dr. Jonny Rutqvist on 21st March 2024-03-01

The 45th ISRM Online Lecture "Coupled Processes Modeling in Energy Geosciences" by Dr. Jonny Rutqvist from Lawrence Berkeley National Laboratory (LBNL), Berkeley, California will broadcast on 21st March.

5th International Conference on Information Technology in Geo-Engineering 2024-03-11

The organization of the 5th International Conference on Information Technology in Geo-Engineering announces that the deadline for full-length paper has been extended to 31 March 2024

Professor Jun Sun passed away 2024-03-19

It is with profound sadness and a heavy heart that we convey the news of the passing of Professor Jun Sun. Professor Sun departed peacefully due to illness at 21:58 on March 1, 2024, at Zhongshan Hospital in Shanghai, at the age of 98.

The ISRM owes Professor Sun a lot from his enormous and constant dedication to the Society during many years, as the Vice President at large from 1995 to 1999, as well as a Fellow of ISRM from 2015.

Professor Sun's lifelong commitment to teaching, research, and engineering applications in geomechanics, tunneling, and underground engineering has left an indelible mark on our community. His leadership and contributions will be remembered with deep respect and gratitude.

During this challenging time, our thoughts and condolences go out to Professor Sun's family, friends, and colleagues. We

share in the grief of his loss and celebrate the profound impact he had on the global rock mechanics community.

The 45th ISRM Online Lecture is online 2024-03-21

The 45th ISRM Online Lecture "Coupled Processes Modeling in Energy Geosciences" by Dr. Jonny Rutqvist from Lawrence Berkeley National Laboratory (LBNL), California is now online. Follow the link to watch: https://isrm.net/page/show/1727

Webinar on the Second Generation of Eurocode 7 and Rock Engineering 2024-03-22

Eurocode 7 is known as the European standard for geotechnical engineering design and is widely considered as a great success story. The second generation of the standard is currently being drafted by the subcommittee CEN/TC250/SC7 of the European Committee for Standardization (CEN) and will represent a significant step forward towards further harmonization and efficient guidance for geotechnical design.

This online webinar, organised by ISSMGE ERTC10, CEN/TC 250/SC7 and delivered in partnership with NEN, will focus on specific aspects related to rock engineering design. The Rock Engineering Platform (REP) of CEN/TC 250/SC7 was asked to coordinate the presentations, and the International Society for Rock Mechanics and Rock Engineering (ISRM) was invited to co-sponsor the webinar. This webinar aims to encourage geotechnical engineering professionals working with rock engineering design across Europe and the world to engage with the Eurocode 7 experts.

Learn first hand about the upcoming changes and meet the experts digitally as they present the improvements and challenges. There is no cost to participate in this webinar. Just regiter at the following link: https://eurocode7-rock-engineering.nen-evenementen.nl/

Luís Lamas
ISRM Secretary General
CEN/TC 250/SC7/REP Convenor

5th European Rock Mechanics Debate "Rock bolting: approaches in mines and in tunneling" on 8 April 2024-03-27

The 5th European Rock Mechanics Debate with Charlie Li from Norway and Robert Galler from Austria will take place on the 8 April 2024 at 2 P.M. CET. The title is "Rock Bolting: approaches in Mines and in Tunneling".

Download the flyer with complete information or follow the link to register for the debate.

ISRM 2023 News Journal is now online 2024-03-29

Dear ISRM Member

The 2023 issue, volume 26, of the ISRM News Journal is now online on the ISRM website. Since 2012 the ISRM distributes the News Journal to all members in electronic version, and prints copies which are available at our sponsored symposia.

The News Journal includes news from the Society life, including board and regional reports, commission work, conference and symposia reports and papers from awarded members, among other content. Click here to read it directly on our website or to download it.

Best regards

Luís Lamas
ISRM Secretary General

ASSOCIATION INTERNATIONALE DES TUNNELS ET DE L'ESPACE SOUTERRAIN
AITES
ITA
INTERNATIONAL TUNNELLING AND UNDERGROUND SPACE ASSOCIATION

News

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

ITA 50th Anniversary Sponsoring 08 March 2024

In 2024, the ITA, International Tunnelling and Underground Space Association, will celebrate its 50th Anniversary. The main celebration will take place during the WTC 2024 in Shenzhen, China. During the year additional celebrations will occur in different countries, Member Nations of ITA. This event is a unique opportunity for your company to be even more associated with ITA, supporting all the actions that have been made in the past and are planned for the coming decades. (see attached)

To celebrate the 50th anniversary, a selection committee is choosing among around 170 infrastructures proposed by ITA Member Nations and stakeholders the 50 iconic projects that represent the development of the tunnelling industry during these 5 decades.

A video and a book on the iconic projects are being prepared. In addition a booklet with the history of ITA will be realized and a photo contest organized.

The video will be presented for the first time during the 50th anniversary celebration, on April 23rd, 2024 in Shenzhen. The "50 iconic projects" book and the ITA History booklet will be distributed to the Member Nations and other ITA Stakeholders.

In Shenzhen a photo exhibition will present the winners of the competition.

Link: Email contact: olivier.vion@ita-aites.org

Scooped by ITA-AITES #113, 14 March 2024

ECRL's tunnel works progressing smoothly, 30 successfully excavated | Malaysia

Sela tunnel In Arunachal Pradesh, world's longest twin-lane tunnel, dedicated to Nation | India

The incredible £260m tunnel being built through European country just for ships | Norway

Tunnel Update | USA & Canada

Huge 17.2mile £25billion tunnel to link Spain and Africa under the sea

Poland's longest tunnel to slash train journey times from Kraków

Milestone for Sydney Metro project | Australia

How the Stockholm metro doubles as an underground art museum | Sweden

What's the Metro Manila Subway? | Philippines

Insane £13.2bn tunnel that will link two countries 582 miles apart | Austria - Italy

Scooped by ITA-AITES #114, 26 March 2024

UK Power Networks & specialists dig tunnel to power HS2 construction into Euston

Ford government prepares to build stations for Eglinton Crosstown West Extension | Canada

Inside India's under-river metro: Decoding the tunnelling tech used in Kolkata metro

Work on €6.4 million new St Paul's Bay sewer advancing rapidly, government says | Malta

Major work powers ahead at Hunter Street Station | Australia

Sydney Metro West TBMs relaunch as tunnelling ramps up | Australia

Milestone reached with 2.2-mile underground sewer tunnel completion in Old Town | USA

Breakthrough completes boring of High Speed 2's longest tunnel | UK

New undersea tunnel sets record | China

Will VTA change its tunnel design for the San Jose BART extension after completing a new cost estimate? | USA

BRITISH TUNNELLING SOCIETY YOUNG MEMBERS

BTSYM March Workshop
Soft Ground Tunnel Design

Speaker: Benoît Jones

Thursday, 21 March 2024, Institution of Civil Engineers, 1 Great George Street, Westminster, London

Workshop agenda:

Delivered by Benoît Jones, author of *Soft Ground Tunnel Design*, this BTSYM workshop will describe the most important aspects of tunnel design, highlighting the following aspects:

- Overview of Soft Ground Tunnel Design
- Mini-workshop on undrained stability
- Mini-workshop on drained stability
- Mini-workshop on estimating ground movements due to tunnelling

Speaker:

Dr Benoît Jones has more than two decades of very diverse experience in tunnelling as a designer, researcher, contractor, academic and inventor. He is a Chartered Civil Engineer and Founder and Managing Director of Inbye Engineering, a technology and consulting company established in 2014, and also works part-time for Bedi Consulting. Before this he set up the MSc in Tunnelling and Underground Space at the University of Warwick and ran it for nearly 5 years. Throughout his career he has demonstrated a strong commitment to innovation, research and best practice, writing more than 60 articles and papers. He is the author of a textbook called 'Soft Ground Tunnel Design', and currently chairs the International Tunnelling Association Activity Group on Low Carbon Concrete Linings.

Benoît's book is currently on sale 20% off, click here to find out more.

Benoît Jones
Eur Ing Dr Benoît Jones MEng EngD FGS CEng MICE
Managing Director, Inbye Engineering

INTERNATIONAL GEOSYNTHETICS SOCIETY

www.geosyntheticssociety.org

News

Don't Miss Diversity Session At GeoAmericas2024
March 7, 2024

Learn and collaborate with like-minded colleagues keen to boost diversity and opportunities in the geosynthetics industry at GeoAmericas 2024. The IGS Diversity Task Force (TF) **Read More »**

10 Questions With... Yuse Lajiminmuhip March 18, 2024

The IGS Sustainability Committee drives the green agenda

for the Society and its members, encouraging and supporting the significant contributions that geosynthetics make to sustainable **Read More »**

In Memoriam: Peter Davies March 21, 2024

A pioneering geosynthetics expert who dedicated five decades to our industry passed away in February. Peter Davies contributed to the use and understanding of geosynthetics **Read More »**

IGS Council Elections 2024 – Have You Voted? March 21, 2024

There are just a few weeks left to cast your vote in the latest IGS Council elections. Seventeen candidates are competing for one of just **Read More »**

IGS Foundation Welcomes New Board Members March 26, 2024

The IGS Foundation (IGSF) has expanded its reach and abilities with three additional trustees. The Board of Trustees has been boosted from five to seven **Read More »**

Registration Open For Barcelona Technical Workshop March 17, 2024

Join expert IGS speakers in Barcelona for a technical workshop on 'Reinforcement and drainage in soil structures' this June by registering Read More

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BGA
THE BRITISH GEOTECHNICAL ASSOCIATION

62nd Rankine Lecture

The 62nd Rankine Lecture was delivered by Professor Lidija Zdravković, of Imperial College London, on 'Geotechnical Engineering for a Sustainable Society' on 13 March 2024.

https://www.youtube.com/watch?v=yJcbI5bcetY

Watching the lecture online: The Lecture was streamed live via YouTube, via this link - https://lnkd.in/eaxWdHNf

Should you experience any difficulties with the live feed, please email Truong Le (truong.le@imperial.ac.uk), with details of your issue.

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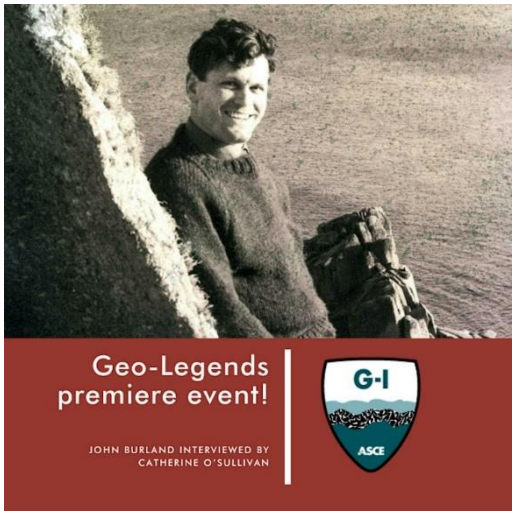
G-I ASCE
GEO-INSTITUTE
www.geoinstitute.org

Watch the Geo-Legends premiere: John Burland with Catherine O'Sullivan



Geo-Legends: John Burland

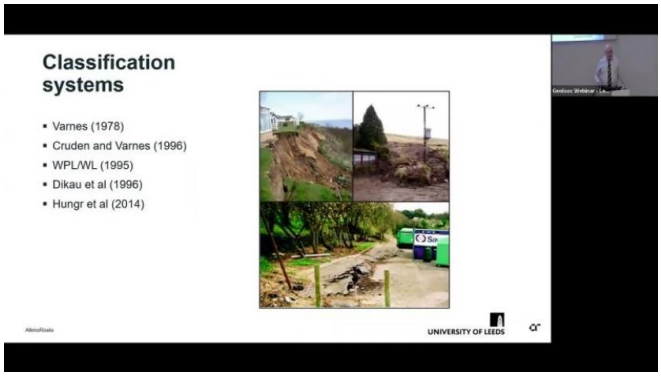
John Burland joined Catherine O'Sullivan in the lab for our latest Geo-Legends interview! You'll hear all the stories that made him a Legend - brought to you only as the Geo-Institute can! Join us for the premiere of John Burland's Geo-Legends interview, this Thursday, March 21, 2024 at 10:30 AM.

https://www.eventbrite.com/e/geo-legends-premiere-john-burland-with-catherine-osullivan-tickets-855652789527?aff=ebdsoporgprofile

Engineering Group of the Geological Society (EGGS)

EGGS Meeting: CIRIA C810 - Natural slopes and Landslides - Condition, Assessment and Mitigation

If you missed our talk earlier this week on natural slopes and landslides, you can catch up via our YouTube channel now. https://lnkd.in/eekj63Az



https://www.youtube.com/watch?v=7-Oq9sAiBmc

Seismic Earth Pressure Calculator

Description

The Rankine classic earth pressure solution has been expanded for the calculation of seismic earth pressure on rigid retaining walls supporting c-Φ phi backfill. The expanded solution is based on the conjugate stress concept, without employing any additional assumptions. A single formulation is used for static and pseudostatic seismic analyses of active conditions. A closed-form expression, as opposed to the constant value commonly used in practice, has been derived for the soil-wall friction angle as a function of the inertial forces and problem geometry for a given pseudostatic acceleration. The method is much easier to use than tedious analysis required in commonly used methods.

Seismic lateral pressure increases with depth, and the point of application of the resultant is calculated based on stratigraphy. Comparison of the formulation with the widely used Mononobe-Okabe solution revealed a perfect match for the proposed predictions, provided the same soil-wall friction angle is used in both formulations.

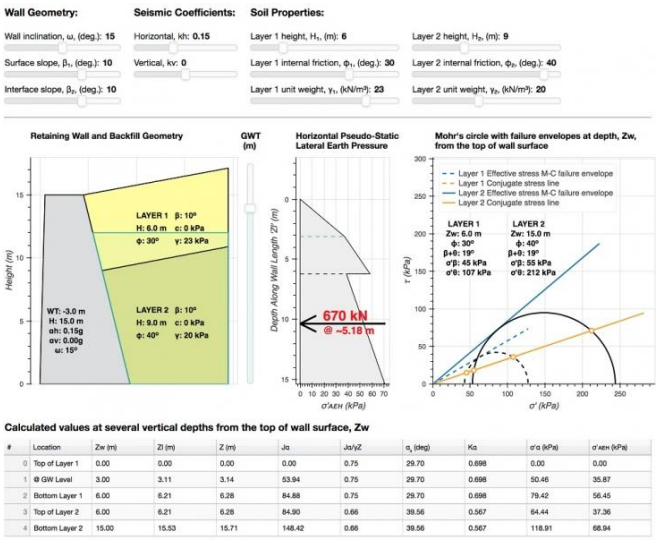
Specifications

Licence: Freeware

Provider:Geoengineer.org

Platforms: Cloud, SaaS, Web-Based

Gallery



https://www.dcodes.io/software/seismic-earth-pressure-calculator

ΔΙΑΚΡΙΣΕΙΣ ΕΛΛΗΝΩΝ ΓΕΩΤΕΧΝΙΚΩΝ ΜΗΧΑΝΙΚΩΝ

Τρεις Ελληνίδες και μέλη της ΕΕΕΕΓΜ περιλαμβάνονται στον κατάλογο των Top 20 most inspiring women in Ground Engineering's March 2024 issue! Γιούλη Δουλαλά-Rigby, Χριστίνα Μαυρομμάτη και Κατερίνα Τσιαμπούση

Στο προηγούμενο τεύχος ανεφέρθη, λόγω ελλειπούς πληροφόρησης του εκδότη, ότι η Γιούλη Δουλαλά-Rigby περιλαμβάνεται στον κατάλογο των Top 20 most inspiring women in Ground Engineering's March 2024 issue. Τελικά δεν είναι μόνο η Γιούλη, αλλά τρεις! Μαζί με την Γιούλη είναι η Χριστίνα Μαυρομμάτη και η Κατερίνα Τσιαμπούση.

Χριστίνα Μαυρομμάτη

Project director in geotechnics, metros and civil division, Mott MacDonald

Christina Mavrommati is a MICE & TEE chartered geotechnical engineer with a BEng Hons degree from University College London and an MSc in soil mechanics and engineering seismology from Imperial College London.

Pursuing a career as a "hands on" engineer was a conscious decision for Mavrommati. She wanted a creative and challenging job that was a bit out of the ordinary.

Mavrommati has been working in geotechnical engineering for more than 22 years, both in the UK and in Greece. She has worked as a designer and team leader on large-scale civil engineering projects, including High Speed 2 (HS2), Crossrail 2, Doha Metro Major Stations, Thames Tideway Tunnel, Athens and Thessaloniki Metro, Egnatia Motorway and Net-work Rail Wessex Capacity Upgrade.

Currently, Mavrommati a resource manager, equality, inclusion and diversity champion, and a member of the senior leadership team of the foundations and geotechnics principal account of the metros and civil division at Mott MacDonald.

She is team leader and delivery and integration manager for the 200-plus-strong HS2 MWCC N1N2 geotechnical team. Over the past four years, she has delivered technically complex solutions to geotechnical designs by leading this diverse, multicultural and multi-disciplined team with expert communication skills and the keenest eye for detail that ensures successful and timely results every time.

Mavrommati is also an elected member of the BGA committee and served as a team mentor in the very first GE Early Careers Challenge.

Katerina Tsiampousi

Senior lecturer, Imperial College London

Katerina Tsiampousi completed her undergraduate studies in civil engineering at Aristotle University of Thessaloniki in 2005. She obtained an MSc in soil mechanics in 2006 and a PhD in geotechnics in 2011 from Imperial College London.

Since 2013, Tsiampousi has been a senior lecturer in the Department of Civil and Environmental Engineering at Imperial College. Following a period as the director of the Geotechnics MSc, she is now the director of the entire suite of MSc courses in the Department. She is an elected member of the British Geotechnical Association executive committee, a nominated member of the International Society for Soil Mechanics and Geotechnical Engineering technical committee on unsaturated soils and an associate editor of *Geotechnique*.

Tsiampousi has led and contributed to a number of research grants funded by the UK Engineering and Physical Sciences

Research Council. She was also a key member of the organising committee of the highly successful NUMGE 2023 conference.

Tsiampousi continues to deliver high quality research on the topic of unsaturated soil. This has been recognised in a 2017 editor's choice award from the Canadian Geotechnical Journal and a 2015 President's medal at Imperial College.

Tsiampousi clearly sees her role as director of the MSc programme as a way to transform taught postgraduate teaching in geotechnics in the UK. She has led the introduction of a new MSc stream on data science and is currently coordinating new additional MSc streams that will better meet the industry's needs over the coming years.

Prof. George Gazetas
National Technical University of Athens

The earthquakes in Turkey (6 February 2023) and Japan (1 January 2024): Seismology, recorded ground motions, geotechnical aspects

Στα πλαίσια μαθήματος στο Πανεπιστήμιο της L' Aquila GeotechLab UnivAQ, την Δευτέρα 25η Μαρτίου, μεταδόθηκε διαδικτυακά η διάλεξή του Καθ. Γ. Γκαζέτα για τους πρόσφατους σεισμούς Τουρκίας και Ιαπωνίας.

Abstract

The two recent earthquakes, of magnitudes 7.8 (Turkey) and 7.6 (Japan), caused enormous structural and geotechnical damage, primarily near the respective causative Faults. A huge (by world standards) number of accelerograms were recorded on top of, or adjacent to, the two Faults. The lecture will introduce elements of seismology of the two events, and will try to relate the evolution in time and space of the rupture process with the intensity, duration, and frequency characteristics of the recorded motions. Accelerations higher than 1g, recorded in about 10 sites in Turkey and Japan, will be studied and their potential for destruction will be explored. Geotechnical-type failures, such as tilting and settling of buildings due to exceedance of bearing capacity, liquefaction and settlement, lateral spreading, and fault emergence on the ground surface will be illustrated.

About the Speaker

George Gazetas is Emeritus Professor of Geotechnical Engineering at the National Technical University of Athens, following an academic career in the US, where he taught at SUNY-Buffalo, Rensselaer(RPI), and Case Western Reserve University.

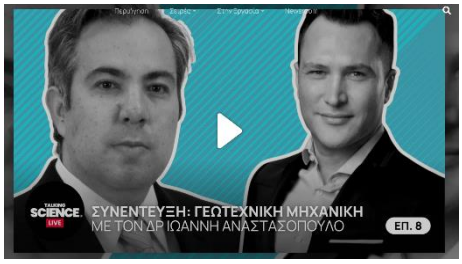
His main research interests have focused on the dynamic response of footings, piles and caissons; the seismic response of earth dams and quay-walls; soil amplification of seismic waves; and soil–structure interaction problems.

Much of his research has been inspired by observations after destructive earthquakes. An active writer and teacher, he has been a consultant or referee on a variety of (mainly dynamic) geotechnical problems. Recipient of several awards for his research, he has delivered some prestigious lectures including the "Coulomb", "Ishihara", "KenethLee", and "Michele Maugeri" Lectures, In 2015 he was awarded the Excellence in University Teaching Prize in Greece. He was honored as the 59th Rankine Lecturer, 2019, in London, and as a Geo-Legend by ASCE's Geotechnical Institute in the GeoStrata magazine, 2022.

Σύνδεσμος Εισόδου: https://lnkd.in/dhRjwh_h

Περισσότερες Πληροφορίες: https://lnkd.in/d2zXG_2E

Συνέντευξη Καθ. Ιωάννη Αναστασόπουλου
ΓΕΩΤΕΧΝΙΚΗ ΜΗΧΑΝΙΚΗ
στο Talking Science®



Σε αυτό του Talking Science Live - Podcast, συζητούμε με τον Δρ. Ιωάννη Αναστασόπουλο - Ioannis Anastasopoulos, Καθηγητή Γεωτεχνικής Μηχανικής στο ETH Zürich για το πώς η ανθρώπινη ευφυΐα, η τεχνολογία, και η μηχανική συναντώνται για να αντιμετωπίσουν τις προκλήσεις του φυσικού περιβάλλοντος. Η Γεωτεχνική Μηχανική, ένας κλάδος της μηχανικής που ασχολείται με την αλληλεπίδραση ανθρώπινων κατασκευών με το γεωλογικό περιβάλλον, βρίσκεται στην πρώτη γραμμή της μάχης ενάντια στους κινδύνους που θέτουν οι φυσικές καταστροφές.

Οικοδεσπότης του Talking Science Live - Podcast είναι ο Δρ Φώτης Φιλιππόπουλος - Fotis Filippopoulos, PhD

https://lnkd.in/djtQvf68

ΘΕΣΕΙΣ
ΓΙΑ ΓΕΩΤΕΧΝΙΚΟΥΣ
ΜΗΧΑΝΙΚΟΥΣ

School of Architecture, Building and Civil Engineering

The impact of hydrogeological factors on the degradation of masonry-lined railway tunnels

Qaulification(s) available: PhD

Project details

This project is sponsored by Network Rail and is an exciting opportunity to work on the degradation of masonry-lined tunnels, which pose a risk to UK railway infrastructure.

This project will: (i) enhance understanding of the degradation processes; (ii) investigate inspection and condition assessment strategies; and (iii) develop modelling techniques, leveraging machine learning and artificial intelligence, to evaluate current, and forecast future, degradation. The outcomes will lead to improvements in Network Rail's capability to proactively manage these important assets.

The doctoral researcher will have the opportunity to engage with Network Rail inspection and monitoring data and will be expected to develop data analytics and modelling approaches.

Supervisors

Primary supervisor: Dr Alister Smith
Secondary supervisors: Prof. Sergio Cavalaro

Application deadline 21 April 2024

https://www.lboro.ac.uk/study/postgraduate/research-degrees/phd-opportunities/the-impact-of-hydrogeological-factors/

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

7th International Conference Series on Geotechnics, Civil Engineering and Structures (CIGOS), April 4-5, 2024, Ho Chi Minh City, Vietnam, https://cigos2024.sciencesconf.org

International Seminar on Successes and Failures: What did we learn? April 11, 2024, Copenhagen, Denmark, www.dfi-events.org/copenhagen2024

EGU General Assembly 2024 / Session NH9.6 - Natural hazards' impact on natural and built heritage and infrastructure in urban and rural zones, 14–19 April 2024, Vienna, Austria & Online, https://meetingorganizer.copernicus.org/EGU24/session/48709

ICGE-2024 - Fourth International Conference on Geotechnical Engineering-Iraq and WICES-2024 - Warith First International Conference of Engineering Sciences, 17-18th April 2024, Karbala, Iraq, https://wices.org

World Tunnel Congress 2024 19 to 25, April, 2024, Shenzhen China, www.wtc2024.cn

PILING AND FOUNDATIONS 2024, 23 April 2024, London, United Kingdom, https://piling.geplus.co.uk/2024/en/page/home

iCGE'24 International Conference of Geotechnical Engineering, April 25-27, 2024, Hammamet, Tunisia www.icge24.com

GEO AMERICAS 2024 5th Pan-American Conference on Geosynthetics Connecting State of the Art to State of Practice April 28 – May 1, 2024, Toronto, Canada, www.geoamericas2024.org

IFCEE 2024 International Foundation Congress and Equipment Expo, May 7–10, 2024, Dallas, USA https://web.cvent.com/event/c42dd622-dd91-409f-b249-2738e31c9ef5/summary

8th International Conference on Earthquake Geotechnical Engineering (8ICEGE), 7-10 May, 2024 Osaka, Japan, https://confit.atlas.jp/guide/event/icege8/top?lang=en

GeoShanghai 2024 International Conference on Geotechnical Engineering, May 26 – 29, 2024, Shanghai, China, www.geoshanghai.org

2nd annual Conference on Foundation Decarbonization and Re-use, May 28-30 2024, Amsterdam, The Netherlands, https://foundationreuse.com

IS-Macau 2024 11th International Symposium of Geotechnical Aspects of Underground Construction in Soft Ground, June 14-17, 2024, Macao SAR, China, https://is-macau2024.sklsotsc.um.edu.mo

ISC'7 7th International Conference on Geotechnical and Geophysical Site Characterization "Ground models, from big data to engineering judgement", June 18-21, 2024, Barcelona, Spain, https://isc7.cimne.com

28th European Young Geotechnical Engineers Conference 2024, 25 to 29 June 2024, Demir Kapija, North Macedonia, https://eygec2024.net

WCEE2024 18th World Conference on Earthquake Engineering, June 30 - July 5, 2024, Milan, Italy, www.wcee2024.it

WCEE2024 18th World Conference on Earthquake Engineering, June 30 - July 5, 2024, Milan, Italy, www.wcee2024.it / Session SHR-7: When science meets industry: advances in engineering seismology stemming from engineering practice, olga.ktenidou@gmail.com

3rd ICPE 2024 Third International Conference on Press-in Engineering, 3-5 July 2024, Singapore, https://2024.icpe-ipa.org

EGRWSE-2024 5th International Conference on Environmental Geotechnology, Recycled Waste Materials and Sustainable Engineering, July 4-6th, Warsaw, Poland, https://iil.sggw.edu.pl/egrwse-2024

ICEC2024 SECOND INTERNATIONAL CONFERENCE ON EARTHEN CONSTRUCTION, 8-10 July 2024, Edinburgh, United Kingdom, https://icec2024.eng.ed.ac.uk, https://icec2024.sciencesconf.org

IS Landslides 2024 International Symposium on Landslides "Landslides across the scales: from the fundamentals to engineering applications" & IS Rock Slope Stability 2024, July 8-12th, 2024, Chambéry, France, www.isl2024.com

EUROCK 2024 ISRM European Rock Mechanics Symposium New challenges in rock mechanics and rock engineering July 15-19, 2024, Alicante, Spain, www.eurock2024.com

5th ICITG 5th International Conference on Information Technology in Geo-Engineering, August 5-8, 2024, Golden, Colorado, USA, https://learn.mines.edu/ICITG

S3: Slopes, Support and Stabilization, August 6-8, 2024, Aurora, Colorado, USA, https://s3.amazonaws.com/xcd-shared/dfi/Media/S324/2024-S3-CFA-20230807.pdf

ECSMGE 24 XVIII European Conference on Soil Mechanics and Geotechnical Engineering, 26-30 August 2024, Lisbon, Portugal, www.ecsmge-2024.com

4ο Συνέδριο Φραγμάτων και Ταμιευτήρων, 10 και 11 Σεπτεμβρίου 2024, Αθήνα, www.gcold-conference.gr

ISIC 2024 4th International Conference of International Society for Intelligent Construction, 10 – 12 September 2024, Orlando, United States, www.is-ic.org/conferences/2024-isic-international-conference

International Symposium on Dams and Earthquakes, 7th Meeting of the EWG, 12 -13 September 2024, Athens, Greece, link.

NGM 2024 19th Nordic Geotechnical Meeting, 18th - 20th of September 2024, Göteborg, Sweden, www.ngm2024.se

ISRM International Symposium 2024 and 13th Asian Rock Mechanics Symposium (ARMS13), 22 to 27 September 2024, New Delhi, India, https://arms2024.org

IS-Grenoble 2024 Geomechanics from Micro to Macro, September 23-27, 2024, Grenoble, France, https://is-grenoble2024.sciencesconf.org

International Symposium on Dams and Earthquakes, 7th Meeting of EWG, September 25-27, 2024, Athens, www.eemf.gr

92nd ICOLD Annual Meeting & International Symposium on Dams for People, Water, Environment and Development, 29th

September – 3rd October, 2024, New Delhi, India, www.icold2024.org

5th European Conference on Physical Modelling In Geotechnics, 02 to 04 October 2024, Delft, Netherlands, https://tc104-issmge.com/ecpmg-2024

XVIII African Regional Conference on Soil Mechanics and Geotechnical Engineering, 06 ÷ 09 October 2024, Algiers, Algeria, https://algeos-dz.com/18ARC.html

October 16th, 2024, Antwerp, Belgium
https://beyondatunnelvision.eu

Tunnels play a vital role in infrastructure. Many of them are aging and in need of major renovations. They cannot be shut down due to the required high availability. Because of the volume and urgency of the tasks, this challenge needs to be addressed on an international scale. Let's get together and address this at the Beyond a Tunnel Vision Conference in 2024.

Beyond a tunnel vision is an international conference on tunnel renovation, focused on the joint challenges in the infrastructure network of Europe. How can tunnels be renovated in a clever way? To which extend can they be updated with minor impact on traffic? How can renovation be used to diminish energy consumption and environmental impact of a tunnel? In what way can digitalization processes contribute to an efficient renovation? These questions were addressed in plenary sessions and interactive workshops.

With the support and cooperation of nine countries the Dutch centre for underground construction, the COB, has composed a position paper on tunnels in Europe. This paper addresses the challenges that lay ahead and the need for an European tunnel programme. The Beyond a tunnel vision conference is an important stepping stone towards this programme.

Topics

Skills & resources

Infrastructure, particularly in tunnels, faces challenges such as limited personnel, time, and resources. Expertise in tunnels often relies on experience rather than formal education, and there's a lack of global standards for tunnel management. With many experts approaching retirement, there's a pressing need to transfer their knowledge. Digitalization is viewed as a potential solution, but its integration into infrastructure management is intricate. Although there's interest in digital tools like 'digital tunnel twins,' the question remains: Are we prepared for this shift?

Asset management for tunnels

We see a widely spread ambition to become a more asset management organization instead of an organization focused on projects (either building or renovation projects). But what is professional asset management for tunnels and what should be focal points for the upcoming decade?

Renovation, management & maintenance

Cities will suffer massive strokes if we cannot use underground space more effectively and without hindering existing networks, such as metro-systems, and city life at street level. Building and renovating must be done whilst 'the shop is open for business. We see that each country uses valuable time and money to develop their own strategies and options. Some 'tweaking' at a national level is always useful, but we could all benefit from more by sharing data, models, experiences, and options.

RMCC2023 1st International Rock Mass Classification Conference "Rock Mass Classification meets the Challenges of the 21st Century", 30-31 October 2024, Oslo, Norway, www.rmcc2024.com

PANAMGEO CHILE 2024 17th Pan-American Conference on Soil Mechanics and Geotechnical Engineering, 12-17 November 2024, La Serena, Chile, https://panamge-ochile2024.cl

CouFrac 2024 The 4th International Conference on Coupled Processes in Fractured Geological Media: Observation, Modeling, and Application, November 13-15, 2024, Kyoto, Japan, https://www.ec-convention.com/coufrac2024/

3ο Διεθνές Συνέδριο Αρχαίας Ελληνικής και Βυζαντινής Τεχνολογία, 19-20-21 Νοεμβρίου 2024, Αθήνα, www.edabyt.gr

ICTG 2024 5th International Conference on Transportation Geotechnics 2024 "Sustainable and Evolving Technologies for Urban Transport Infrastructure", 20 – 22 November 2024, Sydney, Australia www.ictg2024.com.au

Geotechnics for Sustainable Infrastructure, 28-29 November 2024, Kathmandu, Nepal, https://geomandu.ngeotechs.org

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

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

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

The Norwegian Group for Rock Mechanics welcomes you to Norway for EUROCK 2025, the international symposium of ISRM.

The event will take place at the Clarion Hotel & Congress in the beautiful city of Trondheim from June 16th to 20th.

Main Topics

1. New Tools and Techniques
2. Rock Support Design
3. Rock Mass Characterization
4. Prognosis Models in Rock Tunneling
5. Fluid Flow in Rock Mass
6. Ground Investigations
7. Laboratory Testing of Rock
8. Brittle Failure
9. Rock Mass Monitoring
10. Geohazards
11. 3D modelling and Visualization
12. Rock Mass Grouting
13. Sustainability in Rock Engineering

Contact us

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Norwegian Group for Rock Mechanics
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0201 Oslo, Norway
Secretary: nbg@tekna.no
Phone: +47 22 94 75 00

Chairperson of Organizing Committee:
Henki Ødegaard

Technical queries:
For any question regarding registration and abstract/paper submittal, please contact post@atlanticmice.no

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

In 1925 Karl Terzaghi published the book „Erdbaumechanik auf bodenphysikalischer Grundlage". On the occasion of the 100th Anniversary of this publication the *Austrian Geotechnical Society* and the *Austrian Society for Geomechanics* are proud to host the 21st International Conference on Soil Mechanics and Geotechnical Engineering (ICSMGE) in Vienna, Austria.

Austrian Geotechnical Society and Austrian Society for Geomechanics

Contact person: Prof. Helmut F. Schweiger
Email: helmut.schweiger@tugraz.at

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

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

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

Rockfall caught on video hitting trucks in Peru

Frame of the dashcam footage (Credits: JAM PRESS VID)

A rockfall that occurred on March 2, in Peru, was caught on dashcam crushing two trucks.

Furthermore, the incident took place in San Mateo de Huanchor of the Huarochiri Province, and more specifically, on the 97th kilometer of the Central Highway.

One of the two vehicles can be seen getting flattened by large falling boulders, shortly before they also hit the following one.

An investigation regarding the reasons behind the accident has been launched, although it is suspected that recent heavy rainfall in the area played a major part in the rockfall being triggered.

Concerns have also arisen about the highway's state, as it is a vital transportation route in the area.

Finally, the drivers of both vehicles miraculously survived the accident.

Sources: bnnbreaking.com, www.mirror.co.uk, www.ndtv.com, www.thesun.co.uk

https://www.youtube.com/watch?v=0-1QjFMIt0g

(Geoengineer.org, Mar, 02, 2024, https://www.geoengineer.org/news/rockfall-caught-on-video-hitting-trucks-in-peru)

An update on the 13 February 2024 landslide at Çöpler Mine in Turkey

In the aftermath of the 13 February 2024 landslide at Çöpler Mine in Turkey, work continues to try to understand the causes of the failure.

A Planet Labs image of the aftermath of the 13 February 2024 landslide at Çöpler Mine in Turkey. Image copyright of Planet Labs, used with permission. Credit: Planet Labs

The news cycle has mostly moved on from the 13 February 2024 landslide at Çöpler Mine in Turkey, but after a few weeks it is interesting to take stock of the situation, and what we have learnt.

Triggering

There has been some speculation about potential triggers for the landslide, with suggestions for example that blasting might have played a role. It is worth noting of course that an event on this scale may not need a trigger, if a progressive failure mechanism was in play, and the observation of the development of cracks over the last few days before the collapse might support this. But, on LinkedIn, Omid Memarian Sorkhabi from University College Dublin has a thoughtful analysis of conditions leading up to the failure:-

Before the landslide on 30 January 2024, Sentinel-2 imagery captured heavy snowfall with an air temperature of -6.75°C. Subsequent observations on February 11, 2024, revealed significant snowmelt and an air temperature of 3.5°C. The rapid increase in temperature caused the snow to melt quickly, penetrating the soil layers and triggering landslides on unstable slopes, resulting in this disaster.

Dr Omid Memarian Sorkhabi, UCD

This is a credible explanation for the events over the final days, with a rapid injection of water into the heap leach stack finally destabilising the slope.

Meanwhile, the impact of the landslide continues to be felt widely. The latest reports indicate that the remains of the nine people killed in the landslide have not been recovered, with operations greatly hampered by continued risk of further failures and from potential health impacts of the mined material on the health of the rescue personnel.

Two additional engineers were arrested on 2 March 2024, although their potential role in the disaster is not clear. Reports in Turkey suggest that Anagold, the company operating the

mine in country, has fired 27 workers as a result of the accident. Journalist İsmail Saymaz tweeted a letter to one of the workers:-

The automatic translation of the text of the Tweet is:-

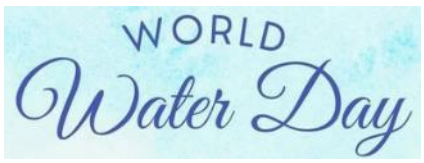
In the gold mine in İliç, where 9 workers were trapped under the rubble, 27 workers were dismissed today, their contracts not being extended. The mining disaster was given as the reason. Other workers will be on leave until April 1. The situation will be evaluated after the election. Workers gather in İliç Square.

Tweet by İsmail Saymaz

However, Anagold has now indicated that this decision will be reviewed.

Meanwhile, the Turkish government insists that SSR Mining Inc will pay for the clean up costs of the accident, although experience from elsewhere causes me to wonder if this will be true in reality. SSR Mining itself has seen an approximate halving of its share value since the landslide, with no real recovery over the last few weeks.

(Dave Petley / THE LANDSLIDE BLOG, 7 March 2024, https://eos.org/thelandslideblog/copler-mine-update)



Today (Mar 22) is #WorldWaterDay. Geomembranes are often used as liners in potable water reservoirs to contain drinking water, but how do they hold up when Cl is added to disinfect pathogenic microorganisms harmful to human health? Research: https://ow.ly/ajay50QyzZT

Longevity of 12 geomembranes in chlorinated water

M.S. Morsy, R. Kerry Rowe kerry.rowe@queensu.ca, and F.B. Abdelaal

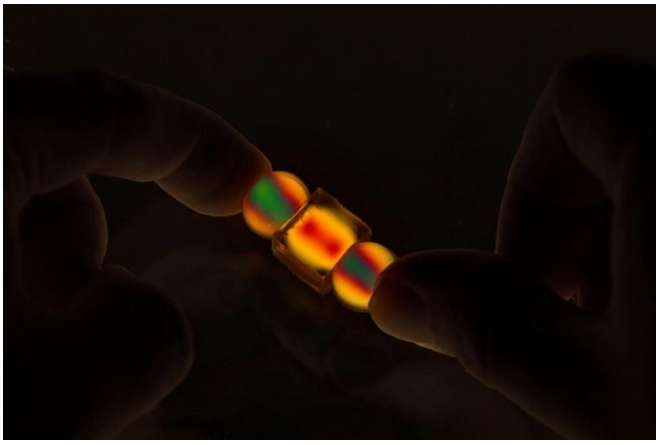
Abstract

The long-term performance of geomembranes with 12 different resin–antioxidant master-batch combinations, including eight high-density polyethylene (HDPE), three linear low-density polyethylene (LLDPE), and one blended polyolefin (BPO) base resins, is investigated. Results are reported for immersion tests in chlorinated water (0.5 ppm) for 35 months at 85 °C. The degradation trends show that the choice of resin type played a key role in the longevity of the geomembranes but also that some hindered amine light stabilizer (HALS) packages contributed to better resistance to degradation in chlorinated water. The results show that the specific antioxidant package is more important than the initial oxidative induction time (OIT) in terms of long-term performance. Finally, it is shown that while increased thick-ness may be beneficial, a more resistant resin or antioxidant–stabilizer package can be more effective than increasing thickness in improving geomembrane performance in chlorinated water. The conclusion regarding the beneficial role of HALS is specific to chlorinated water and generally is not true in other cases of submerged or buried geomembranes.

(Canadian Geotechnical Journal, 4 June 2020, https://doi.org/10.1139/cgj-2019-0520)

With a new experimental technique, MIT engineers probe the mechanisms of landslides and earthquakes

The behavior of granular materials has been difficult to visualize, but a new method reveals their internal forces in 3D detail.

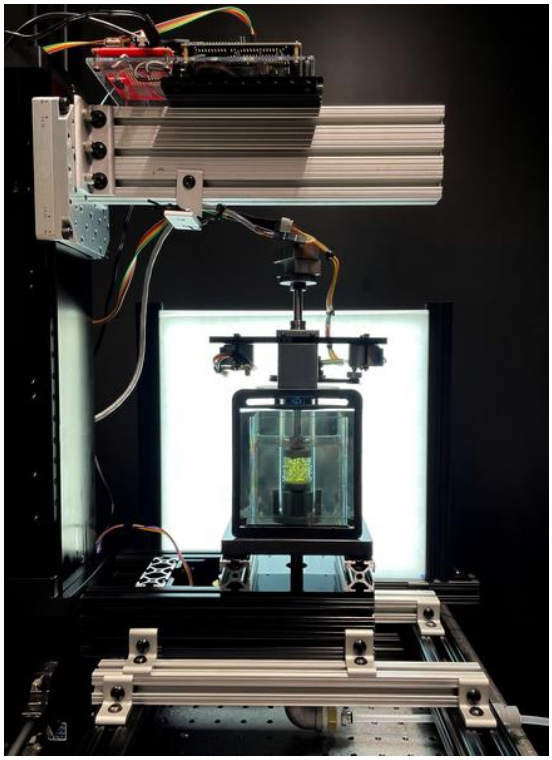


MIT researchers developed a method that allows for 3D experiments that can reveal how forces are transmitted through granular materials, and how the shapes of the grains can dramatically change the outcomes. In this photo, 3D photoelastic particles light up and change color under external loads. Image: Courtesy of the researchers

Granular materials, those made up of individual pieces, whether grains of sand or coffee beans or pebbles, are the most abundant form of solid matter on Earth. The way these materials move and react to external forces can determine when landslides or earthquakes happen, as well as more mundane events such as how cereal gets clogged coming out of the box. Yet, analyzing the way these flow events take place and what determines their outcomes has been a real challenge, and most research has been confined to two-dimensional experiments that don't reveal the full picture of how these materials behave.

Now, researchers at MIT have developed a method that allows for detailed 3D experiments that can reveal exactly how forces are transmitted through granular materials, and how the shapes of the grains can dramatically change the outcomes. The new work may lead to better ways of understanding how landslides are triggered, as well as how to control the flow of granular materials in industrial processes. The findings are described in the journal *PNAS* in a paper by MIT professor of civil and environmental engineering Ruben Juanes and Wei Li SM '14, PhD '19, who is now on the faculty at Stony Brook University.

From soil and sand to flour and sugar, granular materials are ubiquitous. "It's an everyday item, it's part of our infrastructure," says Li. "When we do space exploration, our space vehicles land on granular material. And the failure of granular media can be catastrophic, such as landslides."



In Prof. Juanes' Lab at MIT, Dr. Li constructed the first working prototype of an interference optical projection tomography scanner. Researchers pack their photoelastic particles in a glass tube, then apply normal and shear stresses from the top. The filamentary patterns in the pack can be directly observed through the circular polarizing filter. Image: Courtesy of the researchers

"One major finding of this study is that we provide a microscopic explanation of why a pack of angular particles is stronger than a pack of spheres," Li says.

Juanes adds, "It is always important, at a fundamental level to understand the overall response of the material. And I can see that moving forward, this can provide a new way to make predictions of when a material will fail."

Scientific understanding of these materials really began a few decades ago, Juanes explains, with the invention of a way to model their behavior using two-dimensional discs representing how forces are transmitted through a collection of particles. While this provided important new insights, it also faced severe limitations.

In previous work, Li developed a way of making three-dimensional particles through a squeeze-molding technique that produces plastic particles that are free of residual stresses and can be made in virtually any irregular shape. Now, in this latest research, he and Juanes have applied this method to reveal the internal stresses in a granular material as loads are applied, in a fully three-dimensional system that much more accurately represents real-world granular materials.

These particles are photoelastic, Juanes explains, which means that when under stress, they modify any light passing through them according to the amount of stress. "So, if you shine polarized light through it and you stress the material, you can see where that stress change is taking place visually, in the form of a different color and different brightness in the material."

Such materials have been used for a long time, Juanes says, but "one of the key things that had never been accomplished was the ability to image the stresses of these materials when they are immersed in a fluid, where the fluid can flow through the material itself."

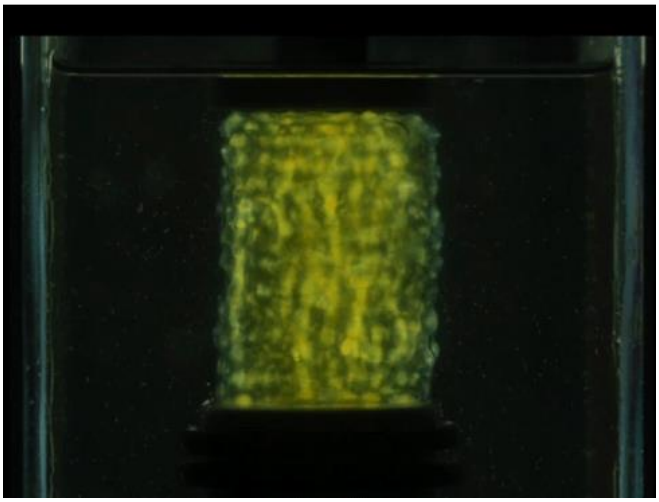
Being able to do so is important, he stresses, because "porous media of interest — biological porous media, industrial porous media, and geological porous media — they often contain fluid in their pore spaces, and that fluid will be hydraulically transported through those pore openings. And the two phenomena are coupled: how the stress is transmitted and what the pore fluid pressure is."

The problem was, when using a collection of two-dimensional discs for an experiment, the discs would pack in such a way as to block the fluid completely. Only with a three-dimensional mass of grains would there always be pathways for the fluid to flow through, so that the stresses could be monitored while fluid was moving.

Using this method, they were able to show that "when you compress a granular material, that force is transmitted in the form of what we would call chains, or filaments, that this new technique is able to visualize and depict in three dimensions," Juanes says.

To get that 3D view, they use a combination of the photoelasticity to illuminate the force chains, along with a method called computed tomography, similar to that used in medical CT scans, to reconstruct a full 3D image from a series of 2,400 flat images taken as the object rotates through 360 degrees.

Because the grains are immersed in a fluid that has exactly the same refractive index as the polyurethane grains themselves, the beads are invisible when light shines through their container if they are not under stress. Then, stress is applied, and when polarized light is shone through, that reveals the stresses as light and color, Juanes says. "What's really remarkable and exciting is that we're not imaging the porous medium. We're imaging the forces that are transmitted through the porous medium. This opens up, I think, a new way to interrogate stress changes in granular materials." He adds that "this has really been a dream of mine for many years," and he says it was realized thanks to Li's work on the project.



A new technique allows full 3D visualization of the way forces are distributed in a mass of irregularly shaped grains as force is applied. Credit: Courtesy of the researchers

Using the method, they were able to demonstrate exactly how it is that irregular, angular grains produce a stronger, more stable material than spherical ones. While this was known empirically, the new technique makes it possible to demonstrate exactly why that is, based on the way the forces are distributed, and will make it possible in future work to study a wide variety of grain types to determine exactly what characteristics are most important in producing stable structures, such as the ballast of railroad beds or the riprap on breakwaters.

Because there has been no way to observe the 3D force chains in such materials, Juanes says, "right now it is very difficult to make predictions as to when a landslide will occur precisely, because we don't know about the architecture of the force chains for different materials."

It will take time to develop the method to be able to make such predictions, Li says, but that ultimately could be a significant contribution of this new technique. And many other applications of the method are also possible, even in areas as seemingly unrelated as how fish eggs respond as the fish carrying them moves through the water, or in helping to design new kinds of robotic grippers that can easily adapt to picking up objects of any shape.

The work was supported by the U.S. National Science Foundation.

(David L. Chandler | MIT News, March 25, 2024, https://news.mit.edu/2024/new-experimental-technique-probe-mechanisms-landslides-earthquakes-0325)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΓΕΩΛΟΓΙΑ

The sea 'began to boil': Freak volcanic eruption of Santorini 1,300 years ago indicates huge blasts can occur during time of quiet

A giant layer of pumice and ash found buried underwater in the Santorini caldera indicates an eruption in A.D. 726 was much bigger than previously thought.

The famous white houses of Santorini overlooking the caldera at sunset. (Image credit: Dimitris Meletis via Getty Images)

An eruption at Santorini volcano 1,300 years ago was far larger than previously thought, suggesting explosive blasts can occur even in periods of relative quiet, new research shows.

Santorini is an underwater volcano located along a string of volcanoes known as the Hellenic Island Arc between Greece and Turkey. It can produce eruptions that are so extreme the crust above the magma chamber collapses and forms a bowl-shaped pit, or caldera, several miles across. The last caldera-forming eruption at Santorini, known as the Minoan eruption, occurred in 1600 B.C. and blew the top off what was then one island, leaving behind the present-day archipelago.

Eruptions of this scale are typically followed by a "rejuvenation" period, during which the magma chamber replenishes and feeds only small eruptions. But a huge explosion in the year A.D. 726 has scientists rethinking how the volcano behaves during quiet periods, according to a study published Monday (March 25) in the journal Nature Geoscience.

"Historical accounts mention that, during the summer of 726 C.E., the sea within the Santorini caldera began to boil until dense smoke rose and was accompanied by pyroclastic eruptions," researchers wrote in the study. (Pyroclastic eruptions are characterized by flows of blistering ash, gas and rock.) "Large pumice blocks were ejected in such quantity that they covered the sea over an immense area, reaching the coasts of Macedonia and Asia Minor more than 400 km [kilometers, or 250 miles] away."

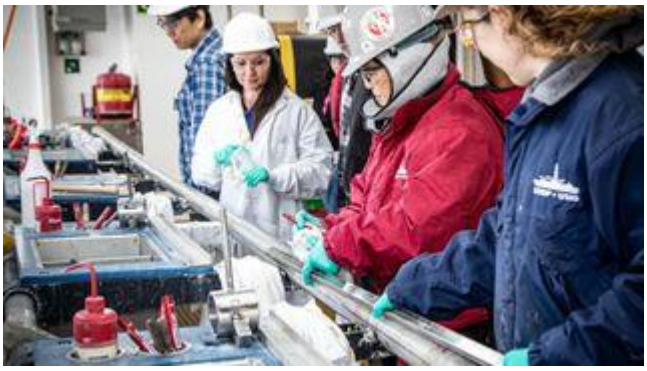
While these descriptions hint at a huge explosion, the only trace of this eruption previously found was a thin layer of pumice on Palea Kameni — one of two islands that sit in the center of the Santorini caldera, where a vent called the Kameni volcano opened up following the Minoan eruption.

Now, scientists have gleaned the full extent of the 726 eruption and found that it likely blasted from the Kameni vent with a magnitude similar to that of the record-shattering Tonga volcano eruption of 2022, according to the study.

Research vessel personnel lay down a core barrel on the rig floor to extrude the sediment core extracted from the sea-bed. (Image credit: Erick Bravo and Thomas Ronge (JRSO-IODP))

To find out more about the eruption, the researchers drilled at different sites around the Kameni vent. The sediment cores they collected revealed a thick layer of pumice and ash, indicating the eruption ejected 0.7 cubic miles (3.1 cubic kilometers) of material — roughly the equivalent of 1 million Olympic swimming pools. Scientists didn't expect to find evidence of such a powerful eruption just 2,300 years after a caldera-forming eruption. The finding suggests the Santorini caldera is capable of exploding when it should — theoretically — be recharging, according to the study.

"Our finding that the Santorini caldera is capable of producing large explosive eruptions at an early stage in the caldera cycle implies an elevated hazard potential for the eastern Mediterranean region," the researchers wrote.



Chieh Peng (laboratory officer, IODP JRSO) in red jacket helped by Kara Vadman (marine laboratory specialist, IODP JRSO) define where core sections will be cut, while scientists take a first look at the core material and define if and where samples should be collected. (Image credit: Erick Bravo and Thomas Ronge (JRSO-IODP))

The Kameni volcano vent last erupted in 1950, producing small explosions and lava flows. It has since been dormant, except for a phase of unrest between 2011 and 2012, when satellites picked up telltale signs of magma moving beneath the volcano.

The thin layer of pumice on Palea Kameni island indicated the 726 eruption had a magnitude between 3 and 4 on the Volcanic Explosivity Index, which was until now considered a worst-case scenario for the Kameni volcano vent.

The new results, however, indicate the eruption was a magnitude 5 event, which is 10 to 100 times bigger than previously thought. "A similar eruptive event today would have severe consequences not only for the inhabitants of Santorini

and its neighboring islands but also for the broader eastern Mediterranean," the researchers wrote in the study.

Editor's note: The headline and article were corrected at 6 a.m. ET on March 26, 2024, to remove references to the eruption being as violent as the 2022 Tonga event. The eruption was of the same order of magnitude as the 2022 Tonga event.

(Sascha Pare / LIVESCIENCE, 25 March 2024, https://www.livescience.com/planet-earth/volcanos/santorini-volcano-freak-eruption-1300-years-ago-was-as-violent-as-2022-tonga-eruption)

Geologists reject the Anthropocene as Earth's new epoch — after 15 years of debate

But some are now challenging the vote, saying there were "procedural irregularities".

Crawford Lake near Toronto, Canada, has collected and preserved signs of humans' impact on Earth in its sediments, including microplastics and plutonium from hydrogen-bomb tests. Credit: The Canadian Press/Alamy

After 15 years of discussion and exploration, a committee of researchers has decided that the Anthropocene — generally understood to be the age of irreversible human impacts on the planet — will not become an official epoch in Earth's geologic timeline. The ruling, first reported by the *New York Times*, is meant to be final, but is being challenged by the chair and a vice-chair of the committee that ran the vote.

Twelve members of the international Subcommission on Quaternary Stratigraphy (SQS) voted against the proposal to create an Anthropocene epoch, while only four voted for it. That would normally constitute an unqualified defeat, but a dramatic challenge has arisen from the chair of the SQS, palaeontologist Jan Zalasiewicz of the University of Leicester, UK, and one of the group's vice-chairs, stratigrapher Martin Head of Brock University in St Catharines, Canada.

In a 6 March press statement, they said that they are asking for the vote to be annulled. They added that "the alleged voting has been performed in contravention of the statutes of the International Commission on Stratigraphy", including statutes governing the eligibility to vote. Zalasiewicz told *Nature* that he couldn't add more just yet, but that neither he nor Head "instigated the vote or agreed to it, so we are not responsible for procedural irregularities".

The SQS is a subcommittee of the International Commission on Stratigraphy (ICS). Normally, there would be no appeals process for a losing vote. David Harper, a geologist at Durham University, UK, who chairs the ICS, had earlier confirmed to *Nature* that the proposal "cannot be progressed further". Proponents could put forward a similar idea in the future.

If successful, the proposal would have ended the current Holocene epoch, which has been going on since the end of the last ice age 11,700 years ago, and started the Anthropocene in the year 1952. This is when plutonium from hydrogen-bomb tests showed up in the sediment of Crawford Lake near Toronto, a site chosen by some geologists as capturing a pristine record of humans' impact on Earth. Other signs of human influence include microplastics, pesticides and ash from fossil-fuel combustion.

But pending the resolution of the challenge, the lake and its plutonium residue won't get a 'golden spike' designation from geologists now. Selecting one site as such a marker "always felt a bit doomed, because human impacts on the planet are global", says Zoe Todd, an anthropologist at Simon Fraser University in Burnaby, Canada. "This is actually an invitation for us to completely rethink how we define what the world is experiencing."

A cultural concept

Although the Anthropocene probably will not not be added to the geologic timescale, it remains a broad cultural concept already used by many to describe the era of accelerating human impacts, such as climate change and biodiversity loss. "We are now on a fundamentally unpredictable planet in ways that we have not experienced for the last 12,000 years," says Julia Adeney Thomas, a historian at the University of Notre Dame, in Indiana. "That understanding of the Anthropocene is crystal-clear."

The decision to reject the designation became public through the *New York Times* on 5 March, after the SQS had concluded its month-long voting process, but before committee leaders had finalized discussions and made an official announcement. Philip Gibbard, a geologist at the University of Cambridge, UK, who is on the SQS, says that the crux of the annulment challenge is that Zalasiewicz and Head objected to the voting process kicking off on 1 February. The rest of the committee wanted to move forward with a vote and did so according to SQS rules, Gibbard says. "There's a lot of sour grapes going on here," he adds.

Had the proposal made it through the SQS, it would have needed to clear two more hurdles: first a ratification vote by the full stratigraphic commission, and then a final one in August at a forum of the International Union of Geological Sciences.

Frustrated by defeat

Some of those who helped to draw up the proposal, through an 'Anthropocene working group' commissioned by the SQS, are frustrated by the apparent defeat. They had spent years studying a number of sites around the world that could potentially represent the start of a new human-influenced epoch. They performed fresh environmental analyses on many of the sites, including studying nuclear debris, fly ash, and other markers of humans' impact in their geological layers, before settling on Crawford Lake.

"We have made it very clear that the planet we're living on is different than it used to be, and that the big tipping point was in the mid-twentieth century," says Francine McCarthy, a micropalaeontologist at Brock University who led the Crawford Lake proposal1. Even though the SQS has rejected it, she

says she will keep working to highlight the lake's exceptionally preserved record of human activities. "Crawford Lake is just as great a place as it ever was."

"To be honest, I am very disappointed with the SQS outcome," says Yongming Han, another working group member and a geochemist at the Institute of Earth Environment of the Chinese Academy of Sciences in Xi'an. "We all know that the planet has entered a period in which humans act as a key force and have left indisputable stratigraphic evidences."

For now, the SQS and the ICS will sort out how to handle Zalasiewicz's and Head's request for a vote annulment. Meanwhile, scientific and public discussions about how best to describe the Anthropocene continue.

One emerging argument is to define the Anthropocene as an 'event' in geological history — similar to the rise of atmospheric oxygen just over 2 billion years ago, known as the Great Oxidation Event — but not as a formal epoch[2]. This would make more sense because geological events unfold as transformations over time — such as humans industrializing and polluting the planet — rather than an abrupt shift from one state to another, says Erle Ellis, an ecologist at the University of Maryland Baltimore County in Baltimore, Maryland. "We need to think about this as a broader process, not as a distinct break in time," says Ellis, who resigned from the Anthropocene working group last year because he felt it was looking at the question too narrowly.

This line of thinking played a role in at least some of the votes to reject the idea of an Anthropocene epoch. Two SQS members told *Nature* they voted down the proposal in part because of the long and evolving history of human impacts on Earth.

"By voting 'no', they [the SQS] actually have made a stronger statement," Ellis says, "that it's more useful to consider a broader view — a deeper view of the Anthropocene."

doi: https://doi.org/10.1038/d41586-024-00675-8

Updates & Corrections

Correction 06 March 2024: An earlier version of this story incorrectly stated that there was a ten-year waiting period before a failed proposal could be resubmitted to the SQS. That waiting period applies to different circumstances, and there is no existing guidance on resubmitting failed proposals.

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1. McCarthy, F. M. G. *et al. Anthropocene Rev.* 10, 146–176 (2023). Article PubMed Google Scholar

2. Walker, M. J. C. *et al. Boreas* 53, 1–3 (2024). Article Google Scholar

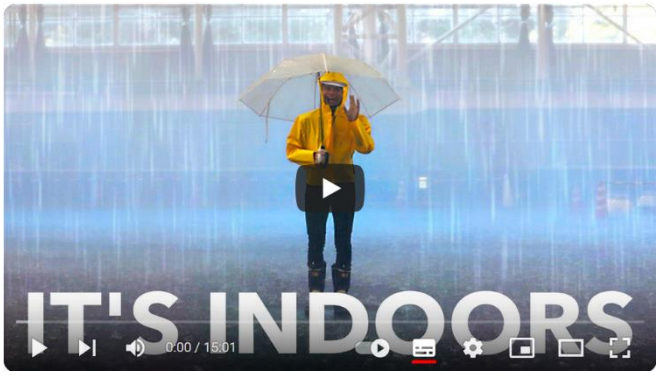
(Alexandra Witze / nature, 06 March 2024, https://archive.is/20240308100753/https:/www.nature.com/articles/d41586-024-00675-8#selection-1367.0-1612.1)

(βλέπε και άρθρο στην επόμενη ενότητα – ΠΕΡΙΒΑΛΛΟΝ)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΠΕΡΙΒΑΛΛΟΝ

Fascinating Look at NIED in Japan, the World's Largest Rainfall Simulator

Japan's National Research Institute for Earth Science and Disaster Resilience (NIED) currently houses the world's largest rainfall simulator in Tsukuba, and it's essentially a warehouse-sized building that can be moved on rails over five experimental positions.



https://www.youtube.com/watch?v=lGJEihgN4OU

Various structures and terrain can be installed in this facility, as the rain falls with four different drop sizes at a rate between 15-300 mm/hour. As you can see, the latter is near the most intense rainfall ever reported on Earth and not something you want to be experience firsthand. NIED is typically used by researchers to analyze landslides, debris flow, soil erosion, urban flooding, and more. However, we wouldn't be surprised to see it used as a movie set / sound stage either.

(Bill Smith / TECHEBLOG, January 27, 2024, https://www.techeblog.com/largest-rainfall-simulator-nied-japan)

(από τον συνάδελφο Γιώργο Κοσσένα)

Are We in the 'Anthropocene,' the Human Age? Nope, Scientists Say.

A panel of experts voted down a proposal to officially declare the start of a new interval of geologic time, one defined by humanity's changes to the planet.

In weighing their decision, scientists considered the effect on the world of nuclear activity. A 1946 test blast over Bikini atoll. Credit...Jack Rice/Associated Press

The Triassic was the dawn of the dinosaurs. The Paleogene saw the rise of mammals. The Pleistocene included the last ice ages.

Is it time to mark humankind's transformation of the planet with its own chapter in Earth history, the "Anthropocene," or the human age?

Not yet, scientists have decided, after a debate that has spanned nearly 15 years. Or the blink of an eye, depending on how you look at it.

A committee of roughly two dozen scholars has, by a large majority, voted down a proposal to declare the start of the Anthropocene, a newly created epoch of geologic time, according to an internal announcement of the voting results seen by The New York Times.

By geologists' current timeline of Earth's 4.6-billion-year history, our world right now is in the Holocene, which began 11,700 years ago with the most recent retreat of the great glaciers. Amending the chronology to say we had moved on to the Anthropocene would represent an acknowledgment that recent, human-induced changes to geological conditions had been profound enough to bring the Holocene to a close.

The declaration would shape terminology in textbooks, research articles and museums worldwide. It would guide scientists in their understanding of our still-unfolding present for generations, perhaps even millenniums, to come.

In the end, though, the members of the committee that voted on the Anthropocene over the past month were not only weighing how consequential this period had been for the planet. They also had to consider when, precisely, it began.

By the definition that an earlier panel of experts spent nearly a decade and a half debating and crafting, the Anthropocene started in the mid-20th century, when nuclear bomb tests scattered radioactive fallout across our world. To several members of the scientific committee that considered the panel's proposal in recent weeks, this definition was too limited, too awkwardly recent, to be a fitting signpost of Homo sapiens's reshaping of planet Earth.

"It constrains, it confines, it narrows down the whole importance of the Anthropocene," said Jan A. Piotrowski, a committee member and geologist at Aarhus University in Denmark. "What was going on during the onset of agriculture? How about the Industrial Revolution? How about the colonizing of the Americas, of Australia?"

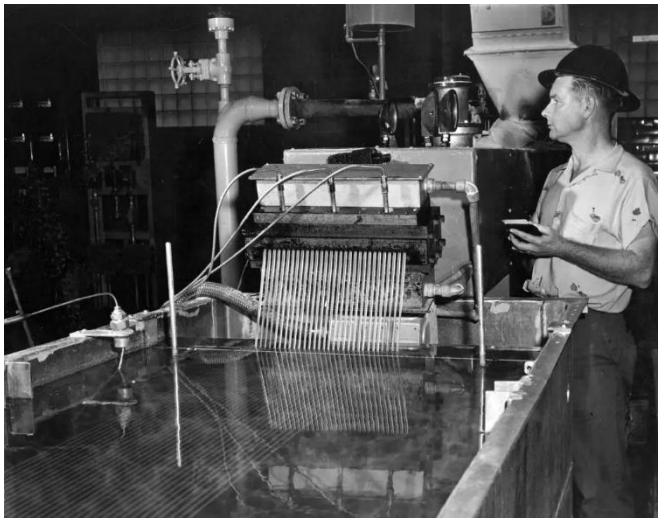
"Human impact goes much deeper into geological time," said another committee member, Mike Walker, an earth scientist and professor emeritus at the University of Wales Trinity Saint David. "If we ignore that, we are ignoring the true impact, the real impact, that humans have on our planet."

Hours after the voting results were circulated within the committee early Tuesday, some members said they were surprised at the margin of votes against the Anthropocene proposal compared with those in favor: 12 to four, with two abstentions. (Another three committee members neither voted nor formally abstained.)

Even so, it was unclear on Tuesday whether the results stood as a conclusive rejection or whether they might still be challenged or appealed. In an email to The Times, the committee's chair, Jan A. Zalasiewicz, said there were "some procedural issues to consider" but declined to discuss them further. Dr. Zalasiewicz, a geologist at the University of Leicester, has expressed support for canonizing the Anthropocene.

This question of how to situate our time in the narrative arc of Earth history has thrust the rarefied world of geological timekeepers into an unfamiliar limelight.

The grandly named chapters of our planet's history are governed by a body of scientists, the International Union of Geological Sciences. The organization uses rigorous criteria to decide when each chapter started and which characteristics defined it. The aim is to uphold common global standards for expressing the planet's history.



Polyethylene being extruded and fed into a cooling bath during plastics manufacture, circa 1950. Credit...Hulton Archive, via Getty Images

Geoscientists don't deny our era stands out within that long history. Radionuclides from nuclear tests. Plastics and industrial ash. Concrete and metal pollutants. Rapid greenhouse warming. Sharply increased species extinctions. These and other products of modern civilization are leaving unmistakable remnants in the mineral record, particularly since the mid-20th century.

Still, to qualify for its own entry on the geologic time scale, the Anthropocene would have to be defined in a very particular way, one that would meet the needs of geologists and not necessarily those of the anthropologists, artists and others who are already using the term.

That's why several experts who have voiced skepticism about enshrining the Anthropocene emphasized that the vote against it shouldn't be read as a referendum among scientists on the broad state of the Earth. "This was a narrow, technical matter for geologists, for the most part," said one of those skeptics, Erle C. Ellis, an environmental scientist at the University of Maryland, Baltimore County. "This has nothing to do with the evidence that people are changing the planet," Dr. Ellis said. "The evidence just keeps growing."

Francine M.G. McCarthy, a micropaleontologist at Brock University in St. Catharines, Ontario, is the opposite of a skeptic: She helped lead some of the research to support ratifying the new epoch.

"We are in the Anthropocene, irrespective of a line on the time scale," Dr. McCarthy said. "And behaving accordingly is our only path forward."

The Anthropocene proposal got its start in 2009, when a working group was convened to investigate whether recent planetary changes merited a place on the geologic timeline. After years of deliberation, the group, which came to include Dr. McCarthy, Dr. Ellis and some three dozen others, decided that they did. The group also decided that the best start date for the new period was around 1950.

The group then had to choose a physical site that would most clearly show a definitive break between the Holocene and the Anthropocene. They settled on Crawford Lake, in Ontario, where the deep waters have preserved detailed records of geochemical change within the sediments at the bottom.

Last fall, the working group submitted its Anthropocene proposal to the first of three governing committees under the International Union of Geological Sciences. Sixty percent of each committee has to approve the proposal for it to advance to the next.

The members of the first one, the Subcommission on Quaternary Stratigraphy, submitted their votes starting in early February. (Stratigraphy is the branch of geology concerned with rock layers and how they relate in time. The Quaternary is the ongoing geologic period that began 2.6 million years ago.)

Under the rules of stratigraphy, each interval of Earth time needs a clear, objective starting point, one that applies worldwide. The Anthropocene working group proposed the mid-20th century because it bracketed the postwar explosion of economic growth, globalization, urbanization and energy use. But several members of the subcommission said humankind's upending of Earth was a far more sprawling story, one that might not even have a single start date across every part of the planet.

This is why Dr. Walker, Dr. Piotrowski and others prefer to describe the Anthropocene as an "event," not an "epoch." In the language of geology, events are a looser term. They don't appear on the official timeline, and no committees need to approve their start dates.

Yet many of the planet's most significant happenings are called events, including mass extinctions, rapid expansions of biodiversity and the filling of Earth's skies with oxygen 2.1 to 2.4 billion years ago.

Even if the subcommission's vote is upheld and the Anthropocene proposal is rebuffed, the new epoch could still be added to the timeline at some later point. It would, however, have to go through the whole process of discussion and voting all over again.

The world’s first full-scale atomic power station in Britain in 1956. Credit...Hulton Archive, via Getty Images

Time will march on. Evidence of our civilization’s effects on Earth will continue accumulating in the rocks. The task of interpreting what it all means, and how it fits into the grand sweep of history, might fall to the future inheritors of our world.

“Our impact is here to stay and to be recognizable in the future in the geological record — there is absolutely no question about this,” Dr. Piotrowski said. “It will be up to the people that will be coming after us to decide how to rank it.”

(Raymond Zhong / The Times, March 8, 2024, https://archive.is/20240310040205/https:/www.nytimes.com/2024/03/05/climate/anthropocene-epoch-vote-rejected.html)

Are We in the ‘Anthropocene,’ the Human Age? Nope, Scientists Say. - The New York Times

But, naturally, (un-)*Nature* is frustrated by the defeat: Geologists reject the Anthropocene as Earth’s new epoch — after 15 years of debate | But some are now challenging the vote, saying there were “procedural irregularities”. | Nature

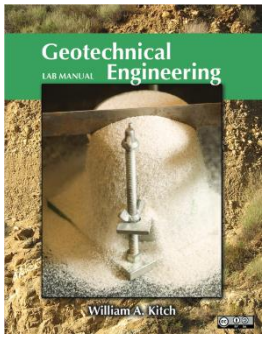
And the mournful (pseudo-)*Science* wants to resurrect it: The Anthropocene is dead. Long live the Anthropocene | Science | AAAS

Fortunately the geologists' vote was categorical (12 against, 4 for). So let's inaugurate another, more meaningful geological epoch, **Narcisscene**: Welcome to the Narcisscene | The Breakthrough Institute

Regards,

Demetris Koutsoyiannis
National Technical University of Athens

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



Geotechnical Engineering Lab Manual

Prof. William A. Kitch (Angelo State University)

Prof. William A. Kitch of Angelo State University has prepared a comprehensive manual for the most common Laboratory Tests in Geotechnical Engineering. The manual is intended primarily for use in an undergraduate soil mechanics lab class. It is intended neither as a guide for researchers nor as a manual of practice for commercial labs. It is instead focused on engaging students in learning fundamental soil mechanics by applying standard lab tests to the solution of realistic, applied engineering problems.

The manual presents a short description of the purpose of each test and the theory behind the test before presenting the test procedures. The purpose section is intended to tie the test to a specific applied engineering reason for performing the test. The theory section is intended to provide an overview of the theory needed to understand why the procedures work. The theory section is not intended to replace fundamentals covered in a soil mechanics class.

The manual encourages students to collect samples for testing, and therefore, the first procedures described, in Chapter 2, are for drilling and sampling. This chapter is followed by a section (Chapters 3 through 7) that covers the basic index properties needed to classify soils. The tests in these chapters should be completed before starting the strength and compressibility tests in Chapters 8 through 11. However, there is no specific order for the tests outside of the general organization just presented. Each chapter is designed to stand alone as much as possible. The final chapter of the manual provides a guideline for preparing a geotechnical data report. The outline is intended to provide a reasonable organization for a typical report of site conditions and soil data for a geotechnical project. It is modeled after state-of-the-practice geotechnical reports.

The Geotechnical Engineering Lab Manual by Prof. William A. Kitch is distributed under Creative Commons license CC BY-SA 4.0.

Educational Resources

Geotechnical Engineering Lab Manual *Prof. William A. Kitch, Angelo State University*

(https://www.geoengineer.org/education/laboratory-testing/geotechnical-engineering-lab-manual-by-prof-william-a-kitch-angelo-state-university)

Innovations and Techniques - Application to Earth Structures in the Future - A PIARC technical Report

Technical Committee 2020-2023 4.3

As we move further into the 21st century, it is becoming increasingly more clear that climate change is the biggest concern that we must face. The effects of climate change, specifically the increasing frequency and intensity of natural hazards, are wreaking havoc on infrastructure, including earth structures, around the globe. The need for more resilient earth structures requires firm and bold action by owners, managers, stakeholders and the whole scientific community.

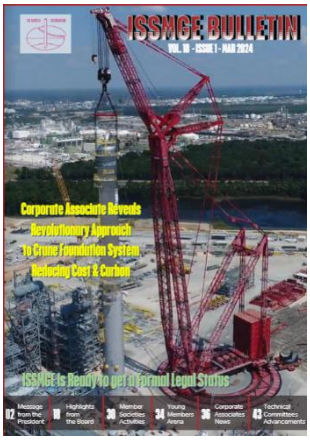
The purpose of this report is to expand upon the work found in the first report published by Working Group 2 (WG2) of Technical Committee 4.3 Earthworks (TC4.3) titled Techniques and Innovations in Earthworks – A PIARC Collection of Case Studies (2022R11EN). The case studies report included 36 case studies from countries all around the world showcasing innovative solutions and techniques related to various aspects of earthworks and earth structures. Innovation will be the key to fight the effects of climate change through more resilient and sustainable earth structures.

This report aims to be a "future vision" of the path we must follow in the sustainable management of earth structures throughout the life cycle. Making decisions and finding solutions in all phases of an earth structure's life cycle will be key in long lasting, sustainable, and resilient earth structures. This report includes a chapter focused on the various phases of the life cycle, followed by a chapter taking a deeper dive into the maintenance phase including a focus on drainage, a key component in the resilience of an earth structure. Resilience indicators, part of a new tool for estimating the value of an earth structure's resilience, are introduced and presented in the fifth chapter. This tool would be useful for an agency or owner looking to build an asset management program for their earth structures.

The report concludes by identifying current and future challenges and some recommendations for future work to be undertaken by PIARC in hopes of progressing this topic among nations of all sizes.

(PIARC, 2023, ISBN: 978-2-84060-818-9)

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ



International Society for Soil Mechanics and Geotechnical Engineering

ISSMGE Bulletin, Vol. 18, Issue 1, March 2024

www.issmge.org/publications/issmge-bulletin/vol-18-issue-1-march-2024

Κυκλοφόρησε το ISSMGE Bulletin, Vol. 18, Issue 1, March 2024 της International Society Soil Mechanics and Geotechnical Engineering με τα ακόλουθα περιεχόμενα:

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- Young Member;s Arena
- Corporate Associates Corner
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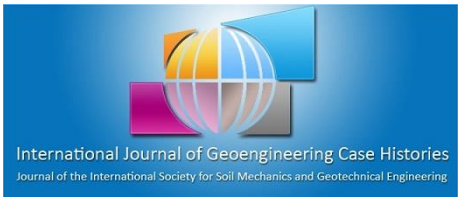

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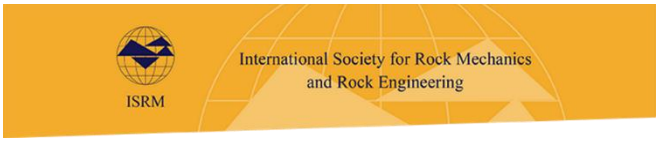
Probabilistic Assessment and Comparison of Scour Protections at Horns Rev 3 and Egmond aan Zee Offshore Wind Farms, Chambel, J., Fazeres-Ferradosa, T., Figueiredo, R., Rosa-Santos, P., Pinto, F. T., Read More

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



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https://isrm.net/newsletter/show/248#isrm-international-symposium-2024-and-arms13-22-27-september-2024-new-delhi

Κυκλοφόρησε το ISRM Newsletter No. 65 - Spring 2024 της International Society for Rock Mechanics and Rock Engineering με τα ακόλουθα περιεχόμενα:

- ISRM International Symposium 2024 and ARMS13, 22-27 September 2024, New Delhi
- 45th ISRM Online Lecture by Dr. Jonny Rutqvist
- Eurock2024, Alicante, Spain, 15-19 July 2024
- Volume 26 - 2023 of the ISRM News Journal is online
- 5th European Rock Mechanics Debate on 8 April
- International Workshop on Recent Advances in Rock Mechanics in San José, Costa Rica, with the ISRM Board
- Professor Jun Sun passed away
- New ISRM Suggested Method Video
- Eurock2025, Trondhei, Norway, 16-20 June 2025 - call for abstracts
- Webinar on the Second Generation of Eurocode 7 and Rock Engineering
- 13th ISRM Young Members' Seminar
- Workshop on Definition of Rockbursts hosted by the ISRM Commission on Rockbursts
- eXtended Reality: bridging the gap between education and experience
- 5th ICITG - International Conference on Information Technology in Geo-engineering, a JTC2 Conference
- 14th International Symposium on Landslides (ISL Landslides 2024) - a JTC 1 Conference
- ISRM Sponsored Conferences

www.nxtbook.com/dfi/DEEP-FOUNDATIONS/march-april-2024/index.php#/p/2

Κυκλοφόρησε το Deep Foundations Magazine του Deep Foundations Institue, Mar/Apr Issue, με τα ακόλουθα περιεχόμενα:

- **PRESIDENT'S MESSAGE**: 2024: A Year of Expectation and Planning for the Future
- **EXECUTIVE DIRECTOR UPDATE**: Connecting & Constructing the Future
- **COVER STORY**: Constructing the New Lone Peak Tram Foundations
- **DFI ACTIVITIES**: IFCEE 2024; upcoming DFI events including SP '24, S3 and DFI49; updates on DFI podcasts and publications, and more.
- **REGIONAL REPORTS**: DFI Europe, DFI of India.
- **EDUCATIONAL TRUST REPORT**: Recent scholarship recipients, news on upcoming scholarships and grants, and schedule of 2024 Trust events.
- **TECHNICAL ACTIVITIES UPDATE**: Updates from the director of technical activities and reports from the Drilled Shaft and Structural Slurry Wall and Seepage Control committees.
- **MEMBER PROFILE**: Andrew Verity is Tops by All Accounts.
- **FEATURE ARTICLE**: Helical Piles Support Transmission Line in Sensitive Wetland Environment
- **FEATURE ARTICLE**: Deep Foundation Challenges for a Combined Sewer Overflow Station
- **FEATURE ARTICLE**: Smart Foundations: Transforming Engineering with AI, IoT and EDCs
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- **FOUNDATIONS FOR A SUSTAINABLE FUTURE**: Deep Foundations BOGO

- Tips for Managing Design Risk on a Project
- **LEGALLY SPEAKING**: Not-So-Good Vibrations.
- **DFI PEOPLE AND COMPANIES**: News about people, companies and Products.
- **CALENDAR & AD INDEX**.

ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ ΕΕΕΕΓΜ (2023 – 2026)

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