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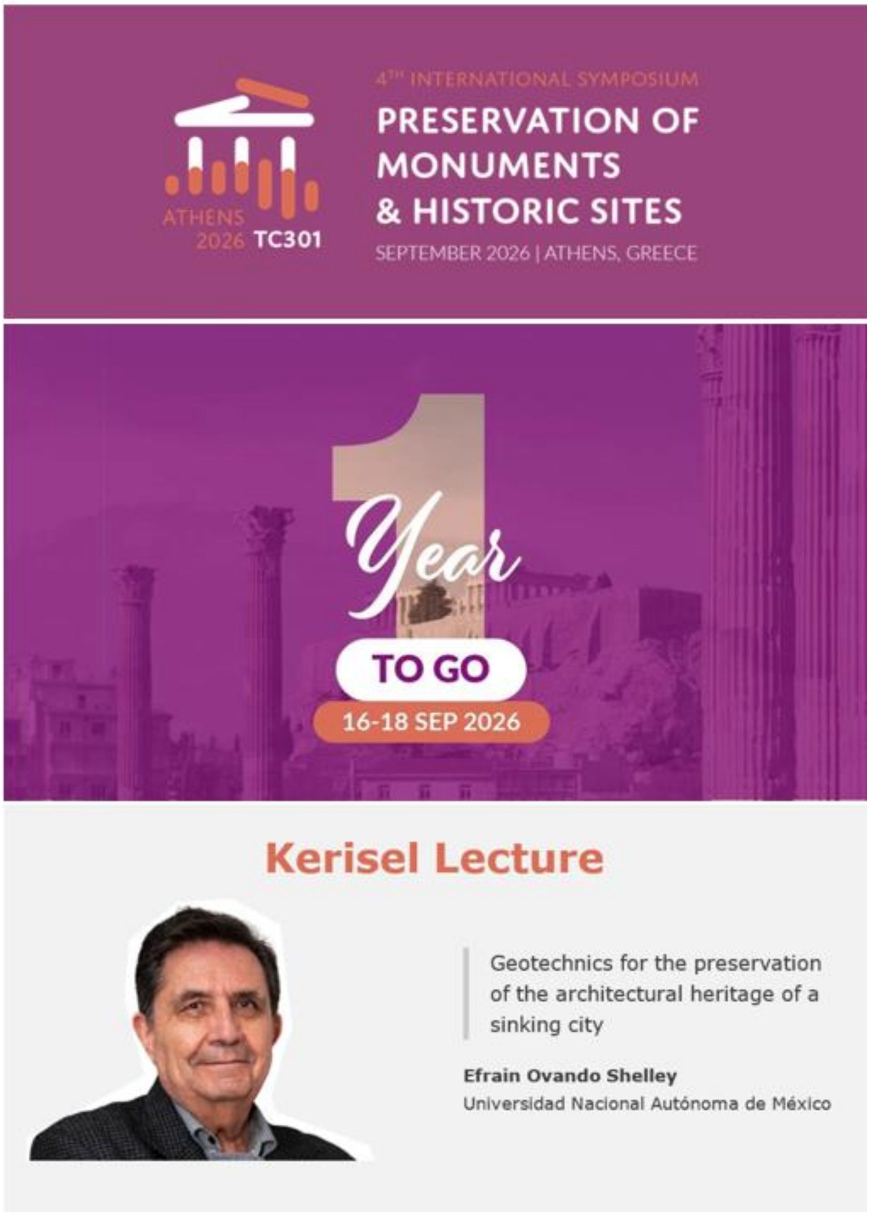


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## Π Ε Ρ Ι Ε Χ Ο Μ Ε Ν Α



Lighthouse in Iceland, built in 1939
Civil Engineering Discoveries

# ΑΡΘΡΑ

## The Challenge of Rock Mass Classification of Anisotropic Rockmasses

**Charalampos Saroglou**

**Abstract**

Rock mass classification of anisotropic rockmasses has always been a challenge for the Rock Engineering industry. The widely used rock mass classification systems, such as RMR, Q and GSI have been tested in practice over the years and in many cases, it proved that they could provide a classification of such rockmasses only if reasonable modifications to their original form were pursued. The intention of the paper is to review the state of the art of rock mass classification systems for anisotropic rockmasses. The primary challenge is the fact that in anisotropic rockmasses, classifications are only applicable when the failure is not governed by the orientation and the properties of the anisotropic planes. In cases where failure is not controlled by the anisotropy planes, it is critical to classify the rockmass appropriately considering the complexity due to anisotropy. A review of the available tools for the classification of such rockmasses is presented. Recently, anisotropic rock mass rating (ARMR) system provided a means for quantitative rock mass classification for anisotropic rockmasses. The paper presents a review from the application of the system in various cases studies, mainly from rock slope engineering and tunneling projects and provides a comparison with RMR and GSI. The method of application of ARMR is also discussed. The paper gives further insight for future challenges and developments of rockmass classifications for anisotropic rockmasses.

**1 Introduction**

The engineering behavior of many rock masses is strongly dependent on their degree of anisotropy, which stems from joints, bedding or schistosity. Anisotropy effect is present in different scales, from the micro-scale in intact rocks due to the preferential alignment of rock crystals (inherent anisotropy) to the macro-scale in transversely isotropic rockmasses, characterized by persistent joints, bedding or schistosity planes. These two main scales of transverse anisotropy are presented in Fig. 1.

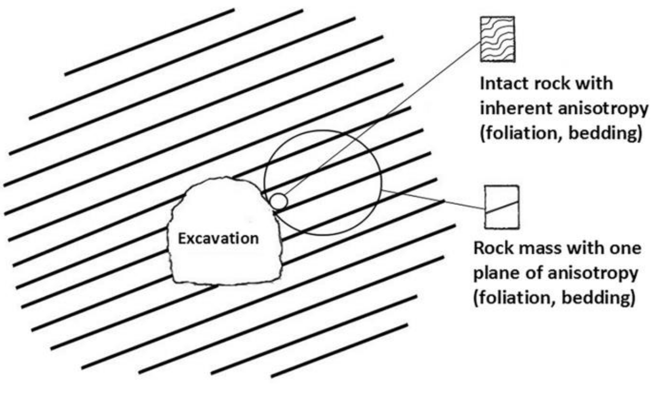


**Fig. 1** Characterization of transversely anisotropic rockmass with different scales of anisotropy

1. Inherent strength anisotropy of intact rock due to the variation of uniaxial compressive strength ($\sigma_{c\beta}$), when loading occurs at different orientation, β, in relation to the plane of anisotropy. Anisotropy of intact rock is characterized by the strength anisotropy index (Rc), which is the ratio of uniaxial compressive strength perpendicular to planes of anisotropy over the minimum uniaxial compressive strength occurring when planes of anisotropy are oriented at an angle of 30°–45° in relation to the major principal stress.

$$R_C = \frac{\sigma_{ci}(90°)}{\sigma_{ci}(\min)} \tag{1}$$

2. Anisotropy of rockmass is due to the presence of persistent bedding/foliation planes. The degree of rockmass anisotropy is determined by the spacing of the anisotropy planes. In this respect, the spacing of the anisotropy planes will be greater in a rockmass that has a lower degree of anisotropy compared to that of a highly anisotropic rockmass. The degree of anisotropy is also related to the quality of the anisotropy surfaces, to the extent of shearing along foliation planes and tectonic disturbance.

Rock Mass classification of anisotropic rockmasses has always been a challenge for the Rock Engineering industry, due to the complexity of their engineering behavior and its dependence on various factors, such as the strength of the intact rock, the spacing and condition of the anisotropy planes, the degree of fracturing, the condition of joints other than anisotropy planes, the degree of tectonic disturbance, the role of stresses etc.

A survey performed by Erharter et al. (2024) showed that the Rock Mass Rating (Bieniawski 1973, 1989), the "Rock Mass Quality (Q)" system (Barton et al. 1974) and the Geological Strength Index (GSI) (Hoek & Brown 1980) are the dominating systems in the world for underground engineering- and slope-related applications since 1980s and thus have managed to prove their practical applicability. Other classification systems such as the Basic Quality index, BQ (GB 50218–94, 1994) are widely used in China. The main classification systems (i.e., RMR, Q and GSI) have been developed primarily using data from isotropic rockmasses. These systems have been used also widely for the classification of anisotropic rockmasses and can account for anisotropic rock mass behavior with proper consideration and adjustments. Alejano (2024) reviewed the use of rockmass classification systems and noted that more effort should be put to classify anisotropic rockmasses.

The paper reviews the state of the art of rock mass classify-cation systems for anisotropic rockmasses and discusses the challenges and areas for future development.

**2 Types of Anisotropic Rockmasses**

The majority of rockmasses can exhibit anisotropic behavior due to the presence of either bedding, schistosity or other discontinuities. In sedimentary rocks, anisotropy stems primarily from bedding planes and rockmasses can be layered and heterogeneous, in the case of alternations of different rock types. Depending on the spacing of bedding planes, sedimentary rockmasses range can be thinly to thickly bedded and the anisotropy degree is higher when bedding planes are closely spaced (Fig. 2b). Further complexity in sedimentary sequences can be added when the rockmasses are folded and tectonised (Fig. 2a, d), due to presence of faulting and shear planes. Another typical anisotropic, heterogeneous sedimentary rockmass is flysch, which consists of intercalations of siltstone, sandstone and sometimes conglomerate or marl layers (Fig. 2c).

In metamorphic rockmasses, anisotropy originates primarily from foliation or banding planes as in the case of schists, phyllites and gneisses. Anisotropy in metamorphic rocks is more pronounced in rockmasses with low strength, such as phyllites and weak schists (Fig. 3a, b, c). For higher strength rockmasses, i.e., gneisses (Fig. 3d) the effect of fracturing becomes more important and the rockmasses become less anisotropic. Anisotropy is encountered both at the scale of the intact rock (inherent anisotropy) and at the rockmass scale, as foliation planes are very persistent.

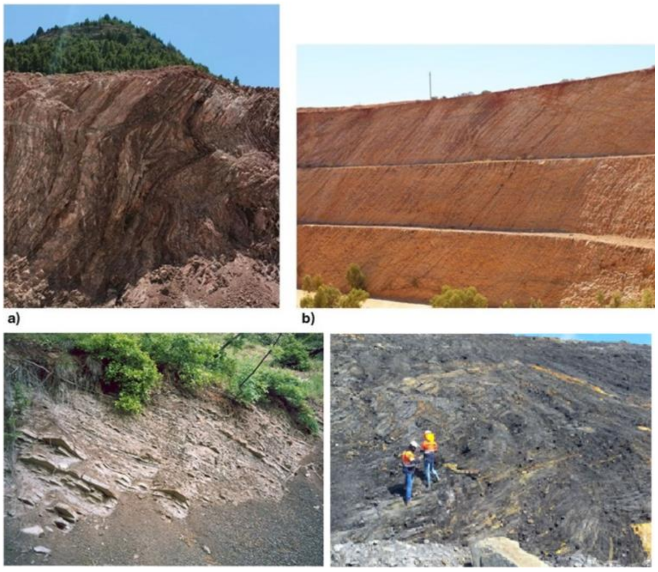

**Fig. 2** Anisotropic rockmasses in sedimentary rocks. a thinly bedded folded limestone—shale (Central Greece), b bedded siltstone (Telfer Mine, Australia) c sandstone—siltstone flysch (Kalydona tunnel, Greece), d thinly bedded and sheared mudstone (Dominican Republic). Photos by the author

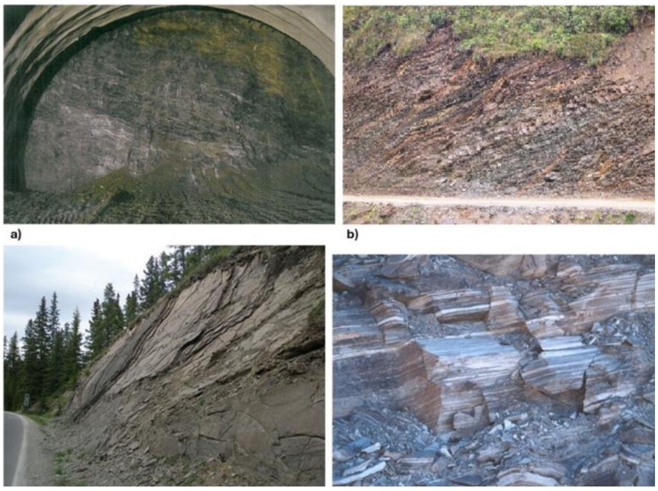

**Fig. 3** Anisotropic rockmasses in metamorphic rocks. a Phyllite (Tempi tunnel, Greece) b phyllite (Mazar dam, Equador), c schist (Banff, Canada) d Gneiss (Egnatia Highway, Greece). Photo Mazar dam phyllite provided by F. D'Allesandro. All other photos by the author

**Fig. 4** Anisotropic rockmasses in igneous rocks with pseudo-bedding. a Columnar jointed basalt (Baihetan dam, China), b andesitic lavas (Santorini, Greece). Photos by the author

In igneous rockmasses, anisotropy is less frequent but also exists due to the presence of pseudo-bedding due to flow in volcanic rocks, i.e., in rhyolites and basalts (Fig. 4a) and intercalations of volcanic layers of different rock strength, which usually result in very heterogenous rockmasses (Fig. 4b). However, often this lithologic hetereogenity does not generate mechanical anisotropy.

**3 Rock Mass Classification for Anisotropic Rocks**

**3.1 Applicability of Rockmass Classification Systems**

The rockmass classification systems have been proposed either for rock mass parameter estimation or prediction of support and reinforcement design for underground openings/ tunnels or in some cases for both. The applicability of the various rockmass classification methods for engineering with anisotropic rock masses, is presented in Table 1. A comparison is made in terms of which parameters account for anisotropy in each system and their applicability.

**Table 1** Applicability of various rockmass classification systems for engineering with anisotropic rock masse

| Classification system | Parameter(s) dealing with anisotropy | Application |
|---|---|---|
| RMR | RQD | Support and reinforcement design |
| Q | Parameter Jr<br>Parameter Ja | Support and reinforcement design |
| RMi | Parameter jR<br>Parameter jA | Support and reinforcement design |
| GSI | Structure | Rock mass parameter estimation |
| ARMR | UCS anisotropy degree<br>Spacing of anisotropic structure<br>RQD | Rock mass parameter estimation |
| A-BQ | Anisotropy degree, Joint spacing, RQD | Qualitative stability assessment of tunnels |
| DRMR | UCS, fracture frequency, joint conditions, groundwater | Rockmass classification |

It is noted that the prediction of support for tunnels based on rockmass classification systems is appropriate in isotropic rockmasses, where loading is more uniform and conditions relatively simple. In anisotropic rockmasses the support design requires detailed numerical modeling using appropriate methodologies to account for the anisotropic loading on the support and calculation of resulting tunnel deformation.

**3.2 Rock Mass Rating (RMR)**

Bieniawski (1973) proposed the Rock Mass Rating (RMR), consisting of rating UCS, RQD, joint spacing, joint conditions, water condition and joint orientation in relation to tunnel advance and then calculating the RMR as the sum of these ratings. The system was further revised to in 1989 (Bieniawski 1989), which is the most used version till today (RMR 89 ). The system provided stand-up times of underground openings according to classes and design guidelines in terms of support and reinforcement based on experience from tunnels.

RMR has been widely applied in anisotropic rockmasses to predict the support and reinforcement of underground works. The classification can account for anisotropy of rockmass if RQD and joint spacing and joint conditions are adjusted accordingly.

**3.3 Rock Mass Quality (Q)**

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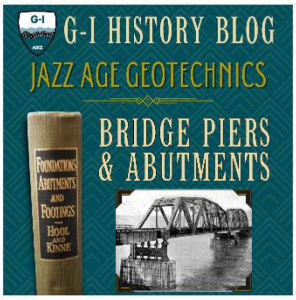


**_Foundations, abutments and footings_ (Hool and Kinne, Eds., 1923), Section 7 (Bridge piers and abutments), featuring the Baltimore and Ohio Railroad as a case study**

**Review By Michael Bennett, P.E., M.ASCE (Virginia Tech: Blacksburg, VA)**

Innovation and invention go hand in glove with civil engineering, as the shared roots of the words "engineer" and "ingenuity" reflect. The need for civil engineers to innovate generally arises from a combination of two factors. The first is the gap between what works on paper and what works on a job site. Rookie geo-professionals learn quickly that their early years in the workforce help them learn all the steps that lie between and around the theories and formulas they've learned as students. They soon become seasoned at choosing methods of calculation, selecting construction means and methods, and preparing reports, all of which helps them appreciate how much room these interstitial spaces of practice provide for engineering innovation. T.S. Eliot stated this point lyrically in his poem The Hollow Men:

"Between the idea
And the reality
Between the motion
And the act
Falls the Shadow."

Rev. Benjamin Brewster, an Episcopal bishop, put it more humorously:

"In theory, there's no difference between theory and practice, while in practice, there is."

The quote is often misattributed to baseball legend and part-time philosopher Yogi Berra. In fairness, he freely acknowledged that this often happened to him, once observing, "I really didn't say everything I said" (Eliot 1925, FG 2012, QI 2012, QI 2018, TAMU 2024).

The other main catalyst for civil engineering innovation and creativity is what Karl Marx, a far more astute historian than political philosopher, memorably called "the dull compulsion of economic relations." The profit motive to reduce costs or increase returns has been the most powerful engine driving technical innovation ever since the dawn of capitalism. Sometimes, it drives those engines quite literally, as it did on US railroads in the early and mid-19th century. American civil engineers originally imported the earliest components of railroading technology, such as track structures and signaling systems, directly from the UK. Yet they soon realized that their country's larger size, lower population density, and more rugged terrain meant their railroads needed much lower operating costs per mile to stay in business than European lines, and they quickly got busy applying their Yankee ingenuity. Accordingly, the late 19th and early 20th centuries were a golden age of theoretical and practical innovation by US railroad civil engineers, and their publications on their work filled American and international civil engineering journals (Marx 1867, Rizzo 2004).

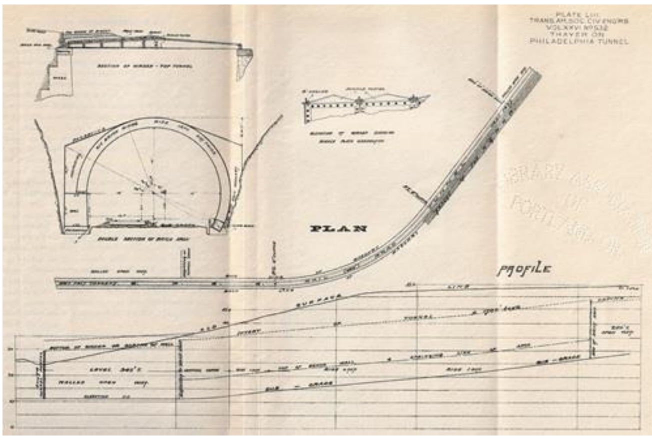


Image 1: Diagram of Baltimore & Ohio Railroad tunnel under Reservoir Hill in Philadelphia, PA from an 1892 *Transactions of ASCE* article. The tunnel remains in service, and the Philadelphia Art Museum now occupies the hill. *Source*: Thayer (1892).


Image 2: A 1902 B&O Railroad stock certificate. *Source*: Author's collection.

American railroads that failed to innovate enough went bankrupt or were gobbled up by rivals or robber barons. However, a few not only survived but thrived through a combination of hard work, innovation, business savvy, and sheer luck. One that came out on top was the Baltimore and Ohio Railroad, popularly known as the B&O. Modern Americans know the line from the boardgame *Monopoly*, but its creative talents were far more Boardwalk than Baltic Avenue in caliber. Chartered in 1827, the B&O grew through careful, incremental expansion, technical ingenuity, and shrewd partnerships with other similarly sized railroads (such as the Reading, its *Monopoly* mate). Eventually, it connected New York City and Washington, DC to Chicago and St. Louis via crack passenger trains such as the *Royal Blue* (York 1987).


Image 3: First stone of the B&O Railroad, placed in 1828. *Source*: Author.

THE Royal Blue

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DINNER

SOUP DU JOUR MINTED GRAPEFRUIT SEGMENTS CLAM BROTH

FRIED MARYLAND OYSTERS, CHILI SAUCE—2.40
BAKED SEASONAL FISH, BUTTER BASTED—2.25
ROAST MARYLAND TURKEY, DRESSING, CRANBERRY JELLY—2.50
BREADED CHOICE PORK CHOPS, SPICY TOMATO SAUCE—2.40
BROILED SELECTED SIRLOIN STEAK—3.90

CARROTS VICHY SOUTHERN STYLE STRING BEANS
CANDIED SWEETS OR HOME FRIED POTATOES

HOT POTATO ROLLS HOT BREAD SPECIALTY OF THE DAY

HELP YOURSELF FROM SALAD BOWL

APPLE or PUMPKIN PIE ICE CREAM HALF GRAPEFRUIT
BREAD CUSTARD PUDDING MAPLE BAKED APPLE
CHOICE OF CHEESE AND CRACKERS

COFFEE SANKA POSTUM TEA
MILK or BUTTERMILK

Manager, Dining Car and Commissary Department
Baltimore, Maryland

Baltimore and Ohio Dining Car Service

Image 4: A *Royal Blue* dinner menu from the mid-1900s. *Source*: Author's collection.

The B&O's innovative streak first emerged in the early 1830s, when it became one of the earliest US railroads to use locomotives rather than horses to power its trains. At around the same time, it introduced to its passenger trains – themselves a novelty at the time – cars that incorporated wheels and axles mounted on swiveling trucks, not directly on the car bodies. The trucks allowed the cars to pivot in transit, enabling them to round curves more easily and safely. Meanwhile, the B&O began mounting the axles of its cars and locomotives in journal boxes, early roller bearings that allowed them to rotate far more freely and without friction than did the conventional body-mounted axle brackets of the day. In 1844, Samuel Morse strung his first telegraph wire and sent the first message crackling in his eponymous code along B&O tracks between Baltimore and Washington, cementing an iconic look for American railroads. As the decades rolled by like a highballing express past country fields, the B&O also became the first railroad to use eight-wheeled passenger cars and iron boxcars (Fenton 2004, York 1987).


Image 5: Replica of an 1830s B&O passenger train, B&O Railroad Museum, Baltimore, MD. *Source*: Author.

As the B&O crept steadily westward, its feats of infrastructure engineering were just as notable as its improvements in rolling stock and engine power. In designing and building its route in the 1830s and 1840s, the railroad became one of the first American employers to maintain its own workforce of engineers rather than simply renting the services of US military engineers. (At the time, engineering had yet to be divided into its modern disciplines.) The B&O's civil engineers calculated that the rugged Allegheny Mountains between Cumberland, Maryland and Wheeling, Virginia (now West Virginia) could be overcome using track with a 2.2% grade, or 116 feet of climb per mile – much steeper than anything European railroads had attempted. They then successfully designed both the route and locomotives that could surmount it. To this day, 2.2% remains the maximum grade used by American railroads. When the B&O's early masonry bridges proved too costly, its engineers developed designs for, and built, sturdy wooden trusses to lower construction costs without sacrificing strength. Eventually, they replaced these with iron trusses, another first, for enhanced durability and fire safety. All the while, the B&O developed fundamentals of railroading operations and management ranging from statistics such as the ton-mile to publicly available timetables for passenger trains. Collectively, its innovations helped transform the United States from an agricultural nation of widely dispersed communities into an industrial powerhouse with a centralized, closely interconnected economy (Fenton 2004, Hankey 2002, York 1987).


Image 6: A late 19th century passenger car in *Royal Blue* livery, B&O Railroad Museum. *Source*: Author.

Image 7: B&O dining car china used on trains such as the *Royal Blue*, Steamtown National Historic Site, Scranton, PA. *Source*: Author.


Image 8: B&O clearance car used to inspect vertical and horizontal clearances of the railroad's tunnels, B&O Railroad Museum. Source: Author.

Section 7 of *Foundations, Abutments and Footings* showed off the B&O's cutting-edge technical acumen but simultaneously reflected how much remained to be learned in civil engineering. Part of Section 7 was written by Chicago bridge engineer Hugh Young, about whom contemporary sources reveal little. His discussion of the counterweight pits of lift bridges, swing bridges, and draw bridges is conspicuously light on geotechnical considerations and detailed calculations. It seems likely that Young's portion of Section 7 tacitly touched on a subject of keen interest to the B&O and, indeed, most civil engineering firms and professionals of any era – how to appropriately balance engineering innovation and advancement with trade secrecy. For decades prior to the 1920s, most US civil engineers had generally held, as one historian noted, that "minding one's own business was … among the basic rules of business" (Lang and Young 1923, Marquis 1922, McCullough 1972).

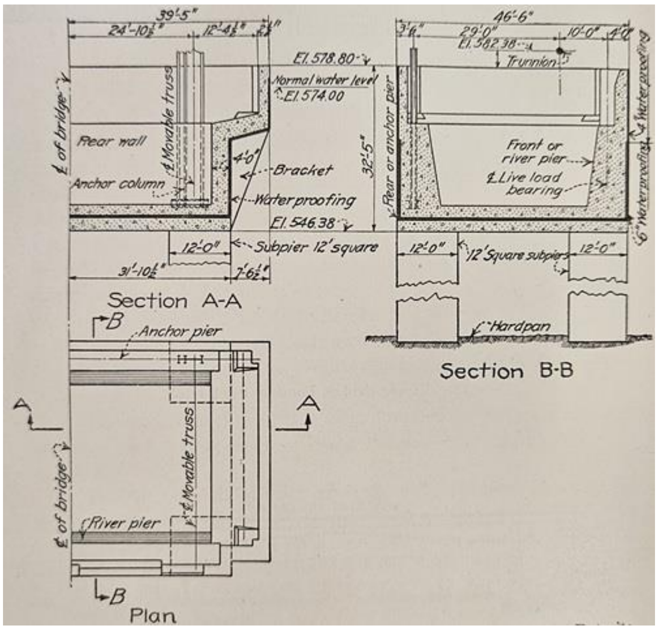


Image 9: Design of the counterweight pit for the Jefferson Avenue - Fort Street bridge in Detroit, MI, early 1920s. *Source*: Lang and Young (1923).

Young's vagueness in his part of Section 7 carries with it echoes of the school of thought that favored trade secrecy over the more widespread distribution of knowledge within American civil engineering. Such an opinion was and remains wholly reasonable, and plenty of his peers in the Jazz Age felt this way. However, by the 1920s, another perspective on the topic was coming into vogue. This point of view held that a more open, collaborative spirit of inquiry was necessary to help civil engineering tackle some of its longest-standing and most intractable problems. Lazarus White, co-author of Section 3 of *Foundations, Abutments and Footings*, and Edmund Prentis, author of Section 5, ably articulated this newer philosophy in the introduction to their 1931 book *Underpinning*:

"Some of the methods, appliances, and machinery described [herein] are the result of a great deal of experimental work by the authors themselves and by the staffs of their companies, involving a considerable expenditure of time and money. They might be considered trade secrets, although some are covered by patents. Nevertheless, they are published here – even at the risk of losing the trade advantage of methods known only to the authors – one compensation to them being the feeling that they have perhaps benefited the profession to which they owe so much" (Prentis and White 1931).

White's perspective was most likely a key reason he and Karl Terzaghi, who had a similar mindset, became fast friends when they met in 1925. During their first meeting, White – tongue firmly in cheek – told Terzaghi it would be a "good investment" for his firm, Spencer, White, and Prentis, to buy every copy of Terzaghi's book *Erdbaumechanik* and dump them all into the Hudson River because the manuscript told the competition too much. Terzaghi got the joke, but the underlying question of how much of a profession's body of knowledge should be publicly available and how much may be kept privately as trade secrets is quite serious, and geoprofessionals debate it to this day. Research consortiums and open-access journals are among current solutions that accelerate civil and geotechnical engineering advances while also respecting trade secrecy and considerations of intellectual property. In such an informational climate, Hugh Young's portion of Section 7 might have read quite differently (Goodman 1999).

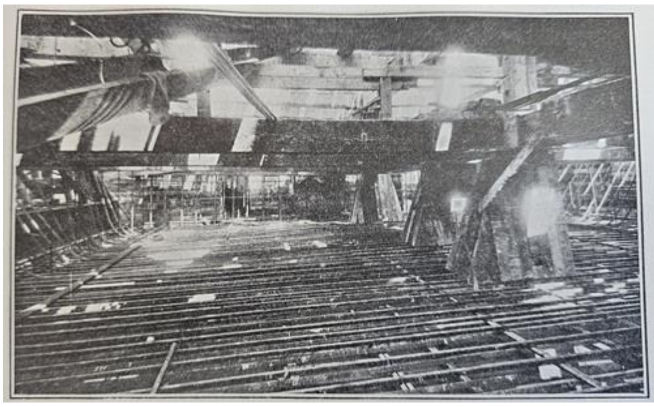

Image 10: Construction of the counterweight pit for the Franklin-Orleans Street Bridge, Chicago, IL designed by Hugh Young. Source: Lang and Young (1923).

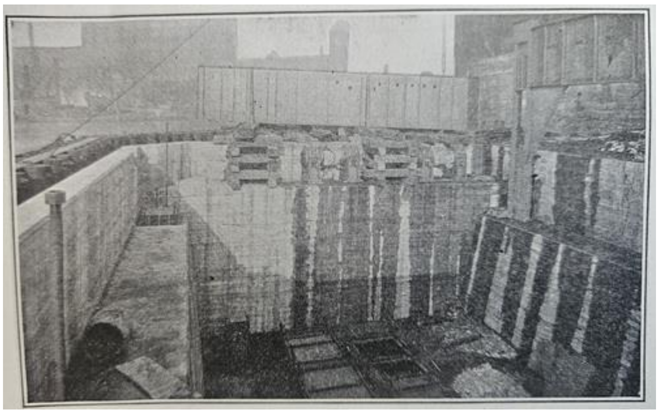

Image 11: Completed counterweight pit for the Franklin-Orleans Street Bridge, Chicago, IL. Source: Lang and Young (1923).

Most of Section 7 of *Foundations, Abutments and Footings* was authored by Philip Lang, one of the Baltimore and Ohio Railroad's bridge engineers. His discussion of the design and construction of bridge piers and abutments was far meatier in terms of technical content than Hugh Young's write-up. Lang had spent 15 years with the B&O by 1923, working his way up from a draftsman to one of its chief bridge engineers. In 1922, he had penned an article for the *Transactions of ASCE* on the design and construction of the railroad's Allegheny River bridge in Pittsburgh. Lang, the B&O's engineer of record on the structure, had pulled off devilishly tricky feats of construction sequencing in building the bridge and transferring traffic over from its predecessor while minimizing disruptions to freight and passenger service. Lang, a prolific technical writer, had also contributed pieces to *Engineering News-Record*, *Railway Age*, and *General Electrical Review* magazines and had authored several textbook sections.

The B&O always capitalized heavily on its history and its reputation for innovation as selling points; its first rail had been laid in 1828 by Charles Carroll, the last surviving signatory to the Declaration of Independence. Thus, it probably supported Lang's technical writing because it recognized the value his innovations provided – not to mention his work's value as a marketing tool to trumpet the B&O's embrace of engineering advances (Hankey 2002, Lang 1922, Marquis 1922).

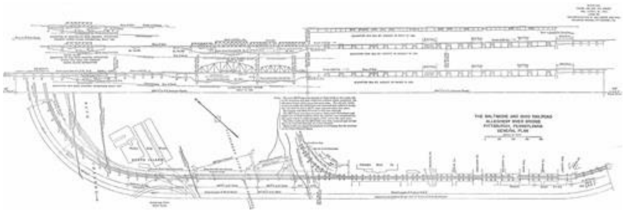

Image 12: Diagram of the new B&O bridge over the Allegheny River, Pittsburgh, PA, c. 1920. Source: Lang (1922).

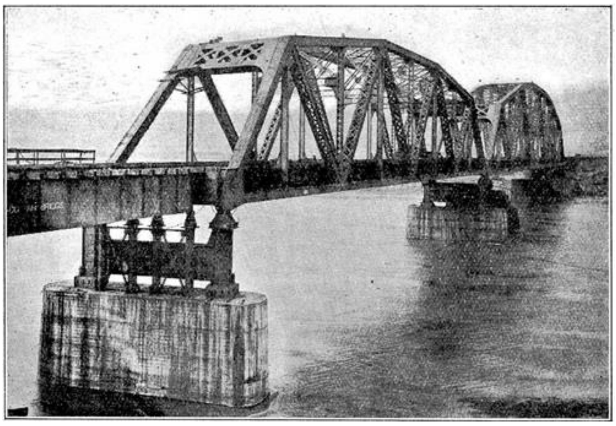

Image 13: The finished B&O bridge over the Allegheny River, 1921. Source: Lang (1922).

At times, Lang's writing closely paralleled modern structural and geotechnical guidance on bridge design. He observed that foundation design for a proposed structure fundamentally depended on the load that the soil and rock beneath it was "capable of not only safely supporting, but supporting without undue settlement." Such an insight, although mundane for modern geo-professionals, was one all too many civil engineers of the Jazz Age failed to appreciate. Similarly, when Lang reviewed how loads were determined for railroad bridges, he referenced the Cooper E-load series, introduced in the *Transactions of ASCE* in 1894. Locomotives of the 1920s were considerably heavier and more powerful than those from the late Gilded Age, but use of the Cooper series had endured, likely because it was among the first civil engineering design codes suited for widespread adoption. The load series remains in daily use among railroad bridge engineers today, even with the advent of diesel and electric locomotives (Lang and Young 1923).

Images 14 through 18: Locomotives of the 1920s.

Image 14: Skagit River Railway No. 6 (2-6-2), Newhalem, WA. Source: Author.

Elsewhere, though, Lang's writing demonstrated that he and the B&O had plenty of room left in terms of civil engineering innovation and advancement. While he referenced discussions of site exploration from previous sections of *Foundations, Abutments and Footings*, he gave only passing coverage to a number of what are now considered geotechnical topics. Lang's 1922 *Transactions of ASCE* paper on his railroad's Allegheny River Bridge also reflects this perspective, as he spent just 2 of his article's 25 pages on the structure's foundation engineering. Edward Stearns, a civil engineer who had been the American Bridge Company's field supervisor on the structure, added his two cents during ASCE's discussion of the paper. He congratulated Lang but also added detail on some geotechnical angles of the story, including the installation of Simplex concrete piles at some pier locations and the excavation of pneumatic caissons through poor-quality shale bedrock at others. Lang replied politely but with palpable impatience that discussion of such "accessory detail" about the job could only distract readers from "those features of general operation that might be of professional interest and merit treatment in a published article." His jarring, dismissive remark helps explain the relatively scarce coverage of some geotechnical subjects in his portion of Section 7 (Lang 1922, Lang and Stearns 1922, Lang and Young 1923).

Image 15: Pennsylvania Railroad No. 460 (4-4-2), Railroad Museum of Pennsylvania, Strasburg, PA. Source: Author.


Image 16: Illinois Central Railroad No. 790 (2-8-0), Steamtown National Historic Site, Scranton, PA. Source: Author.

Philip Lang covered some geotechnical topics in more detail within Section 7 of *Foundations, Abutments and Footings*. However, his treatments of them were often riddled with mistakes that, in hindsight, indicate where the geotechnical advances of the next 100 years would unfold. For example, Lang stated that buoyancy "rarely" compromised the stability of bridge piers and that "generally the neglect of buoyancy will be on the side of safety." Modern geo-professionals, painfully cognizant of the principle of effective stress, will beg to differ. Later, Lang accurately stated that "the dimensions of [pier] foundations" depended upon "the load in tons per square [foot] which it has been determined in advance" that the "underlying material" could support. However, he could provide his readers no further guidance on this point, as scientifically rigorous methods for making this determination were just gaining traction in 1923 [see **Hool and Kinne (1923), Section 3, Part A**]. Finally, when Lang discussed the evaluation of lateral earth pressures on bridge abutments, he correctly noted the importance of ensuring adequate drainage behind them using rock backfill and a network of drainage pipes. However, he also explained (citing the theories of Coulomb and Rankine) that all mathematical treatments of lateral earth pressure at that time incorporated a planar failure surface, a resultant force applied one-third of the way up the wall, and a predefined orientation of this resultant. Modern geo-professionals recognize from subsequent geotechnical advances that the assumptions Lang listed often fall short of the mark. Most notably, the failure surface in passive earth pressures within cohesive soils is best represented using a logarithmic spiral, and the effects of soil arching often elevate the point at which a resultant force acts significantly above one-third of a wall, abutment, or excavation height (Lang and Young 1923, Terzaghi et al. 1996).


Image 17: East Broad Top Railroad No. 16 (2-8-2), Rockhill, PA. Source: Author.

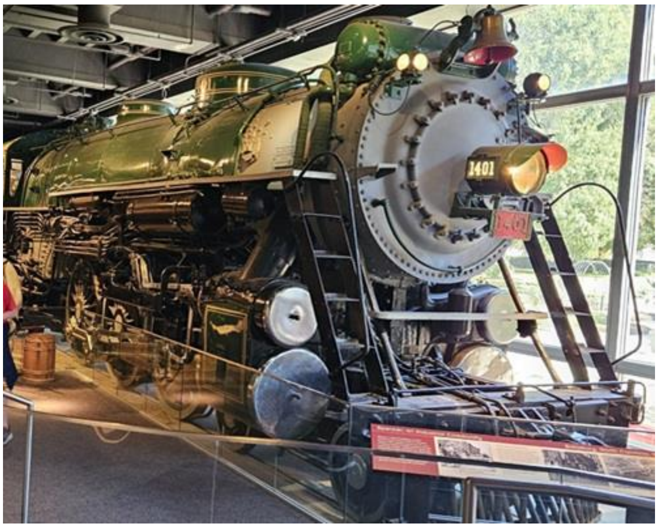


Image 18: Southern Railway No. 1401 (4-6-2), National Museum of American History, Washington, DC. Source: Author.

Philip Lang's discussion of the scour of bridge piers in Section 7 of *Foundations, Abutments and Footings* illustrates more clearly than any other topic he covered both his efforts to handle geotechnical considerations using practicing experience and thinking around corners and how such efforts ultimately come up short when founded on inadequate theoretical knowledge. The proportion of US bridge failures attributable to scour in 1923 was probably even higher than the 60% it is today. By the Roaring Twenties, the fundamental mechanism driving scour at bridge piers was at least well understood. When water flows around an obstruction such as a pier, it accelerates up to 50% to maintain a constant flow rate and picks up material around the pier en route. To combat scour, Lang suggested minimizing this acceleration by building the pier as orthogonally to the channel as was practical, with its shorter side facing upstream. He also recommended that engineers shape this short side into either a semicircle, which he preferred and had used on the B&O's Allegheny River Bridge, or an isosceles triangle with 45° angles from the main body of the pier. Clearly, Lang appreciated how crucial scour considerations were in safely conveying his railroad's trains between its ornate terminals in cities such as Baltimore, Cincinnati, and Philadelphia. Still, he did not yet fully understand the nature of the problem (Briaud 2023, Lang 1922, Lang and Young 1923).

Image 19: The B&O's station in Philadelphia, PA, c. 1920, with its entrance on Chestnut Street clearly visible. Architect Frank Furness designed the terminal. Source: LOC (2025).

Image 20: The B&O's station in Philadelphia, PA, c. 1960, with its staircases to the tracks below Chestnut Street and along the Schuylkill River clearly visible. The tunnel in Image 1 is about 0.75 miles north of here. Source: LOC (2025).

A century onwards, detailed research has made the mechanics and parameters governing scour much better understood. The erosion threshold at which soil undergoes scour can now be expressed as either a critical flow velocity, $v_c$, or a critical shear stress, $\tau_c$, both of which can be empirically correlated to a soil's type and mean grain size, $D_{50}$. More granular soils usually undergo scour to peak depth more rapidly (in hours) than more cohesive ones (in days), albeit to a lesser maximum depth. For a bridge pier in a waterway, the maximum depth of scour may be predicted using the following equation:

$$z_{max}\,(pier) = 2.2 \times B' \times K_{pw} \times K_{psh} \times K_{pa} \times K_{psp} \times (2.6 \times Fr_{[pier]} - Frc_{[pier]})^{0.7}$$

Within this equation, $B'$ is the pier's projected width perpendicular to waterway flow; $K_{pw}$ accounts, as applicable, for the reduced scour potential of shallow water; $K_{psh}$ accounts for the pier's end or nose shape; $K_{pa}$ is the pier's aspect ratio (length to base); $K_{psp}$ accounts for pier spacing; and $Fr_{[pier]}$ and $Frc_{[pier]}$ are, respectively, the current and critical Froude numbers for the waterway. The pier end shape factor, $K_{psh}$, has been defined through repeated study as 0.9 for sharp pier noses, 1.0 for round or circular noses, and 1.1 for square noses. Thus, Philip Lang was mistaken in preferring semicircular noses over sharp noses for his bridge piers, but he did correctly identify the two most favorable nose shapes for minimizing scour. An analogous equation and factors have been developed for scour at bridge abutments, where the abutment shape factor, $K_{ash}$, steadily decreases when going from vertical wall abutments to a standard wingwall abutment to spill-through abutments with sloped aprons. This intuitively makes sense, since vertical abutments reduce a channel's flow area, thus increasing velocity and scour. It also represents a sea change from the guidance Lang offered on bridge abutment design, in which he made no reference at all to scour (Briaud 2023, Browne et al. 2010, Lang and Young 1923).

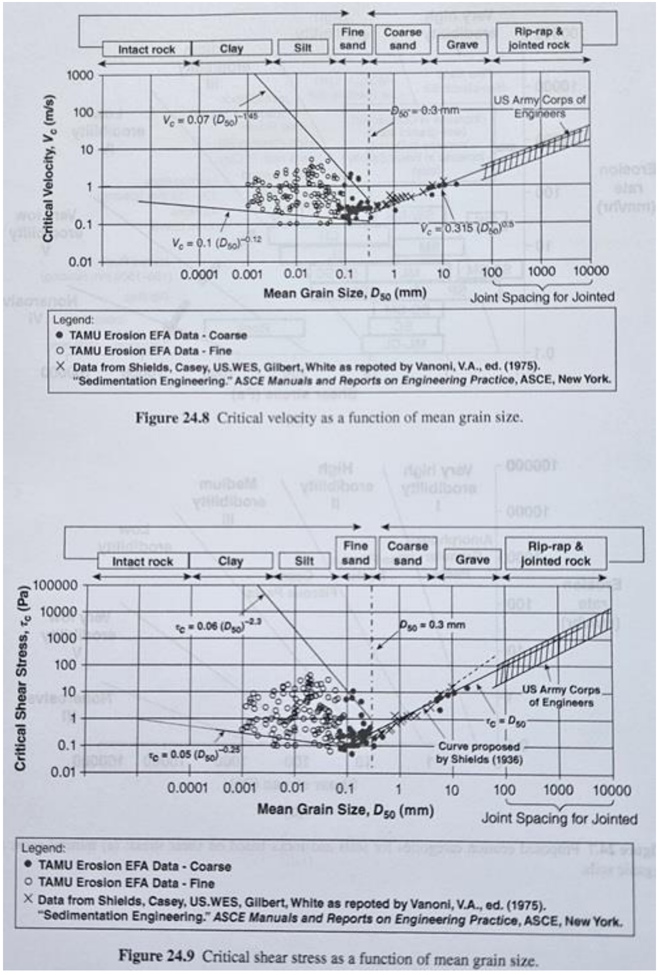


Image 21: Plot of critical velocities (T) and shear stresses (B) for scour prediction as a function of mean grain size of soils. Source: Briaud (2023).

Once structures are built, their geotechnical stability against scour is regularly monitored. Scour inspection procedures, another topic Philip Lang left unaddressed, were standardized in the US after several high-profile, fatal bridge failures from scour in the late 1980s. Scour is usually evaluated every two years during a bridge's federally mandated inspection, and additional checks are often performed following major flood events. Engineers trained as both divers and inspectors use either surface-supplied air or SCUBA gear as they evaluate piers. Surface air supplies permit work at greater depths, in stiffer currents, and for longer durations, but SCUBA gear allows for several dives to be undertaken in quick succession – advantageous for inspecting a multi-pier structure – and eliminates the tangling hazard of a surface air supply umbilical. The divers will be well-positioned to observe horseshoe vortices swirling at the upstream bases of bridge piers and excavating horseshoe-shaped depressions (hence their name) of material there. While the divers ply their trade, additional inspectors on the water's surface monitor their safety and supplement their work using sensing techniques such as remote operated vehicles, electronic video inspection devices, and imaging systems such as fathometers and side-scanning sonar. These methods can be particularly invaluable under conditions unsafe for human diving inspections, such as fast currents, greater flow depths, or debris-laden water. The surface crew will also watch for other potential indicators of scour, such as the telltale whorls of wake vortices spinning downstream of bridge piers (Ayres Associates 2025, Browne et al. 2010).

Image 22: Wake vortices downstream of the bents of a bridge over Roberts Bay in Venice, FL. The right-of-way, a former route for the Seaboard Air Line Railroad, now carries the Legacy Trail, a bicycle and pedestrian path. Source: Author.

Back in the office, the diving and surface inspection teams can compare their complementary findings on scour at a bridge. The divers' notes and photos give an understanding of the bridge's current condition that only boots on the ground – or, more aptly, fins in the water – can provide. Meanwhile, the surface surveys provide large amounts of subsurface data to contextualize the divers' observations and cover inherent pitfalls of diving, including often-poor underwater visibility and the limitations of what divers can see within a relatively short window of time. The results of select geophysical methods, such as ground-penetrating radar and low-frequency sonar, can be used to locate pockets of infilled material around bridge piers, which might otherwise provide a false sense of security about their performance with regards to scour. Geo-professionals might instinctively prefer soil borings, but these are costly and tedious to conduct underwater and provide little information on the lateral extent of infilling (Browne et al. 2010).

Eventually, the inspection team will compile their data into cross-section plots of the waterway channel and of the bases of the piers. Critically, the team members will compare these results to those of previous scour inspections to identify any long-term trends in the structure's scour performance over time. Finally, the team will use their findings together with a detailed descriptive rubric to assess the bridge's performance against scour on a scale of 0 to 9. A bridge rated 9 is in excellent shape on dry land above flood elevations and is unthreatened by scour, while a bridge rated 0 has failed due to scour. Such a rigorous inspection procedure for scour at bridges would likely have staggered Philip Lang and the B&O Railroad's fellow civil engineers. Given their employer's hunger for innovation, though, they might well have moved quickly to implement such protocols on their own bridges (Browne et al. 2010).

Image 23: A bridge pier from a long-abandoned branch of the Lehigh Valley Railroad stands guard in the Lehigh River near White Haven, PA. Source: Author.

A century after *Foundations, Abutments and Footings* was published, evaluating the scour performance of surviving railroad bridge piers and abutments from that time – or, indeed, just about any aspect of their geotechnical performance – is difficult if not outright impossible. The theoretical aspects of the scour and geotechnical design of modern such structures are much more rigorously established, and comparing the work of past engineers to present standards is a far safer proposition than judging that work by those standards. Moreover, survivor bias is at play. Many railroad bridges built in the early 1900s failed due to scour or other design flaws, and those that survive from back then reflect some mix of design conservatism, robust construction, careful maintenance, and happenstance. Furthermore, plenty of robustly built railroad bridges met the wrecking ball later in the 1900s as the American rail industry collapsed (see Image 23). Given all that, the number of US railroad bridges from the early 20th century that remain in service is truly remarkable. Many have endured far beyond their intended lifespans despite dramatically increasing loads and decades of deferred maintenance. Only now in their perilously old age, often well over 100 years, are many of these bridges being replaced. One prominent example is the Portal Bridge on the former Pennsylvania Railroad, the B&O's archrival, near Kearny, NJ. The structure, built in 1907 as part of the Pennsy's extension into Manhattan, is finally being replaced through Amtrak's Gateway Project. *(Disclosure: The author worked on this project.)*

Image 24: The 1907 Portal Bridge, May 2024. Source: Author.

Perhaps not coincidentally, the bridges engineered by Philip Lang and Hugh Young have long outlasted both men and their respective employers. Most of the structures Young and his colleagues at the Chicago Bascule Bridge Company designed continue to carry daily automotive traffic in Chicago and other US cities. The same holds true for the bridges Lang and his B&O peers crafted. Lang's and Young's writings in Section 7 of *Foundations, Abutments and Footings* make clear that they ably, albeit not always, compensated for their lack of theoretical know-how and their occasional aversion to divulging trade secrets with practical, experience-driven solutions to problems and the ability to adeptly think on their feet. The lesson remains an invaluable one for rookie geo-professionals (Lang and Young 1923).

Image 25: The 1907 Portal Bridge and its replacement, April 2025. Source: Author.

Image 26: A Lang-era B&O bridge at Bartram's Garden in Philadelphia, PA remains in daily freight use, as does the tunnel in Image 1. Source: Author.

Image 27: Former site of the B&O's station on Chestnut St. in Philadelphia, PA. Source: Author.

Lang's peer civil engineers at the Baltimore and Ohio Railroad certainly appreciated his knack for creativity and innovation, and their employer fostered a culture in which they were similarly encouraged to push the limits of practice in their field. These innovative ways almost surely played a sizable role in keeping the B&O afloat. The 1960s and 1970s marked the nadir of the American railroad industry (see Hool and Kinne (1923), Section 4), and the B&O was forced to take drastic measures to stay solvent. It ended passenger service on the *Royal Blue* in 1958 and demolished its Philadelphia station on Chestnut Street a few years later. (A mural of the station now stands by the site.) Most notably, the B&O followed most other major railroads in the northeast US and merged to keep above water – in its case with another old rival, the Chesapeake and Ohio, in 1972. However, the newly expanded C&O bucked the economic trends of the day and, unlike almost every other major railroad then in the region, thrived after the merger (York 1987).

Image 28: Mural at the former site of the B&O's Philadelphia station. Source: Author.

In 1980, the new C&O merged again, this time with the Seaboard Railroad. The merged company took the name CSX – C for C&O, S for Seaboard, and X for the merger's anticipated multiplier effect. These hopes were realized, as CSX continues to thrive and is now one of the US's two Class I railroads east of the Mississippi River (the other being Norfolk Southern). Following the July 2025 announcement of advanced merger talks between Norfolk Southern and Union Pacific, which would create the United States' first transcontinental railroad carrier, industry insiders have stated that CSX and BNSF (formerly the Burlington Northern and Santa Fe Railroad) are engaged in similar discussions. If such a merger took place, it would make for quite the celebration of the B&O's upcoming bicentennial in 2027 (Valle 2025, York 1987).

Image 29: Stairs from the B&O's long-demolished station in Philadelphia, PA, are uncovered during the reconstruction of the Chestnut St. bridge, early 2020s.
Source: Jessica Rehrig, P.E. (Alfred Benesch & Co.).

The B&O lives on in several ways in addition to CSX's corporate heritage. Many of its structures remain in service, such as its 1910 bridge over the Schuylkill River in Philadelphia, (see Image 26). It is unknown whether Philip Lang worked directly on this structure but is distinctly possible. Other, less apparent remnants of the railroad also turn up from time to time. When Philadelphia's Chestnut Street Bridge over the Schuylkill River, just 2 miles northeast of the B&O's bridge, was reconstructed recently, crews found that the demolition contractor that tore down the railroad's station there in 1963 had saved money by burying the B&O's stone staircases from street level to track level rather than properly demolishing them. The project team took the opportunity to preserve the staircases for history by first photographing them and then reburying them beneath the new bridge's eastern approach to seal them off from natural deterioration. The team also rehabilitated the stone-arch overpass carrying Chestnut Street over 24th Street, which the B&O had built as part of its station project, and reopened one of the railroad's two sidewalk tunnels beneath Chestnut Street for regular bicycle and pedestrian traffic (Meyers and Spivak 2010, Rehrig and Sirignano 2023).

Image 30: 24th Street underpass originally built by the B&O for its Philadelphia station. The mural in Image 27 is immediately to the right of the underpass. Source: Author.

As CSX trains continue to rumble over the bridges Philip Lang and his peers designed for the B&O, the railroad's history has also been preserved more systematically. The B&O Railroad Museum at the line's original Baltimore terminus ably chronicles the railroad's rich heritage. The exhibits speak to the hard work and dedication of early 20th-century civil engineers such as Lang who compensated, often successfully, for their lack of technical geotechnical know-how with abundant ingenuity and tenacity, along with sturdy construction. Their work shows that great engineering, or even a new approach to it, doesn't have to be overly elaborate or intricate; it merely needs to be sound and workable. The ability of Lang, his peers, and their predecessors and successors at the railroad to break problems down to their basics, consider solutions outside the box, and bring those solutions into being explains as much as anything else the success and durability of the Baltimore and Ohio Railroad and its corporate successors.


Image 31: A B&O engine pushes a departing excursion train of restored passenger cars away from the B&O Railroad Museum in Baltimore. *Source*: Author.

**Acknowledgments**

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# ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

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**ISSMGE News**
www.issmge.org/news

## Real-Time Back Analysis (RTBA) working group Technical Presentations 23 September 2025

Ying Chen / TC206 / 09-09-2025

Dear colleagues,

Our upcoming technical presentation will be delivered by Dr. Truong Lee (Imperial College), Dr Ying Chen (Transport for London) and Ningxin Yang (Imperial College). Please feel free to share this invitation with anyone who may have an interest in the topic.

Title: **The importance of reliable monitoring data in back-analysis: a case study from Tottenham Court Road**

Authors: Truong Le*, Ying Chen, Ningxin Yang

Abstract: For many geotechnical engineering projects, extracting value from a sophisticated monitoring programme remains challenging. When incorporating field monitoring data into a back-analysis, there are numerous challenges related to data volume, accuracy, precision, and sources. This presentation aims to illustrate the complexities of data processing and interpretation for the purposes of back-analysis. We will discuss new insights stemming from a re-investigation of the Tottenham Court Road monitoring data. Common pitfalls will be highlighted, along with the importance of applying sound engineering judgement/decision-making in the back-analysis process. We will also share lessons learnt from this exercise that may inform strategies for realising real-time back-analysis.

23 September 2025 10:00am UK time for one hour.

Tue, 23 Sept 2025 10:00 - 11:00 (UTC+01:00) Dublin, Edinburgh, Lisbon, London

To Join the webinar, please register:
https://events.teams.microsoft.com/event/637b0db7-4b02-417e-b473-1c7dde2398fb@4ae48b41-0137-4599-8661-fc641fe77bea

## Announcing the Publication of the 2025 Geotechnical Business Directory

ISSMGE IT Administrator / General / 18-08-2025

GeoWorld, the network for geotechnical engineers, has just published the 2025 Geotechnical Business Directory. The directory is published with the support of the International Society for Soil Mechanics and Geotechnical Engineering. This is **the 11th year for the Geotechnical Business Directory, the most comprehensive directory in the geotechnical engineering field!**

This truly unique directory is available in **three** formats:

1. an Online Interactive Platform
2. an e-book, and
3. in-print through Amazon

The 2025 index has grown significantly and **includes 42,000+ GeoWorld members with 1,000+ companies and organizations** from a total of 162 countries. The directory is expected to reach 50,000+ professionals through various media channels.

The online platform of the directory allows visitors to search for professionals or companies based on location, experience, expertise, industry and other parameters. There is no other such directory in geotechnical engineering. The directory is also a "live" publication in the sense that as more members join and complete their profiles, the publication will become more comprehensive.

The online platform of the directory, which is updated daily, has increased search functionality compared to the e-book and printed version.

GeoWorld's team is already preparing for the **2026 edition**, which will be a unique publication, showcasing exclusive stories, corporate updates, and noteworthy geo-news from around the world. Next years in-print version will also be **distributed for free at the 21st ICSMGE** in Austria, offering unmatched visibility for participating professionals and companies. It will include complete professional and company profiles so make sure your ISSMGE profile is linked to GeoWorld and is up to date to maximize your visibility within the global geotechnical community!

ISSMGE Corporate Associates interested in being promoted in the 2026 directory can find out more here: https://www.mygeoworld.com/business-directory/21-icsmge

If you are not a member of GeoWorld, visit the website and join at no cost, so that you can be part of the 2026 Geotechnical Business Directory.

## TC206-220 Monitoring group Technical Presentation "Lessons Learned from Monitoring HS2 Northolt Tunnels"

Ying Chen / TC206 / 15-08-2025

Dear All,

TC206-220 Monitoring Group will host an online Technical Presentation " **Lessons Learned from Monitoring HS2 Northolt Tunnels**" by **Fiona Hughes and Colin Carter**

Date: Tuesday, 9 September 2025

Time: 09:00-10:00 UK time

Please contact group leader Mr Hock Liong Liew (LinkedIn) for joining the presentation.

## Spotlight: Argentina – Asociación Civil de Ingeniería Geotecnica (SAIG)

Max Barbosa / Young Members / 03-09-2025

The **Young Geotechnical Engineers Group of Argentina**, coordinated by **Cecilia Belén Laskowski Orlandi** (International Representative for Young Geotechnical Engineers in Argentina), has launched an exciting and impactful initiative: a **series of Technical Conferences for Young Geotechnical Engineers** across Latin America.

**The goal** of this initiative is to create a relaxed and friendly environment for young engineers to interact, exchange experiences, discuss technical ideas, and foster international collaboration especially with geotechnical groups from neighboring countries. The conferences also aim to promote long-term connections among young geotechnical professionals and highlight the diversity of engineering practices across the region.

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2025 Conference Highlights

**1st Edition April 9, 2025**

**Theme:** *Challenges in Tailings Stability*
**Partner Society:** Sociedad Chilena de Geotecnia (Chile)

**Speakers:**

- Mauro Sottile (Argentina)
- Cristian Monje (Chile)
- Ignacio Cueto (Argentina)

**Topics Presented:**

- *A comparison of advanced constitutive models for evaluating the liquefaction of upstream tailings dams*
- *Effect of saline soil collapse on the physical stability of tailings deposits*

  Followed by an interactive **round of Q&A and discussion**.

---

**2nd Edition August 6, 2025**

**Theme:** *Geotechnical Design and Reliability in Excavations and Retaining Walls*
**Partner Society:** Asociación Boliviana de Ingeniería Geotécnica (Bolivia)

**Speakers:**

- Pedro Fernández (Argentina)
- Rodrigo Pérez (Bolivia)
- Valentina Skorepa (Argentina)

**Topics Presented:**

- *Reliability analysis in the design of urban excavations*
- *Geotechnical design of a retaining wall incorporating unsaturated soil mechanics*

  Followed by an engaging **discussion session**.

---

Impact and Future Plans

Both events were a great success, with over **200 registrants** and more than **60 active participants**, including young professionals and senior members from Argentina and other Latin American countries. The enthusiasm and participation demonstrated the need for these conferences to become **recurring events** in the regional geotechnical calendar.

Looking ahead, the group plans to host **at least two more Technical Conferences** before the end of 2025, continuing to empower young geotechnical engineers to present their work, expand their networks, and gain international visibility.

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**Watch the video summary below:**


**We would love to hear from your YMPG group too!**

To contribute an update or video from your country's Young Members Group, please write to: ympg.issmge@gmail.com

Let's keep sharing and learning together across borders!


**https://issmge-e.eu**

**News**

**Latest Newsletter**

The latest from across Europe including activities of the Vice President

**10th Geotechnical Symposium - Kocaeli 2025**

The 10th Geotechnical Symposium, organized on behalf of the Turkish Chamber of Civil Engineers (TMMOB) by its Ankara, Kocaeli, and Sakarya Branches, will be held in Kocaeli in November 2025.

**News**
https://www.isrm.net

**1990 reconstituted lecture by Evert Hoek at the University of Leeds now on the ISRM website** 2025-08-03

This lecture was compiled from an audio tape of Professor Evert Hoek's lecture on weak rock masses in 1990 at the University of Leeds, combined with his slides. The lecture was not prepared in paper form in the original proceedings although the discussion which can be heard, was (pp 223-225; Cripps et al., 1993). It is considered important as it sets out Professor Hoek's philosophy about what makes a rock mass weak, and, in answer to a question from Dr John Sharp he presented an early version of the Hoek-Brown strength criterion which over time has morphed into the Geological Strength Index (GSI). As he stated, there wasn't then (and still isn't) any other tool which allows the strength of fractured, isotropic rock masses to be estimated.

Steve Hencher
Emeritus Professor
University of Leeds, UK.

Click here to watch the lecture

**Evert Hoek - And the Future of Rock Engineering by Professor Charles Fairhurst** 2025-08-03

Professor Charles Fairhurst delivered the keynote lecture "Evert Hoek, his Legacy and Rock Mechanics/Engineering in the 21th Century" at the 59th US Rock Mechanics / Geomechanics Symposium (ARMA Rocks 2025) held in Santa Fe, New Mexico, in June 2025.

The ISRM extends its sincere thanks to Professor Fairhurst for graciously agreeing to share this remarkable lecture—honoring the late Professor Evert Hoek—on the ISRM website.

We also wish to thank the Itasca Consulting Group (ICG)—who recorded the lecture and produced the video—and the American Rock Mechanics Association (ARMA) for granting permission to publish it on the ISRM website.

Click here to watch the lecture

**51st ISRM Online Lecture by Professor Michel Van Sint Jan from Chile --11 September at 10 a.a. UTC** 2025-08-23

The 51st ISRM Online Lecture will be given by Professor Michel Van Sint Jan from Chile. The topic of the lecture will be "Rockbursts: Mechanisms, Hazards, and Engineering Implications". It will be broadcast in September on 11 September at 10 a.m. UTC and will remain available on the Online Lecture's page.

**5th "Short-term prediction of rock failure" competition** 2025-08-30

The "Short-term Prediction of Rock Failure Competition" is an event held to promote the resolution of key scientific issues related to major natural and engineering disasters in rock mass systems such as earthquakes, landslides, rock bursts, and gas outbursts. The activity takes the form of conducting indoor large-scale rock sample failure tests. The purpose of the competition is to promote the innovation of theories, methods, technologies, and monitoring instruments for complex geological disasters and nonlinear rock mechanics, and to enhance human ability to predict and forecast major natural disasters in rock mass systems.

Previous editions were hosted by Taiyuan University of Technology, China. The 5th competition will be held from 31 October to 3 November 2025 in Wuhan, China, and is sponsored by the ISRM Commission on Ultradeep Rock Mass Mechanics and Engineering and the Journal of Rock Mechanics and Engineering.

**The organizers welcome research teams in rock mechanics from around the world to participate**, exchange knowledge, and advance the science and technology of rock disaster prediction. For more details, please download the official announcement.

**Scooped by ITA-AITES #137, 14 August 2025**

Progress on the Naples-Bari High-Speed Line | Italy

North End Connectors wins Yonge North Subway Extension tunnelling contract | Canada

Work on Purple Line river tunnel begins | Thailand

Hanoi to formalise regulations on underground space development | Vietnam

High-Speed Rail to connect France and Italy

Coffs Bypass tunnelling milestone reached | Australia

Kolkata Metro set for major expansion, 3 new routes likely to open by end of August | India

[Underground Works Begin for Cluj Metro First Phase Plans | Romania]

[Africa's longest underground tunnel with three train stations that cost £2.6bn | South Africa]

[China's first vertical large model for tunnel, underground space sector released]

☙ ❧

BRITISH TUNNELLING SOCIETY YOUNG MEMBERS

**BTSYM Tunnel Talks in Birmingham (and online)**

Tuesday, 12th August 2025, 18:00 - 19:00 (GMT+1)
The Colmore Building, AECOM, 20 Colmore Circus
Queensway, Birmingham B4 6AT
Teams link below

**Event Information:**

Drawing on first-hand project experience, our speakers will explore the design and construction challenges involved in complex shaft excavations and also examine the growing role of trenchless techniques in underground infrastructure delivery.

**Speakers**

**Dr Annie Wong (Aecom)**

**Eyri Visual Impact Provision Garth Shaft - Three-dimensional numerical modelling for complex multi-level excavations**

This presentation outlines the three-dimensional (3D) finite element analysis of the Garth Launch Shaft, a key component of National Grid's Eryri Visual Impact Provision (VIP) project in North Wales. The project involves the installation of underground electricity cables within a 3.3 km long tunnel to replace overhead lines crossing the Dwyryd Estuary. For the Garth Shaft, a staged 3D finite element analysis using PLAXIS 3D was carried out to simulate the shaft construction sequence and investigate soil-structure interaction (SSI). The results provided valuable insights into the behaviour of temporary and permanent support systems, guiding the design of the shaft.

**Jonathon Ure (Aecom)**

**Eyri Visual Impact Provision - Convergence Analysis in the weak rock at Cilfor Shaft**

This presentation outlines the shaft lining design for the Cilfor Shaft, the TBM reception shaft of the Snowdonia Visual Impact Provision project, which is located in a challenging geological setting in North Wales. With a 12.5 m internal diameter and a depth of 60 m, the structure transitions from secant piles at shallow depths to sprayed concrete lining within the underlying rock. The variable and often weak rock conditions presented design challenges, particularly with regards to ground support and deformation control. Standard finite element modelling proved unreliable in the lowest-strength materials, prompting the development of a robust, mathematically based convergence-confinement method. This presentation details the approach used to assess ground behaviour, develop an efficient support strategy, and optimise the permanent shaft lining, ensuring both structural safety and material efficiency.

**Jonathan Koster (Arup)**

**The increasing importance of trenchless technology in the energy transition: An engineer's perspective**

This presentation explores the growing role of trenchless technology in the energy transition from an engineering standpoint. It highlights how methods such as horizontal directional drilling (HDD), pipe jacking and auger boring are influencing infrastructure development by minimising surface disruption, reducing environmental impact, and improving project efficiency. The talk discusses technical challenges associated with some applications, while offering insights into how engineers are adapting to and leveraging these technologies to meet the evolving demands of sustainable energy infrastructure.

*Event kindly sponsored by Aecom.*

**[TEAMS LINK]**

☙ ❧

INTERNATIONAL GEOSYNTHETICS SOCIETY

**[www.geosyntheticssociety.org]**

**News**

**[Young Members Photo Contest – Winners Revealed]** August 5, 2025

Geosynthetics captured in sunset are among the winning images for the latest IGS Young Members (YM) Photo Com-petition. The call-out was launched at the GeoAmericas **[Read More »]**

**[Dinners And Discussion For Young Members At GeoAsia8]** August 6, 2025

A busy program of social and educational events engaged young engineers at the recent 8th Asian Conference on Geosynthetics (GeoAsia8) in Brisbane, Australia. Around 250 **[Read More »]**

**[Spotlight On Sustainability At Spain Conference]** August 12, 2025

Members of the IGS's Technical Committee on Soil Reinforcement (TC-R) and Sustainability Committee spread the word on greener solutions at the recent EGRWSE 2025. This **Read More »**

**More Videos Added To Sustainability Calculator Series**
August 14, 2025

Thirteen new recordings have been added to the newly renamed IGS Environmental Sustainability Calculator training series. Joining four videos covering the basics of setting up **Read More »**

**IGS Colombia Holds Second EtE Event** August 20, 2025

Geosynthetics education strengthened its reach with a second in-person Educate the Educators (EtE) workshop for IGS Colombia. Forty-five educators gathered in Bogotá for the event **Read More »**

**IGS Educate The Educators – Future Focus** August 26, 2025

Since its establishment 10 years ago the IGS Educate the Educators (EtE) program has delivered geosynthetics learning from Argentina to the Philippines. Since its revitalization **Read More »**

**Team IGS To Attend Environmental Expo** August 28, 2025

The transformative power of geosynthetics in sustainable solutions will be showcased at the global Environmental Services & Solutions Expo (ESS 2025) next month. IGS Executive **Read More »**

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

**Title announced for the 64th Rankine Lecture by Professor William Powrie** 11.08.2025

For the 64th Rankine Lecture Professor William Powrie of the University of Southampton will present on 'The role of behavioural mechanisms and observed performance in affordable, resilient geotechnical infrastructure' Read More

**Testimonials from recipients of the BGA Knowledge Support Fund** 25.08.2025

The BGA Knowledge Support Fund allows the BGA to provide financial assistance to individual BGA members for further study or advancement of their career in technical subjects. Read More

**News**
**www.geoinstitute.org/news**

**Jazz Age Geotechnical Engineering Part 7: Bridge Piers and Abutments**

**Created**: 13 Aug 2025


**Michael Bennett, P.E., M.ASCE (Virginia Tech: Blacksburg, VA)**

Featuring the B&O Railroad as a case study.

(το πλήρες κείμενο παρατίθεται στην ενότητα Άρθρα)

**NOAFAULTS KMZ layer Version 7.0**

The next version was Published **5 August 2025** | Version 7.0 **Dataset Open**

NOAFAULTS KMZ layer Version 7.0

https://zenodo.org/records/16728922

Greek Active Faults https://arcg.is/04Haer

# ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

On-site Short Course on Geotechnical Earthquake Engineering, 30 August – 7 September, Kobe and Tokyo, Japan, ixa@ethz.ch

UNSAT2025 5th European Conference on Unsaturated Soils, 1 to 3 September 2025, Lisbon, Portugal, https://eunsat2025.tecnico.ulisboa.pt

ISP8 Symposium International pour le 70ème anniversaire du pressiomètre / International Symposium for the 70th Anniversary of the Pressuremeter, 2nd to 5th of September 2025, LUXEMBOURG, https://isp8-pressio2025.com

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

EYGEC 29th European Young Geotechnical Engineers Conference, 9-12 September, 2025, Rijeka, Croatia, https://eygec2025.uniri.hr

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

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

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

GROUND ENGINEERING GEOTECH 2925 Where innovation meets opportunity, 2 October 2025, London, United Kingdom https://www.geplus.co.uk/news/ground-engineering-to-launch-geotech-2025-conference-where-innovation-meets-opportunity-16-01-2025

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

*f*OMLIG3 FLORENCE 2025 Third Workshop on the Future of Machine Learning in Geotechnics "Ethics and intelligences for a geotechnical Renaissance", October 15-17, 2025, Florence, Italy https://fomlig2025.com

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

6ο Πανελλήνιο Συνέδριο Αντισεισμικής Μηχανικής και Τεχνικής Σεισμολογίας (*6ΠΣΑΜΤΣ*), 30, 31 Οκτωβρίου και 1 Νοεμβρίου 2025, https://6psamts.eltam.org

Med-GU-25 5th Annual Meeting Mediterranean Geosciences Union, 10–13 November 2025 in Athens, Greece, https://2025.medgu.org/index.php

7ο Συνέδριο Αναστηλώσεων, 13-15 Νοεμβρίου 2025, Αθήνα, www.etepam.gr/7o-synedrio-anastiloseon

ORFEUS+EFEHR+EMSC (EPOS Seismology) & Geo-INQUIRE Workshop 2025, 24-27 November 2025, Athens, Greece, https://www.geo-inquire.eu/about/terms-and-conditions, https://docs.google.com/forms/d/e/1FAIpQLSf-LXXy8X-jiEtaCaI_n2VIp7QcM-71TJAY9ZCsPlt8SVNM1Q/viewform

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

PMGEC LEBANON 2026 Pan Mediterranean Geotechnical Engineering Conference, 25 - 28 March 2026, Phoenicia Beirut IHG, Lebanon https://pmgec-leb.com

International Conference on Geotechnics, Civil Engineering and Structures (CIGOS) 2026 Innovation in Planning, Design and Civil Infrastructure for Resilient and Sustainable Transformation, April 16 & 17, 2026, Ho Chi Minh City, Vietnam https://cigos2026.sciencesconf.org

LANDSLIDES 2026 Landslide Geo-Education and Risk (LaGER), 27 April - 1 May 2026, Queenstown, New Zealand http://landsliderisk.nz

15th International Conference "Modern Building Materials, Structures and Techniques", May 12-15, 2026, Vilnius, Lithuania, https://vilniustech.lt/332107

ITA-AITES WTC 2026 World Tunnel Congress, May 15 to 21, 2026, in Montreal, Quebec, Canada, https://wtc2026.ca

94th Annual Meeting & International Symposium on Large Dams - Water, Energy and Society: The Evolving Role of Dams in a Changing World, May 21 to 29, 2026, Guadalajara, Mexico, www.icoldmexico2026.com

ICPMG 2026 Physical Modelling in Geotechnics, 8–12 June 2026, ETH Zürich, Switzerland, https://tc104-issmge.com/icpmg-2026

8th International Young Geotechnical Engineers Conference - 8iYGEC, 11. - 14. June 2026, Graz, Austria, www.tugraz.at/institute/ibg/events/8iygec

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

3rd International Geotechnical Innovation Conference - Shaping the World Beneath: Fostering Sustainability, Innovation and Resilience in Geotechnics, 15 - 16 June 2026, Jed-dah, Saudi Arabia, https://geotechnicalinnovationconference.com Email info@creativeconnectionevents.com

ICONHIC 2026 International Conference on Natural Hazards & Infrastructure, 29 June – 2 July 2026, Chania, Greece https://iconhic.com/2026

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

Soft Soils 2026 International Conference on Advances and Innovations in Soft Soil Engineering 2026, 24-26 August 2026, Delft, Netherlands https://softsoils2026.dryfta.com

X Latin American Congress on Rock Mechanics 26 - 28 Aug, 2026, Brasilia, Brazil, https://larms2026.com

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

Eurock 2026 Risk Management in Rock Engineering - an ISRM Regional Symposium, 15-19 September 2026, Skopje, Republic North Macedonia, https://eurock2026.com

ECEE2026 18th European Conference on Earthquake Engineering Shaping the Future of Earthquake Engineering, 14 – 1 September 2026, Berlin, Germany, https://ecee2026.eu

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

6th International Conference on Information Technology in Geo-Engineering JTC2 Conference, 13-16 October 2026, Graz, Austria, www.icitg2026.com

EWRWSE – 2026 7th International Conference on Environmental Geotechnology, Recycled Waste Materials and Sustainable Engineering, 22-25 October 2026, Surat, Gujarat, India www.egrwse2026.com

SLOPE STABILITY 2026 Slope for Safety Performance an ISRM Specialized Conference, 26 – 29 October 2026, Lima, Peru www.slopestability2026.com/en

PBD-V Chile International Conference on Performance-Based Design in Earthquake Geotechnical Engineering, November 4th to 6th, 2026, Puerto Varas, Chile www.pbd-v-chile.com

ARMS 14 Fukuoka 2026 - 14th Asian Rock Mechanics Symposium Rock Mechanics for the Next Generation –Innovations, Sustainability, and Resilience– an ISRM Regional Symposium, 22-26 November 2026, Fukuoka, Japan, www.ec-convention.com/ARMS14/

## 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.

## XIXth European Conference on Soil Mechanics and Geotechnical Engineering "Connecting Continents Through Geotechnical Innovations" 04-08 September 2028, Istanbul, Turkey

**Conference Topics**

01 Modelling and Experimental Assessment of Geomaterials

02 Geohazards, Earthquakes and Risk Mitigation

03 Development of Resilient and Sustainable Geosystems

04 Geotechnical Construction and Soil Improvement

05 Geotechnical Engineering of Multiscale Observations, Sensors and Monitoring

06 Energy Geotechnologies

07 Technological Innovation

08 Geo Education, Standards And Codes

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# ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

## The 15 July 2025 quick clay landslide at Portneuf in Canada

**A quick clay landslide in the Quebec region has destroyed most of a farm and a local road.**

Over the next few days I will try to bring the blog up to date with some of the major landslides that have occurred whilst I have been on leave.

To start, on 15 July 2025 an interesting quick clay landslide occurred at the Rivière-Blanche Est range, in Saint-Thuribe, in Portneuf, Canada. Radio Canada has an excellent piece on this event (in French) that includes images and videos. They have also posted this video (again, in French) that includes some very good aerial imagery of the site:-


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

This includes the still below:-

The 15 July 2025 quick clay landslide at Portneuf in Canada. Still from a video posted to Youtube by Radio Canada.

The location of this landslide is, I think, [46.69818, -72.15138]. This is a Google Earth image of the site collected in July 2024:-

Google Earth image of the site of the 15 July 2025 quick clay landslide at Portneuf in Canada.

The news reports that I have read do not highlight an obvious trigger for this landslide, but it is interesting to note that the toe is located on the outside of the river bend, where erosion is high. There had been a period of rainfall prior to the landslide, but this does not seem to have been exceptional.

No-one was killed or injured in the landslide, but there is substantial loss of farmland and, in all probability, the farm buildings. The road has also been destroyed. Quick clay landslides are a known hazard in this part of Quebec, but interestingly this site was not classified as being potentially exposed to landslides.

**Acknowledgement**

Thanks to loyal reader Maurice, and others, for highlighting this event.

(Dave Petley / EOS – The Landslide Blog, 5 August 2025, https://eos.org/thelandslideblog/portneuf-1)

## Santorini Rockfall Sparks Concern, Municipality Says No Danger


**Authorities on the iconic Greek island stress that the phenomenon is common due to Santorini's volcanic geology.**

A rockfall on Sunday in the cliffside village of Imerovigli on Santorini, alarmed tourists and residents but was later downplayed by local authorities as a common occurrence linked to the island's geology.

The Municipality of Thera, in a statement issued Wednesday, stressed there was "no reason for concern", describing landslides along the slopes of the caldera as a usual phenomenon caused by the island's volcanic terrain. Authorities added that the incident "posed no danger" and emphasized that safety measures are in place to protect residents and infrastructure.

The municipality also rejected media reports claiming construction work triggered the rockfall, clarifying that all forms of building are prohibited during the peak tourist season.

However, geologists and other experts noted that the location is particularly vulnerable, citing years of excessive development on the island's fragile caldera slopes. In response, officials said existing protections, such as fencing, shielding networks, and other reinforcements, are being maintained, with further interventions planned under a Joint Ministerial Decision issued after February's earthquakes.

"Such incidents, while alarming, rarely present immediate danger," the municipality said, underlining that its top priority is ensuring the safety of residents and visitors as well as safeguarding Santorini's reputation as a premier global destination.

Santorini faced challenges again earlier this year, after weeks of tremors and earthquakes rattled the island, raising more concerns about the resilience of its terrain.

(tovima.com, 20.08.2025, https://www.tovima.com/society/santorini-rockfall-sparks-concern-municipality-says-no-danger/#google_vignette)

## Deep gashes in the earth are slicing up cities, swallowing houses and displacing vast numbers of people

Hundreds of thousands of people are at risk of displacement from expanding 'gullies' in cities across Africa.

A view of a deep urban gully in Kamonia in the Democratic Republic of the Congo. More than 3,000 people are at risk of this gully expanding. Credit: Ruben Nyanguila/Anadolu via Getty

Gigantic trenches known as gullies are opening up in cities in Africa, swallowing up homes and businesses, sometimes in an instant, a study has found[1].

About 118,600 people, on average, in the Democratic Republic of the Congo (DRC) alone were displaced between 2004 and 2023, according to researchers reporting their findings in *Nature*.

Without urgent action, researchers estimate that hundreds of thousands of people across Africa are likely to be displaced within the next 10 years, including more than one-quarter of the 770,000 or so people in the DRC living in the expected expansion zone of these gullies.

"It's an underestimated and severely under-researched hazard," says study co-author Matthias Vanmaercke, a geographer at the Catholic University of Leuven (KU Leuven) in Belgium. It is caused by "a combination of natural and human factors", he says, but this is "not at all unavoidable".

**Expanding gullies**

Gullies are expanding across cities that are built on sandy soils and lack adequate drainage. When there are heavy rains, water accumulates on roads and rooftops. When the drainage systems are inadequate, the water finds its way into unprotected ground, carving deep holes that can stretch for hundreds of metres. Over time, the gullies swallow houses and other infrastructure, and sometimes even result in deaths.

Vanmaercke and his colleagues used satellite images taken between 2021 and 2023 to identify 2,922 urban gullies in 26 of 47 cities, covering a cumulative distance of nearly 740 kilometres. The team cross-checked these images with historical aerial photographs stored at the Royal Museum for Central Africa in Belgium and found that only 46 of the gullies were present in the 1950s. This "gave the first clear indication that this is indeed attributable to the ongoing urbanizetion", Vanmaercke says.

In 99% of cases, the gullies had expanded by at least 10 square metres between 2004 and 2023. The average gully was 253 metres long and 31 metres across at its widest point, and nearly all of them were linked to the road network. "The water cannot infiltrate, and it concentrates along these roads which basically become big canals that turn into rivers," says Vanmaercke.

The researchers then combined data on population density with the gully maps. This enabled them to estimate that an average of 118,600 people were displaced because of gullies over the period — with displacement rates more than doubling after 2020.

Guy Ilombe Mawe, a geomorphologist at the Official University of Bukavu in the DRC and a co-author of the paper says that the widening of gullies can be catastrophic and even fatal, and that families living near gullies often have no safe alternatives.

In November 2019, the researchers visited Kinshasa, the DRC's capital and one of the most affected cities, with 868 urban gullies stretching over a total of 221 kilometres. There they met a mother whose home stood near a gully edge. Two days later, several of her children were killed while sheltering at a relative's house, when an expanding gully collapsed overnight. At least 40 people in Kinshasa died that night.

**References**

1. Mawe, G. I. *et al. Nature* **644**, 952–959 (2025).

*doi:* https://doi.org/10.1038/d41586-025-02745-x

Read the associated News & Views article 'Gully formation in cities is displacing tens of thousands of people

(Miryam Naddaf / nature news, 27 August 2025, https://www.nature.com/articles/d41586-025-02745-x)

# ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ & ΑΝΤΙΣΕΙΣΜΙΚΗ ΜΗΧΑΝΙΚΗ

## Southern Kamchatka shifted 2 m (6.6 feet) during M8.8 earthquake on July 29, 2025

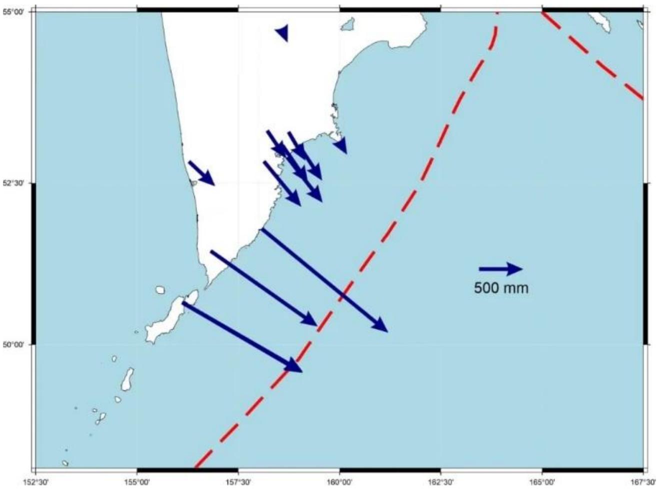
**Preliminary data from KBGSRAS shows that the southern part of the Kamchatka Peninsula shifted southeastward by nearly 2 m (6.6 feet) after M8.8 earthquake on July 29. This is comparable in scale to displacement observed during the 2011 M9.1 Tōhoku earthquake in Japan.**

Preliminary geodynamic calculations by the Kamchatka Branch of the Geophysical Survey of the Russian Academy of Sciences (KBGSRAS) indicate significant coseismic deformation across the Kamchatka Peninsula following tsunami-producing M8.8 Kamchatka earthquake at 23:24 UTC on July 29 2025.

Maximum horizontal ground displacements were recorded in the southern part of the peninsula, where shifts reached nearly 2 m (6.6 feet) in the southeastward direction. According to KBGSRAS, the displacements are comparable in scale to those observed during the 2011 M9.1 Tōhoku earthquake in Japan.

The Petropavlovsk cluster of GNSS stations, including Petropavlovsk-Kamchatsky, experienced measurable but lower levels of displacement.

The pattern of motion is consistent with a preliminary fault slip model that places the highest coseismic slip on the southern flank of the rupture zone. This distribution corresponds with observed macroseismic intensity, which was notably stronger in Severo-Kurilsk and weaker in Petropavlovsk-Kamchatsky.

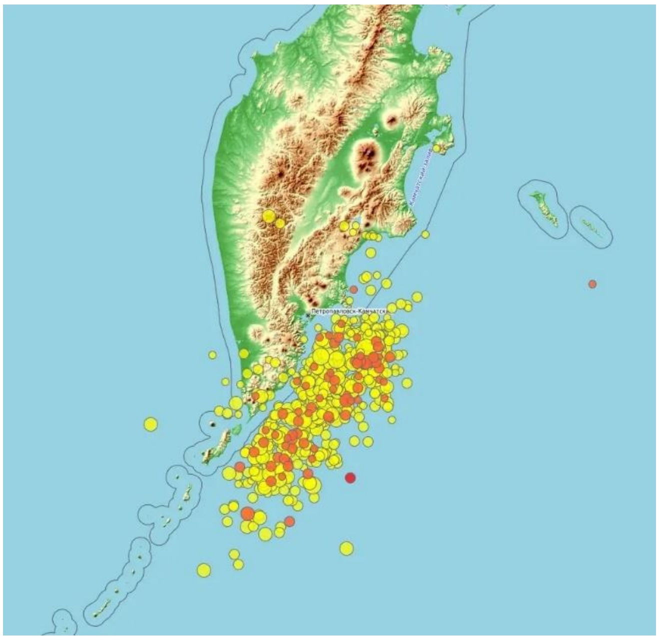



Southern Kamchatka shifted 2 m (6.6 feet) during M8.8 earthquake of July 29, 2025. Credit: GS RAS

The direction of motion across the peninsula generally indicates southeastward displacement of crustal blocks, in line with the regional tectonic stress regime and subduction zone geometry.

Further modeling, including InSAR and postseismic GNSS analysis, is expected to refine the rupture characteristics and ground deformation field.

The M8.8 quake was preceded by multiple strong foreshocks, including M7.4 and three M6.6 on July 20, and followed by more than 420 earthquakes, with 9 above M6.



Earthquakes detected in Kamchatka, Russia in 7 days to August 5, 2025. Credit: KF FRC EGS RAS

Read more:

[1] Powerful M8.8 earthquake and tsunami strike Kamchatka Peninsula, sixth strongest earthquake on record – The Watchers – July 30, 2025

[2] Rare footage shows large tsunami waves hitting Kamchatka coast after M8.8 earthquake, Russia – The Watchers – August 4, 2025

[3] Record tsunami waves cause nearly USD 1 million in damages at Crescent City Harbor, California – The Watchers – August 3, 2025

(Teo Blašković / THE WATCHERS, Tuesday, August 5, 2025, https://watchers.news/2025/08/05/southern-kamchatka-shifted-2-m-during-m8-8-earthquake-july-29-2025/)

## Major Earthquake Shifts and Sinks Huge Russian Peninsula

Scientists in Russia have revealed the geological impact of an earthquake that struck Russia's far east and prompted tsunami warnings as far away as Hawaii.

The Kamchatka Peninsula and surrounding Pacific Rim regions faced seismic instability after an 8.8 magnitude earthquake struck off the Russian coast on July 30.

The magnitude of the event was so great that the southern part of the peninsula sank by almost two meters (six feet) according to the Kamchatka branch of the Unified Geophysical Service of the Russian Academy of Sciences (RAS).

*Newsweek* has contacted the RAS for further comment.

This illustrative image from March 16, 2021 shows the Klyuchevskoy volcano erupting on Russia's far eastern Kamchatka peninsula. | MAXIM FESYUNOV/Getty Images/Getty Images

**Why It Matters**

The epicenter of the initial earthquake was around 74 miles east-southeast of the city of Petropavlovsk-Kamchatsky and triggered a tsunami that sent waves across the Pacific, prompting evacuations and emergency declarations from Russia to Hawaii.

Days later, the remote Krasheninnikov volcano, dormant for roughly 600 years, erupted in the same region. The aftershocks highlighted the vulnerability of global coastlines in the Pacific Ring of Fire which is marked by intense tectonic activity.

**What To Know**

The Kamchatka branch of the Unified Geophysical Service of the Russian Academy of Sciences (RAS) said Tuesday it had conducted preliminary calculations of the earthquake which was among the 10 strongest in recorded history.

Despite the earthquake's magnitude, no fatalities occurred and resulting tsunami damaged port facilities and a fish processing plant in Severo-Kurilsk. While the damage being less than feared, the geological impact was significant.

The RAS said on Telegram two-meter displacements were observed after the earthquake in the southern part of the peninsula which were comparable to the horizontal displacements after the 2011 earthquake in Tohoku, Japan.

That earthquake 14 years ago was the fourth highest ever recorded and triggered tsunami waves of up to 40.5 meters (133 ft) and preceded the Fukushima Daiichi nuclear disaster.

Following the July 30 quake, Russia's Petropavlovsk-Kamchatsky area experienced more modest shifts of roughly 50 centimeters (about 20 inches), the scientists added.

RAS director Danila Chebrov told Russian state media outlet Izvestia that Kamchatka not only shifted but also decreased slightly in height although there are no serious consequences expected.

**What People Are Saying**

**Russian Academy of Sciences (RAS) on Telegram:** "The maximum seismic displacements after the July 30 earthquake were observed in the southern part of the peninsula and amounted to almost 2 meters, comparable to the horizontal displacements after the 2011 earthquake in Tohoku, Japan."

**What Happens Next**

On Monday, Russian scientists revealed the extent of the aftershocks, saying that on that day alone there were seven earthquakes in the Kamchatka region, suggesting that the seismic events there are not over.

(Brendan Cole / Senior News Reporter Newsweek, Aug 06, 2025, https://www.newsweek.com/russia-kamchatka-earthquake-geology-2109724)

## Fibre-optic cables to monitor infrastructure

European researchers are looking at how existing fibre-optic cables could serve as real-time sensors for damage in infrastructure such as bridges, railways, tunnels and energy pipelines.

Coordinated by Aston University, the €5.1m ECSTATIC project is trialling this approach in a major UK city, using a heavily used Victorian-era railway viaduct as its first live test site.

The goal is to detect subtle structural shifts, stress, and vibrations in real time, using laser light pulses sent through fibre-optic cables.

The ECSTATIC project will use existing infrastructure - *AdobeStock*

"Our aim is to create a global nervous system for critical infrastructure," said Professor David Webb, ECSTATIC project coordinator. "We are hoping to turn existing fibre-optic cables into a 24/7 early-warning system, detecting the tiniest tremors or stress fractures before they become catastrophic. If successful, it will be the difference between fixing a fault and cleaning up a tragedy."

Installing physical sensors across entire transport and energy networks would cost billions and cause major disruption, so the ECSTATIC project will use the infrastructure that is already in place.

At the project's first demonstration site researchers will send ultra-precise laser pulses through buried fibre-optic cables. As trains pass overhead, the fibres subtly flex and vibrate. These movements change how the light behaves inside the cable, altering the 'phase' and 'polarisation' of the light, creating an optical 'fingerprint' of the forces acting on the structure.

By measuring these changes and interpreting them using a new dual-microcomb photonic chip and advanced AI signal processing, ECSTATIC aims to pinpoint early warning signs of damage or fatigue without interrupting internet traffic.

"Cracks in bridges, viaducts, or tunnels don't announce themselves; structures wear down gradually and silently, with the first signs of failure remaining invisible until it's too late. The UK and many places across Europe have hundreds of ageing railway bridges, with millions of vehicles passing under or over them each year. Many of the UK bridges date back to Victorian times, which could present a ticking time-bomb unless we take decisive steps to monitor them now."

If the UK trials are successful, the approach could be rolled out across Europe's transport and energy networks, enabling safer, smarter infrastructure monitoring at a fraction of the cost of traditional systems.

Running until July 2028, the ECSTATIC project involves 13 European partners including the universities of Padova, L'Aquila, Chalmers, Alcalá, and West Attica, alongside Telecom Italia Sparkle, OTE Group, Nokia, Network Rail, MODUS, Swiss SME Enlightra SARL, and Greek seismology specialists NOA.

(THE ENGINEER, 11 Aug 2025, https://www.theengineer.co.uk/content/news/fibre-optic-cables-to-monitor-bridge-and-rail-safety)

## Large riverbed sediment flux sustained for a decade after an earthquake

**Gen K. Li, A. Joshua West, Zhangdong Jin, Hongrui Qiu, Fei Zhang, Jin Wang, Douglas E. Hammond, Alexander L. Densmore, Robert G. Hilton, Sijia Dong, Abra Atwood, Woodward W. Fischer & Michael P. Lamb**

*Nature* **volume 644**, pages 398–403 (2025)

### Abstract

Large earthquakes induce widespread landslides that fill river channels with sediment[1,2], generating long-lasting fluvial hazards and reshaping mountain topography. However, riverine sediment fluxes after earthquakes remain poorly resolved, mostly because of a lack of data on bedload flux[3,4]. Here we construct a source-to-sink sediment budget following the 2008 $M_w$7.9 (where $M_w$ is the moment magnitude) Wenchuan earthquake in the eastern Tibetan mountains. We measured sediment accumulation in a man-made reservoir downstream of the earthquake-affected region. Ten years after the earthquake, the Min Jiang River had exported about 9% of the sediment mass from earthquake-triggered landslides, with around 5.7 times increase in the total riverine sediment flux sustained over that time. Bedload flux increased by times compared with pre-earthquake levels, making up of the post-earthquake sediment export—a proportion much higher than typical of most mountainous rivers. At the current pace, the river system will remove most Wenchuan landslide debris over centennial timescales. However, future sediment export rates are likely to vary because of changes on hillslopes (for example, revegetation) and in hydrology, sediment characteristics and transport processes. Our findings demonstrate a decadal bedload-dominated sediment pulse driven by earthquake-triggered landslides, suggesting that increased vulnerability to cascading hazards such as aggradation and flooding could persist for decades in populated downstream regions after a large earthquake.

(https://www.nature.com/articles/s41586-025-09354-8)

## Japan Builds 395 km Tsunami Wall with 9 Million Trees for Natural Coastal Defense

Japan has completed a massive 395-kilometer tsunami wall to safeguard coastal communities from future disasters. Alongside the wall, 9 million trees have been planted, creating a natural barrier to absorb wave impact and prevent soil erosion.

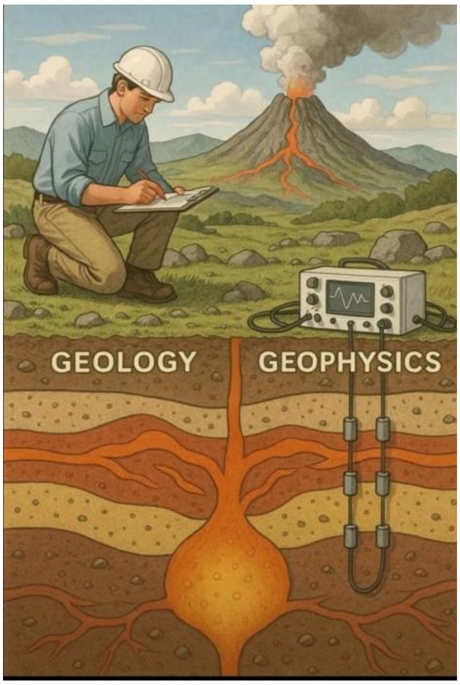

This dual approach combines engineering strength with environmental resilience, offering long-term protection against rising sea levels and extreme weather.

Experts hail the project as a global model for disaster preparedness and eco-friendly infrastructure.

(Bot And Brain, Aug. 15, 2025, https://www.facebook.com/BotandbrainFacebook)

# ΕΝΔΙΑΦΕΡΟΝΤΑ - ΓΕΩΛΟΓΙΑ

## Geophysics without Geology is just Guesswork




As geophysicists, we can create stunning images of the subsurface layers, faults, anomalies, and structures. But here's the truth many miss:

If you don't understand geology, you're only seeing half the picture.

Because behind every seismic reflection, resistivity curve, or gravity anomaly, there's a geological story waiting to be interpreted.

To truly understand what lies beneath, you must think like a geologist.

You need to know the rocks, the formations, the depositional environments, and the tectonic history — or else you're just mapping shapes, not meanings.

Geophysics provides the data.

Geology gives it context.

Together, they reveal the full story of the Earth beneath our feet.

**Resource Geologist** Abdulmalik Shehu Sfada 11.08.2025

## Three Whale Rock: Thailand's 75-million-year-old stone leviathans that look like they're floating in a sea of trees

**Three Whale Rock is a geological formation and tourist attraction in Thailand's Phu Sing Forest Park that looks remarkably like a small family of whales.**

(Image credit: bankerwin/Getty Images)

QUICK FACTS

**Name:** Hin Sam Wan, or Three Whale Rock

**Location:** Bueng Kan province, Thailand

**Coordinates:** 18.250964324624285, 103.81396773139028

**Why it's incredible:** The rock formation looks like a small family of whales.

Hin Sam Wan, or Three Whale Rock, is a natural formation in Thailand that is named after its striking resemblance to a family of whales swimming side by side. It consists of three extremely elongated, rounded boulders that look like giant cetaceans floating in a sea of trees.

Three Whale Rock formed about 75 million years ago due to long-term erosion and tectonic uplift. Wind and rain sculpted and smoothed the sandstone in northeastern Thailand into the shapes we see today, with cracks in the rock helping to form the narrow boulders that now look so much like whales.

The formation is situated near the border between Thailand and Laos, in a forest-covered nature reserve called Phu Sing Forest Park. A network of hiking trails leads up to the three whales, but only the bigger "mommy" and "daddy" whales are accessible by foot. The "baby" whale — the smallest of the three — is closed to the public.

The views from the "backs" of the two biggest stone whales extend to the Mekong River and mountains in Laos' Pakkading district, according to National Geographic. The whales sit on a high ridge and jut out over the forest canopy, which reinforces the illusion that they are sea creatures in their natural habitat.

Three Whale Rock and the surrounding area are part of the Khorat Plateau. This region of uplifted sedimentary rock holds fossils — including evidence of dinosaurs — from the Cretaceous period (145 million to 66 million years ago) and the Cenozoic era (66 million years ago to present).

Phu Sing Forest Park and its stone leviathans are protected as natural and cultural heritage sites.

(Sascha Pare / LIVESCIENCE, 15 Aug 2025, https://www.livescience.com/planet-earth/geology/three-whale-rock-thailands-75-million-year-old-stone-leviathans-that-look-like-theyre-floating-in-a-sea-of-trees)

# ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

**Entire church begins two-day journey across Swedish city**

Watch: Swedish church on the move to new location

A landmark 113-year-old church at risk from ground subsidence is being relocated in its entirety - in a 5km (3 miles) move along a road in Sweden's far north.

The vast red timber structure in Kiruna dating back to 1912 has been hoisted on giant trailers and is on its way to the new city centre.

Travelling at a maximum speed of 500m an hour, the journey is expected to take two days.

The old city centre is at risk from ground fissures after more than a century of iron ore mining. The church's move is the most spectacular and symbolic moment of the wider relocation of buildings in Kiruna, which lies 145km north of the Arctic Circle.

Church move will take two days


Source: LKAB

The journey began with a blessing from the church's vicar, Lena Tjärnberg, and Bishop Åsa Nyström of the Diocese of Luleå.

As the short ceremony ended, engines rumbled to life and the massive wooden church began inching forward. In the first hour, it managed just 30m, the trailers' wheels slowly turning under its weight.

Large crowds lined the streets under clear blue skies, watching in awe as the timber structure rolled forward. Safety barriers kept people back, but the building passed so close that many said it felt as though they could almost reach out and touch it.

"It's a big crowd. People came not just from Kiruna and other parts of Sweden. I heard many different languages being spoken," said culture strategist Sofia Lagerlöf Mättää. "It's like history taking place in front of our eyes."

The man in charge of the move, project manager Stefan Holmblad Johansson, said: "It's a historic event, a very big and complex operation and we don't have a margin of error. But everything is under control."

By the mid-2010s, other buildings in Kiruna were already being shifted to safer ground. Most were demolished and rebuilt, but some landmarks were moved intact.

These include buildings in Hjalmar Lundbohmsgården such as the so-called yellow row of three old wooden houses and the former home of mining manager Hjalmar Lundbohm, which was split into three parts.

The clock tower on the roof of the old city hall was also moved and can now be found next to the new city hall.

Robert Ylitalo The church has been at its current location since 1912

Under Swedish law, mining activity cannot take place under buildings.

Robert Ylitalo, chief executive officer of Kiruna's development company, explained: "There's no risk of people falling through cracks. But fissures would eventually damage the water, electricity and sewage supply. People have to move before the infrastructure fails."

The iron ore mine's operator, LKAB - also Kiruna's biggest employer - is covering the city's relocation bill, estimated at more than 10bn Swedish krona ($1bn; £737m).

Kiruna Church is 35m (115ft) high, 40m wide and weighs 672 tonnes. It was once voted Sweden's most beautiful pre-1950 building.

Relocating such a large building is an unusual feat. But instead of dismantling it, engineers are moving it in one piece, supported by steel beams and carried on self-propelled modular transporters.

"The biggest challenge was preparing the road for such a wide building," said Mr Johansson.

"We've widened it to 24 metres (79ft) and along the way we removed lamp-posts, traffic lights as well as a bridge that was slated for demolition anyway."

Among the onlookers were Lena Edkvist and her husband, who had driven from Gothenburg.

"I'm not a deeply religious person - I only go to church on special occasions. But this is part of my tradition, history and culture," she said. "It feels like an honour that they're moving it intact instead of dismantling it piece by piece."

For Kjell Olovsson, project manager at Veidekke, the contractor leading the relocation, the moment brought calm satisfaction.

"After years of preparation, we're finally moving. I'm thrilled and just enjoying the moment. The weather is good, and I'm confident everything will run smoothly."

Among the most delicate aspects of the move is the protecttion of the church's interior treasures, especially its great altar painting made by Prince Eugen, a member of Sweden's royal family.

"It's not something hanging on a hook that you just take off," said project manager Mr Johansson.

"It's glued directly onto a masonry wall so it would have been difficult to remove without damage. So it will remain inside the church during the move, fully covered and stabilised. So will the organ with its 1,000 pipes."

Reuters The church has been hoisted on a wheeled transportation unit

LKAB Interior parts of the church have been secured by metal scaffolding

The move is much more than an engineering marvel for local residents - it's a deeply emotional moment.

"The church has served as a spiritual centre and a gathering place for the community for generations," said Sofia Lagerlöf Määttä, who remembers walking into the church for the first time as a young child with her grandmother.

"The move has brought back memories of joy and sorrow to us, and we're now moving those memories with us into the future."

That feeling is also shared by project manager Stefan Holmblad Johansson, an engineer who doubles as a member of the church's gospel choir.

"This is a very special task for me," he said. "The church was built over a 100 years ago for the municipality by LKAB. Now we move it to the new city. There simply can't be any other way."

Reuters The church is leaving a place where it truly belongs, says Vicar Lena Tjärnberg

For the vicar, Lena Tjärnberg, the moment carries added meaning.

"The church is leaving a place where it truly belongs," she said.

"Everyone knows it has to be relocated: we live in a mining community and depend on the mine. I'm grateful that we're moving the church with us to the new city centre but there is also sorrow in seeing it leave the ground where it became a church."

If all goes to plan, the church will reach its new home in the city centre by Wednesday evening.

[Swedish television is also broadcasting](#) the entire journey live as "slow TV", marking a rare moment when a piece of history does not just survive change - it moves with it.

(Erika Benke / BBC News, Kiruna, Aug. 19, 2025, https://www.bbc.com/news/articles/cde3xp4xlw9o)

Υπενθυμίζουμε τρεις ελληνικές περιπτώσεις μετακίνησης μνημείων.

### Η μετακόμιση των Αγίων Σαράντα από τη Λεωφόρο Κηφισίας

Τον Μάρτιο του 1991 επί της Λεωφόρου Κηφισίας, μετακινήθηκε μία εκκλησία από ένα σημείο σε άλλο. Ο ναός των Αγίων Σαράντα μεταφέρθηκε με στόχο να σωθεί το βυζαντινό παρεκκλήσι, αλλά παράλληλα, να γίνει και η διαπλάτυνση της Λεωφόρου Κηφισίας, η οποία περιοριζόταν σε μία λωρίδα.

Το παρεκκλήσι βρίσκεται περίπου απέναντι από την εκκλησία του Αγίου Δημητρίου πλέον. Ωστόσο, μέχρι το 1991 ήταν 150 μέτρα μακρύτερα, εκεί που τώρα βρίσκεται η δεξιά λωρίδα, η άνοδος, της Λεωφόρου Κηφισίας.

Οι Άγιοι Σαράντα χτίστηκαν το 1562 και αποτελεί μέχρι και σήμερα ένα μοναδικό μνημείο, μέρος της ζωντανής ιστορίας της Κηφισιάς, ανά τους αιώνες. Για αυτό τον λόγο, οι υπεύθυνοι δεν ήθελαν να προχωρήσουν στην κατεδάφισή του – η οποία ήταν μία από τις προτεινόμενες λύσεις-.

Έπειτα από πρόταση του αρχιτέκτονα Δημήτρη Κορρέ, προς τον Δήμο και με τις απαραίτητες ενέργειες, το Κεντρικό Αρχαιολογικό Συμβούλιο έλαβε την απόφαση ολόκληρης της εκκλησίας αυτούσιας. Ο ναός δε, είχε κηρυχθεί διατηρητέος.


https://www.youtube.com/watch?v=Pu-Pfu21ymA

**Ολόσωμη Μεταφορά Ιερού Ναού Αγ. Πέτρου Σπάτων**

Πρόκειται για σταυροειδή εγγεγραμμένο ναό που χρονολογείται στην πρώιμη μεταβυζαντινή περίοδο. Η αρχική θέση του Ναού ήταν στο χώρο του Αεροδρομίου Ελ. Βενιζέλος και η μετακίνησή του ήταν αναγκαία για την κατασκευή του Δυτικού Αεροδρομίου. Για τη μεταφορά απαιτήθηκε η αποκόλληση του όλου του σώματος του Ναού από τη βάση του, η τοποθέτησή του επί σιδηροτροχιών και ακολούθως η μεταφορά του επί μηκους 340 m σε προεπιλεγμένη θέση.

Αφού έγιναν όλες οι αρχαιολογικές έρευνες και οι δύσκολες προκαταρκτικές εργασίες (ώστε να διασφαλιστεί η ασφαλής μεταφορά του ναού) άρχισε η μετακίνηση πάνω σε ειδικές ράγες, με υποστήριξη από ειδικό σύστημα γρύλων, και ήδη το εκκλησάκι έχει μεταφερθεί κατά 60 μέτρα.

ΚΑΛΛΙΕΡΓΟΣ Ο.Τ.Μ. https://www.kalliergos.com/t-el/extra-projects/relocation-of-stpeter-s-church-at-spata και
ΤΑ ΝΕΑ 2 Αυγούστου 1997
https://www.tanea.gr/1997/08/02/greece/panw-se-rages-metaferetai-to-ekklisaki-twn-apostolwn-petroy-kai-payloy/

**Ένα μοναστήρι… μετακομίζει**
**Ιστορικό μοναστήρι ταξιδεύει σε ράγες**

Η τεχνητή λίμνη του Ιλαρίωνα σχηματίστηκε στην κοιλάδα του Αλιάκμονα μετά την κατασκευή του ομώνυμου φράγματος και εκτείνεται από το Νοτιοανατολικό άκρο της Π.Ε Γρεβενών μέχρι την περιοχή της Αιανής Κοζάνης.

Παράλληλα με την κατασκευή του φράγματος, εκτελέστηκαν σημαντικά έργα για την προστασία αρχαιοτήτων που θα ευρίσκοντο μέσα στην λεκάνη κατάκλυσης. Από τα σημαντικότερα ήταν η μετακίνηση του μοναστηριού Κοιμήσεως της Θεοτόκου Τουρνικίου του Δήμου Δεσκάτης. Πρόκειται για μια ιστορική μονή της οποίας το καθολικό είναι διώροφο και αποτελείται από δυο μονόχωρους ναούς. Οι ναοί είναι πλούσιοι με τοιχογραφίες και χρονολογούνται βάσει επιγραφών το 1481 και το 1728.

Το ιστορικό μοναστήρι, μετακινήθηκε κατά 140 μέτρα και σε μια πλαγιά με κλίση 25%.


Αρχικά τοποθετήθηκε στη νέα του θέση το καθολικό της μονής, ενώ οι υπόλοιπες κτιριακές υποδομές αποσυναρμολογήθηκαν, μεταφέρθηκαν και συναρμολογίσθηκαν επιτόπου στην κορυφή του λόφου.

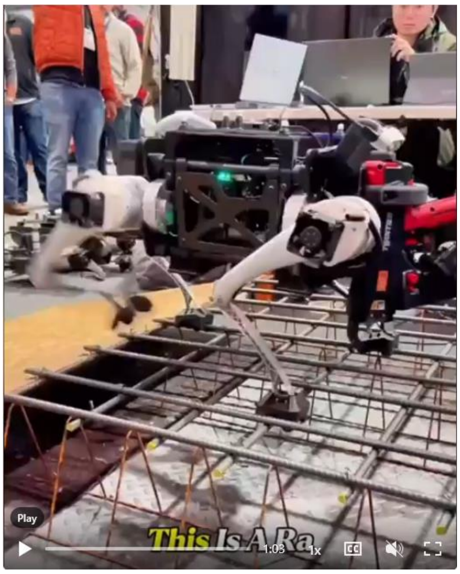
ΑΡΧΑΙΟΛΟΓΙΑ, 30 Αυγ 2011, https://www.archaiologia.gr/blog/2011/08/30/ένα-μοναστήρι-μετακομίζει και thessmemory, 20 Αυγ 2011, https://www.thess-memory.gr/περιηγησεισ/εκτός-των-τειχών/ένα-πρωτοποριακό-εγχείρημα-διάσωση

**Robots Tying Steel Bars – The Future of Rebar**

Quick Summary:

Using advanced robotics to tie steel reinforcement bars is revolutionizing the construction industry. These machines work with precision, speed, and consistency—reducing strain on workers, improving safety, and ensuring uniform ties for structural integrity.

On large projects, robotic rebar tying can save significant labor hours while maintaining the strength and stability required for concrete structures. It's a perfect blend of modern automation with traditional construction techniques.




(World of Construction, Aug 14, 2025, https://www.linkedin.com/feed/update/urn:li:activity:7363470942854873092/)

# ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

## ISSMGE EUROPE NEWSLETTER
Summer 2025

https://issmge-e.eu/newsletter-summer-2025

**Welcome to the Summer 2025 Edition!**

Dear colleagues,

As the European geotechnical community returns from the summer break, this edition brings important updates and reflections. We look ahead to the upcoming EYGEC (European Young Geotechnical Engineers Conference) 2025 in Rijeka, Croatia, honour the memory of Professor Ivan Vaníček, former ISSMGE Vice President for Europe, and celebrate a prestigious international award granted to our current vice president.

Enjoy

—The ISSMGE Europe Editorial Team

- Editorial: Highlights from the Vice President for Europe
- Széchy Memorial Lecture - Budapest, 14 February 2025
- John Mitchell Lecture - Bruges, 23 May 2025
- 31st Prague Geotechnical Lecture - Prague, 26 May 2025
- 3rd International Conference on Energy Geotechnics (ICEGT-2025) - Paris, 18 June 2025
- British Geotechnical Association Annual Conference - London, 25 June 2025
- 75th Anniversary of the Brazilian Geotechnical Society - Rio de Janeiro, 21–22 July 2025
- Looking Ahead

  These engagements are more than ceremonial, they are a reflection of our shared identity as a European community within ISSMGE. They provide opportunities to strengthen connections, amplify the work of our national societies, and deepen engagement with the global profession.

  In the months ahead, I look forward to continuing this work together: encouraging vibrant exchange between our mem-bers, supporting national growth and visibility, and reinforcing a strong, united European voice in geotechnical engineering worldwide.

  Lyesse Laloui
  Vice President for Europe, ISSMGE

**Conference Highlights** 29th European Young Geotechnical Engineers Conference Rijeka, Croatia | 9–12 September 2025

**News** CZECH AND SLOVAK GEOTECHNICAL SOCIETY In Memoriam: Professor Ivan Vaníček (1944-2025)

**AWARDS** Prof. Lyesse Laloui Awarded 2026 InterPore Distinguished Lectureship

**STAY CONNECTED:** issmge-e.eu, ISSMGE Europe on LinkedIn

☙ ❧

GeoWorld

## GEO-TRENDS REVIEW

**Issue #32 - August 2025**
**www.mygeoworld.com/geotrends/issues/32-august-2025**

**New On Geomap: Discover Geo-tagged Photos From Around The World**
GeoWorld, 27 August 2025, Read More

**ISSMGE Bulletin Vol 19, Issue 2, June 2025 has been published**
ISSMGE **Bulletin**, 28 Aug 2025, Read More

**Cascading land surface hazards as a nexus in the Earth system**
Dimitrios Zekkos, 03 Jul 2025, Read More

**Be part of the CAPG session at the 21st ICSMGE in Vienna, June 2026**
ISSMGE, **news**, 04 Jul 2025, Read More

**ISSMGE Interactive Technical Talk Episode 25: Deep Foundations (TC212)**
ISSMGE, **ITT25**, 24 Jul 2025, Read More

**The Los Angeles Clearwater Collapse. Insights On The Causes and Technical Response**
Geoengineer.org, **news**, 16 Jul 2025, Read More

**Proceedings from the 5th International Symposium on Frontiers in Offshore Geotechnics (ISFOG2025) available in open access**
ISSMGE, **news**, 10 Jun 2025, Read More

**Images Collected from the Internet Reveal the Failing Mechanism of the Tailing Dam Breach at Kolontar, Hungary**
International Journal of Geoengineering Case Histories, **news**, 30 Jun 2025, Read More

**CREST 2026 - Call for Abstracts**
ISSMGE, **news**, 01 Jul 2025, Read More

**Announcing The Publication Of The 2025 Geotechnical Business Directory**
GeoWorld, **GBD**, 13 August 2025, Read More

**Subsurface Modeling and Analysis Finalists in the 2025 Going Digital Awards**
Bentley Systems, **Going Digital Awards**, 22 Aug 2025, Read More

**Check out our latest Geo-Short video!**
Geoengineer.org, **Geo-Short**, 27 Aug 2025, Read More

**New Release: GeoStudio 2025.1**
Seequent, The Bentley Subsurface Company, **GeoStudio**, 12 Jun 2025, Read More

**Nearby Geo-Professional Recommendation Card**
GeoWorld Corner, 18 Jul 2025, Read More

**Simulating Rockfall Hazards from Overhanging Slopes Using DEM**
Geoengineer.org, **Discrete Element**, 28 Aug 2025, Read More

**Saturated Slopes and Flash Floods: Hazards in the Himalayas and Caucasus**
Geoengineer.org, **news**, 09 Mar 2025, Read More

**ACPS: Evaluating Single and Multiple Seam Stability in Coal Mining**
DCOdes, **news**, 27 Aug 2025, Read More

**Your Project Deserves a Global Stage — Feature it in the ISSMGE Bulletin!**
ISSMGE, **Bulletin**, 26 Jun 2025, Read More

**Career Pathways in Geotechnical Engineering**
CEEcareers, **Careers**, 03 Jul 2025, Read More

**Geosystem PhD student Gabriela Paredes selected for a 2025 Hearts to Humanity Eternal (H2H8) research grant award**
UC Berkeley Geosystems Group, **award**, 12 Aug 2025, Read More

**Sydney Metro West Marks Tunnelling Milestone at Parramatta Station**
Geoengineer.org, **news**, 05 Aug 2025, Read More

**The Proceedings of the 6th International Conference on Geotechnical Engineering Education 2025 (GEE2025) are online**
ISSMGE, **news**, 25 Jun 2025, Read More

INTERNATIONAL GEOSYNTHETICS SOCIETY

## IGS NEWSLETTER - August 2025

**EuroGeo8 Updates**

Next month EuroGeo8 will be taking place in Lille, France from 15-18 September 2025. Book your place now.

➞ We are pleased to announce that we will be presenting the IGS Geosynthetics Handbook for the first time during EuroGeo8. Visit the IGS exhibitor booth to learn more!

➞ During the IGS Council meeting at EuroGeo8 there will be a vote for the hosts of EuroGeo9.

➞ Professor Nicola Moraci will give the next LMNS lecture on *Suitable design approaches for interfaces involving geosynthetics under various loading and flow conditions*. You can find the full list of Invited lecturers here.

➞ We are pleased to announce during the conference, that the IGS Diversity Committee will host a session delivered by Daniela Felletii on *Awakening Perceptions: challenging minds to lead with empathy.*

➞ You can find the full programme here.

**IGS Premium Corporate Members**

The IGS will be attending a number of conferences in the coming months: Environmental Services and Solutions Expo in Birmingham, UK; HYDRO, in Thessaloniki, Greece; Tailing and Mine Waste in Banff, Canada, where we will be joined by some of our Premium Corporate Members to support us in raising the profile of geosynthetics.

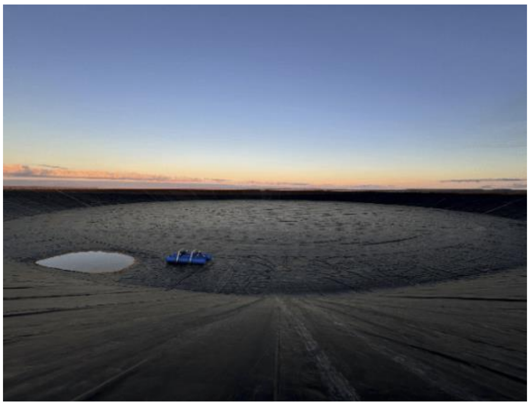
**Complete the FedIGS Sustainability Survey**

You only have a few days left to complete the sustainability survey from JTC4, uniting global experts to support long-term environmental and infrastructure sustainability. Complete the survey.

**Member News**

**Young Member Photos Contest**

Geosynthetics captured in sunset are among the winning images for the latest IGS Young Members (YM) Photo Competition. The call-out was launched at the GeoAmericas 2024 conference in April 2024, welcoming entries over the year. The five winning photographers were revealed this month. See the wining photos.



Laura Cassini's image of a coffee irrigation reservoir in Minas Gerais, southeast Brazil.

Ramon Santos' photo of a landfill site at Santana do Parnaíba, southern Brazil.

**IGS Colombia Holds Second EtE Event**

Forty-five educators gathered in Bogotá for the event co-organized by IGS Colombia, the Colombian Society of Geotechnics (SCG) and the IGS Pan-American Regional Activities Committee, attracting widespread participation from locations including Cali, Yopal, Tunja, Girardot, Urabá, Popayán, Bucaramanga and Medellín. Learn more.

**Phishing Email Warning**

Please be aware of phishing emails that look like they are

addressed from our senior staff and Officers have been reported. Please **do not send any money** outside of our usual member fees which will be invoiced from our Secretariat Manager. If in doubt, please email us first before responding.

**Committee News**

**Spotlight On Sustainability At Spain Conference**

TC-R chair Ivan Puig Damians spoke on 'Exploring sustainability assessment of geosynthetic-based solutions in civil engineering' as well as chairing a session on 'Sustainable geo-infrastructure'. Additionally, representing the IGS Sustainability Committee, Anibal Moncada, gave a presentation on 'Impact of stakeholders' interest on sustainability assessment of geosynthetic reinforced soil structures'. Learn more.

**Calendar of Events**

3-4 September 2025 3G Conference 2025, Kumasi, Ghana

15-18 September 2025 EuroGeo 8, Lille, France

22-23 October 2025 Geosintec 4, Madrid, Spain

13-17 September 2026 13th ICG, Montreal, Canada


**Geotextiles and Geomembranes**
**www.sciencedirect.com/journal/geotextiles-and-geomembranes/vol/53/issue/4**

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# ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ ΕΕΕΕΓΜ (2023 – 2026)


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