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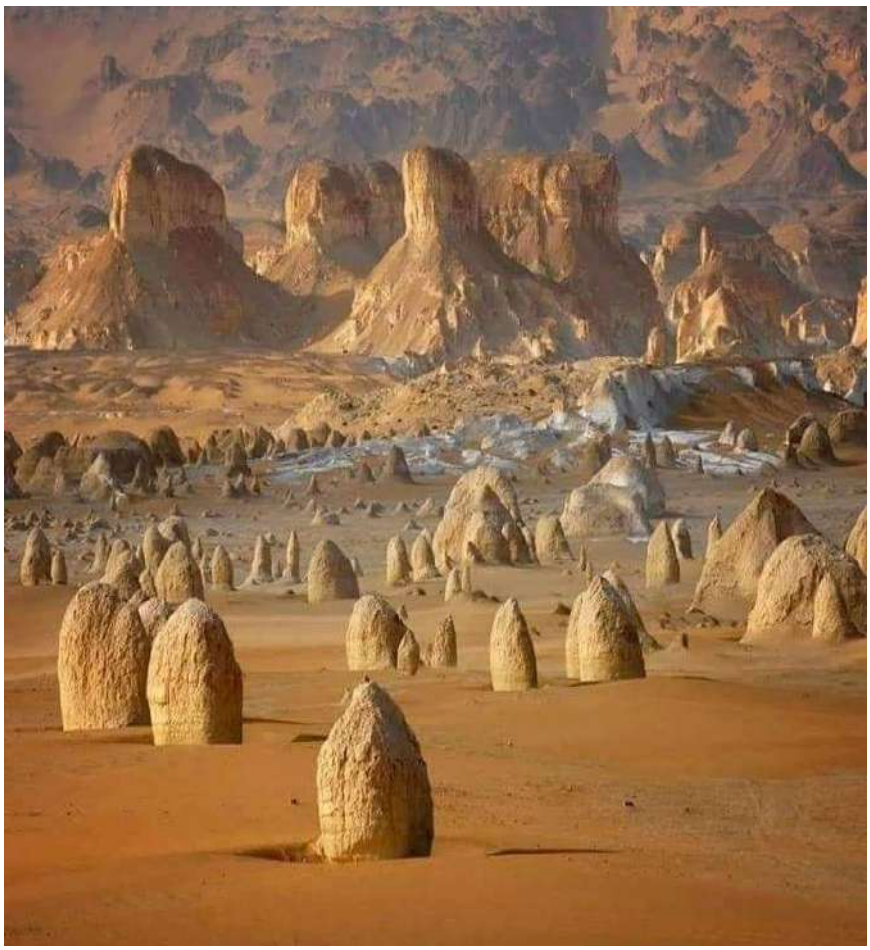

Entrance to the White Desert in Egypt

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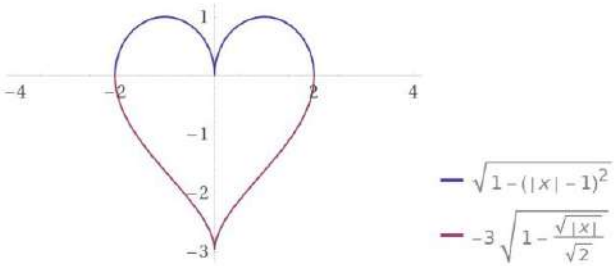

ΑΡΘΡΑ

Engineering education needs push into 21st century

Ramy Harik

Our engineering education programs must step out of the classroom and into the 21st century, says Ramy Harik a mechanical engineering professor at the University of South Carolina.

We spend years as engineering professors trying to optimise a 50-minute session, yet we are failing at where it counts the most. Our faculties are strong, and our curriculums educate, but our programs must step out of the classroom and into the 21st century.

There are two keys to the future of engineering education. First, universities must acquire partnerships with private sector companies, government institutions, and military industries so engineering students have the opportunity to work on real world projects, similar to the concept of a hospital to a medical school. Second, universities and professors must make calculated efforts to innovate university labs. The connection between the classroom and the laboratory must be seamless so students can apply their knowledge to 21st century concepts.

University partnerships with industry leaders in engineering put students in a position to gain applicable skills and later on, work for top-tier companies and influential institutions. It is the job of universities and professors to prepare engineering students to work in high-tech and innovative jobs. If academia enters into this partnership with industry, then when students graduate, they will be job ready, and as a result, be in a position to help create the next great innovation.

The McNair Center's autoclave can warm to 800 degrees Fahrenheit

My fundamental belief in this approach is being put to practice at the University of South Carolina, where I have helped lead the school to funded partnerships with manufacturing leaders, such as NASA, Siemens, Boeing, Nephron Pharmaceuticals and Toray. These partnerships are key to true development in engineering students. Students are allowed to take what they've learned in the classroom and use those skills at the forefront of emerging manufacturing economies. The work that students complete in a classroom is undoubtedly a necessary foundation, but what sets apart a good student from a prepared student is having the experience working with innovative technologies in the private sector and the government/military industry.

The industry partnerships listed above are just a few examples of how engineering students gain valuable experiences. Universities must make sure that their students have the ability to work on state-of-the-art projects that expose them to leading-edge technologies.

The second key to the future of engineering education, which is within the university setting, requires integrative coursework that introduces the future workforce to ideas that can help them create sustainable innovations across different engineering fields. This would require a convergence of disciplines that can never be sustained in silos. Today, we are still graduating mechanical, civil, electrical and other specific types of engineers. The future engineer will have the training to debug, think critically, innovate, communicate, and then implement solutions to case by case problems.

This is why at the University of South Carolina we are setting up the Future Factories laboratory, where autonomy, artificial intelligence, augmented reality, robotics, the so-called Internet of Things, and much more interact while having case studies from aerospace and pharmaceutical industries. Another innovation that we are spearheading in our Future Factories laboratory is the integration of drone inspection that coordinates with tracking systems while a flexible manufacturing system is conducting autonomous operations.

The McNair Center has the only production-scale AFP machine at a university in the world

We have seen the fruits of this education method from what we have implemented at the McNAIR Center through the integration of undergraduate students in research. This process has had a phenomenal influence on the students and the industry, and we have success stories where undergraduate students have been trained on the usage of industrial scale automated fibre placement manufacturing platforms. Such an experience enables the student to unlock new career choices, as well as help the industry acquire skilled students that otherwise would have not pushed into a career in advanced manufacturing.

In the next five years, my plan is to grow the concept of the Future Factories laboratory to promote learning across all age groups. There are seven initiatives that will introduce robotics to middle schoolers, create a new industrial manufacturing systems-based program at the University of South Carolina, and allow retired people to share their knowledge with future generations through a cyber manufacturing platform.

Universities, professors, and industry leaders must make strong commitments to provide ample opportunities for en-

gineering students to engage with real world technologies to make a difference as future industry innovators. This is the future of engineering education.

Dr. Ramy Harik, a Fulbright Scholar, is a mechanical engineering professor at the University of South Carolina's College of Engineering and Computing, and one of Smart Manufacturing magazine's Top 20 most influential professors in smart manufacturing. He is the author of the 'Introduction to Advanced Manufacturing' book by SAE.

(THE ENGINEER, 10th September 2020, https://www.theengineer.co.uk/engineering-education-ramy-harik)

Who should choose the TBM? Aug 2020

Paul Nicholas, AECOM Tunnel Practice Leader - West
Nasri Munfah, AECOM Tunnel Practice - Director

Selection and design of the TBM for a TBM project is a task more complex than might be expected. **Paul Nicholas** and Co-Author **Nasri Munfah** of AECOM discuss the issues and how new forms of contact are providing the possibilities for the collaborative approach via which all parties can contribute to a workable risk sharing mechanism

Discussions about who is best equipped to design, or specify, or choose the TBM for a TBM project can be a controversial decision as, in general terms, three issues are in play: technical specification, cost and liability.

Those who make the decision on the type and specification of the TBM also take on the liability of that decision. In many cases, interested parties, that include the Owner, the Owner's Engineer, or its Program Manager, and the Geotechnical Engineer, want to make, or at least influence, the decision but are often hindered by the risk and the liability issue. The Contractor and the TBM manufacturer want to make the decision yet minimize the liability exposure created by the decision.

The 17.6m TBM for the Tuen Mun-Chek Lap Kok subsea highway in Hong Kong had capabilities engineered in by the design-build contractor, its design engineer and the engaged TBM manufacturer

Of the above interested parties all have been, in one way or another, responsible for procuring TBMs for projects. All try to pass on, or limit, their potential liability exposure.

In reality, everyone should be involved in making the decision and in a collaborative manner. Too often however, commercial and legal issues get in the way leading unfortunately, in many cases, to a decision that is a compromise and not necessarily the best choice. A more appropriate approach to the debate is to examine the role of each entity in specifying and choosing a TBM.

Without ground information the choice of tunneling means-and-methods, including, where appropriate, the choice of the TBM, is very speculative. Ground information from bore hole interpretation is still very limited, with the ground profiles and characteristics seen in geotechnical reports derived from very small samples of ground taken from a small vertical bore or core. Everything between each bore hole is educated guess work based on interpretation and knowledge of the regional geology. But this is the best information available for the TBM selection with respect to the geology, and who is most suited to address this issue other than the Geotechnical Engineer for the project, often retained by the Owner.

For most tunnel projects in the USA, the GBR (geotechnical baseline report) has become the document of choice to share the risk of variation in the ground. It is based on the Owner's interpretation of the ground conditions and provides a level platform for ground risk on which all contractors can bid. This has resulted in less variance in bids and provides a clear basis for ground related claims.

But for TBM selection the reliance on the GBR to select a TBM is ill advised. It is a risk sharing mechanism in which, if certain provisions are encountered, the contractor will be entitled to additional compensation. If the TBM selection is based on the GBR and the machine is then considered not fit for purpose or under-designed, how can remedial measures be quantified on a GBR risk management basis? Remedial measures may not be easily implemented in the field and any significant modifications to the TBM may be at high cost and with damaging schedule impacts.

The Design Engineer working for the Owner will try to maximize its input and control on the project and in many cases, this leads to extensive prescriptive specifications and design documents on construction means-and-methods. This will typically include all the calculations, modeling and specifications for the permanent works and may include some design of shafts and temporary ground support.

Mistakes made in choosing the TBM can lead to major problems

There is a wide variance in the USA and worldwide in the detail of a bid TBM specification document from highly prescriptive documents, verging on the edge of a TBM design, specifying:

- TBM type - EPB, slurry, dual mode or hybrid;
- Minimum torque and cutterhead rev/min;
- Minimum thrust, overcut, cutter diameter and other parameters.

Other performance specifications may state that, based on the geotechnical information, the TBM to be supplied has to excavate and build the tunnel as per the drawings and without causing adverse settlement or damage to nearby structures. In this case the contractor submittal requirements tend to be more extensive. In some cases, the TBM specifications in the bid document are quite prescriptive but based on lim-

ited geotechnical information provided in the tender package acquired from a few widely spaced borehole logs. In such situations it is essential, and normally a contract requirement, for the contractor to carry out additional in-depth ground investigations to determine the ground profile and value of ground parameters to allow for modelling for the design of the permanent ground support and to determine the parameters of the TBM type and specifications. Due to schedule pressure, the TBM is frequently ordered before the additional ground investigation is complete.

Basing the TBM type and specifications on the GBR is complicated further in that there is a wide variation in the way GBRs baseline the expected conditions. A typical example is rock strengths that may test at a maximum strength of 10MPa in the majority of boreholes along the length of excavation, but 80MPa in one borehole in the middle of the drive length. The baseline value of the rock strength could be provided in the GBR simply as 10MPa to 80MPa. The contractor and the TBM manufacturer could provide a TBM capable of excavating mainly 10MPa rock with some 80MPa strengths. If during excavation, strengths of much higher than 10MPa rock is encountered for much of the drive and the cutter tools wear out and progress is slower than anticipated, the contractor would have no chance of a differing site condition (DSC) claim as the maximum rock strength of 80MPa is not exceeded.

Alternatively, if the contractor considers only the high 80MPa value and designs the cutterhead for this rock strength, it is likely to have lower production in the softer ground. Since the baseline covers the strength range found in the borehole cores, the contractor would have no basis for a DSC claim based on the percentage of any given rock strength excavated.

Some GBRs would not only baseline a strength range, but also baseline the percentage of the alignment for the various strength bands of rock. In this case, the contractor would have the basis for a claim for differing site conditions if the amount of hard or soft rock exceeded the baseline. The value of the change order then becomes debatable as the advance rate is never baselined in a GBR.

Hard rock TBM under a design-bid-build contract for the 2nd Avenue Subway in New York

Competent contractors will interpret the geotechnical data, the geotechnical interpretive report, and the GBR if they expect to submit a competitive bid. The geotechnical data and interpretive reports are sometimes not provided to the contractor and, if provided, are often not contract documents. Most contractors do not have a geotechnical engineer as part of their permanent staff and often do not have available time during the bid process to analyze the geotechnical data extensively. Some contractors, knowing the importance of understanding the ground conditions, will engage a local geotechnical engineer to provide a better appreciation of the ground conditions to be expected.

In some cases, the tender documents, with the geotechnical information and the GBR are passed directly to the TBM supplier with the request to provide a TBM of the required size and suitability for the ground conditions indicated in the supplied documents. In this case, the contractor is trying to pass the risk, and the liability, to the TBM supplier who is unlikely to accept the role and opt instead, to providing an advisory role only.

When the tender documents are more performance orientated and for design-build projects, there is always the risk that a contractor will use the lowest cost TBM to arrive at the lowest bid. This may include an optimistic view of the suitability of the selected TBM and the production rates in the ground conditions that may have been misinterpreted. The contractor may also own a TBM of the required diameter, and bids with that TBM which may not be entirely suitable for the project conditions. As an example, this could include the use of an open face TBM in permeable ground below the water table with a reliance on dewatering to get through the more permeable zones. If the dewatering fails to perform adequately, there is the possibility of a face collapse, major surface settlement, damage to surface structures, or a daylighting sink hole. The optimism of tunneling contractors is well known, but they would probably not be in the tunnel business if they were not!

TBM suppliers have their own interests in supplying the best belt-and-braces or belt-and-suspenders solution to the type and the design of the TBM including notoriously low forecasts for excavation. This reduces their risk of failure on the project but increases the TBM and project cost. Unless all bidders are using the same solution, it is unlikely that the contractor with the highest cost TBM will win the contract as the low bidder, regardless of the fact that the Owner is paying in the long run for the high price of a conservative TBM design.

In cases where a prescriptive TBM specification is provided, the TBM selection becomes easier on the contractor and the TBM supplier. However, the Owner is more likely to suffer claims if the TBM fails to perform. In this case, the engineering firm that provided the TBM specification may not have been fully aware of changing TBM technology or may not have had in-house personnel with the required experience and background to write a prescriptive TBM specification based on the forecast ground conditions.

So, who should choose the TBM?

It should be a collaborative effort!

The main interest of the Owner is to build the project for the lowest cost, safely and on time. Providing a conditional performance specification for the TBM – which may include diameter of the finished tunnel, possibly the type and design of the permanent tunnel support system and providing detailed geotechnical information so that the TBM and tunnel liner performance can be properly estimated – is likely to achieve this end.

A well-qualified tunnel contractor with experience in similar ground conditions for a tunnel of similar diameter, supported by an experienced TBM supplier that has supplied TBMs for tunnels in similar ground conditions, is a team most qualified to provide the most technically suitable means-and-methods solution. It may not however result in the least expensive TBM or the lowest bid.

Regional Connector subway drives in Los Angeles are the 2019 ITA Award winning combination of an experienced contractor, designer and TBM supplier working together on a design-build project

An alternative is to award tunnel projects, not based on the lowest price, but on best value also taking into consideration construction risks and risk sharing alternatives. Typically, the best value and technical solution will come from the best qualified contractor and will address the suitability of the TBM to the project at hand.

With these issues in mind, the tunneling industry is evolving and turning more frequently to alternative project delivery procurement methods such as design-build (DB); progressive design build (PDB), construction manager general contractor (CMGC), construction manager at risk (CMAR) and public-private-partnerships (P3) and early contractor involvement (ECI) processes. Under these alternative delivery scenarios, the Owner's engineer provides a preliminary design document, which includes geotechnical information, the tunnel alignment, diameter, and the final liner requirements. In many ways, this is similar to a performance specification in the traditional design-bid-build procurement method with the contractor engaging a consulting engineer to prepare the detailed design and any potential design alternatives that could lead to the sharing of any project costs savings accrued. The design-build tender documents are likely to include the ground investigation geotechnical data, interpretive report and possibly a baseline report. The Contractor may carry out additional geotechnical investigations and completes the design using its preferred means-and-methods for construction. This is likely to be heavily influenced by its own experiences, the reputation and skill of its engaged consulting engineer, and the advice of the TBM supplier, to establish a best technical bid with lowest risk and at lowest cost. The selection of a contractor using the best value option assures the Owner of the most suitable TBM for the project with risk remaining with the entity most suited to deal with it, which, in this case, is the Contractor.

This was the case for the design-build project for the Tuen Mun-Chek Lap Kok subsea highway link in Hong Kong where the contractor, its design consultants and its TBM manufacturer proposed major changes in TBM bored diameter during the procurement process and provided a cost and time saving alternative that also reduced project risk. For the project there was also no geotechnical investigation for the subsea crossing. To reduce cost and risk, different rates were agreed for different ground conditions. This was an interesting risk sharing element of the contract that contributed to the Tuen Mun-Chek Lap Kok subsea highway link winning the top category project prize in the 2019 series of the ITA Awards.

Today it seems clear that tunnel design and means-and-methods of construction should be left to the experts who are, generally, the experienced tunneling contractors with their engineers and equipment suppliers – a scenario more frequently found these days in alternative delivery procurement methods.

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Building tunnels in the 19th century

In June, Peter Harris, Director Tunnels and Civil Engineering COWI UK, gave to an online BTS audience a fascinating and scholarly presentation on how the Victorians built their tunnels. Ivor Thomas reports

The world may be struggling under the adversity and tragedy of the Covid-19 pandemic but the British Tunnelling Society (BTS) is doing its best to maintain a programme of lectures and meetings on a virtual platform. Its meeting on 18 June shows how well these efforts are being supported by the wider tunnelling industry: more than 2,600 people viewed the BTS YouTube channel showing of a talk that evening given by Peter Harris – Director of Civil Engineering at COWI UK – and over 60% of those came from outside the UK.

Harris is clearly an expert in his field of UK railway tunnels and provided a very informative lecture on the construction of the tunnels in the great railway age of the 19th century. So extensive was his talk it is impossible to give credit to all the detail it contained and this report will only cover some of the highlights.

Harris split his talk into five distinct elements:

- The tunnel alignment survey
- The construction of shafts
- The work away from the shafts to form the tunnel
- The portal structures
- Details surrounding the development of tunnels.

Tunnel Alignment Survey

Tunnels were aligned often by constructing a sighting tower at the highest point on the tunnel alignment and sighting from one portal site to the other using a transit theodolite. Intermediate shafts could then be aligned using the theodolite. Such sighting towers would often be constructed in masonry and then enveloped by a timber windbreak structure. Masonry sighting towers remain around the countryside.

The remains of a sighting tower used during the construction of Bramhope Tunnel 1845 to 1849 (l) A masonry sighting tower surrounded by a timber windbreak structure (r)

Shaft Construction

Early tunnels were built from portal to portal but as speed of construction became increasingly important shafts were used along the tunnel to provide ventilation and speed-up the programme. Once sunk, shafts could be used to work faces, splitting the tunnel into a greater number of working faces rather than the two usually seen in an end-to-end construction.

Miners working the face of the heading between shafts and loading onto a tub on wooden rails

Shaft winding equipment always centred on winders and kibbles. In the early days the winder was a horse powered gin, before the move to steam driven beam engines and steam-driven cranes.

Shafts were typically 9 to 10ft (2.7–3m) in diameter and brick lined. An important feature of early tunnel construction was that the method of work always involved two separate teams of workers: the mining team would open the ground and excavate, and the bricklaying team would line the tunnel with brickwork before the excavation could recommence.

The initial section of the shaft would be excavated at ground level; a top timber frame laid at ground level and a lower timber frame pocketed into the ground and hung from the top frame using cast iron rods. This lower frame would then act as a sole plate for the brickwork to be built up from. The excavation was then continued from frame to frame, each downward advance lined with brickwork before excavation started on the next advance.

At a point just above the tunnel crown, a large bottom timber frame would be pocketed into the ground to support the shaft brickwork above and the lower section of the shaft mined to tunnel invert using timber square work.

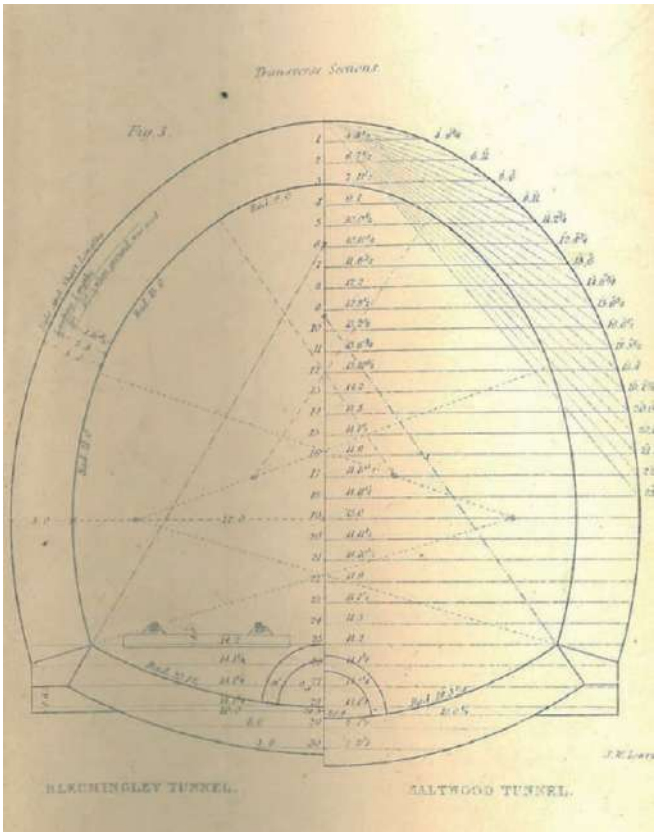
A heading would then be mined out along the tunnel alignment to connect together all the intermediate shafts and the two tunnel entrances.

Tunnel Construction

Once the shafts had been sunk, it was possible to align the tunnel to be constructed by wire drops to tunnel invert level. Two plumb bobs were suspended from wires falling all the way to the shaft bottom and there damped in barrels of oil or sludge. The wires could then be used as a transfer of sight from top to bottom.

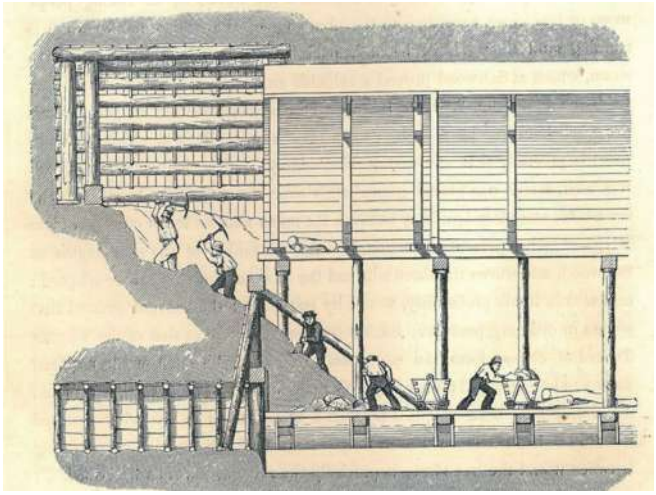
The tunnel cross-section was always set out from a series of circular curves: the miners and bricklayers would work on a series of radial offsets to set out either the alignment of the excavation or the brickwork.

Tunnel construction would proceed out from a break-out chamber adjacent to each shaft and the tunnel worked in a series of lengths from the shaft.



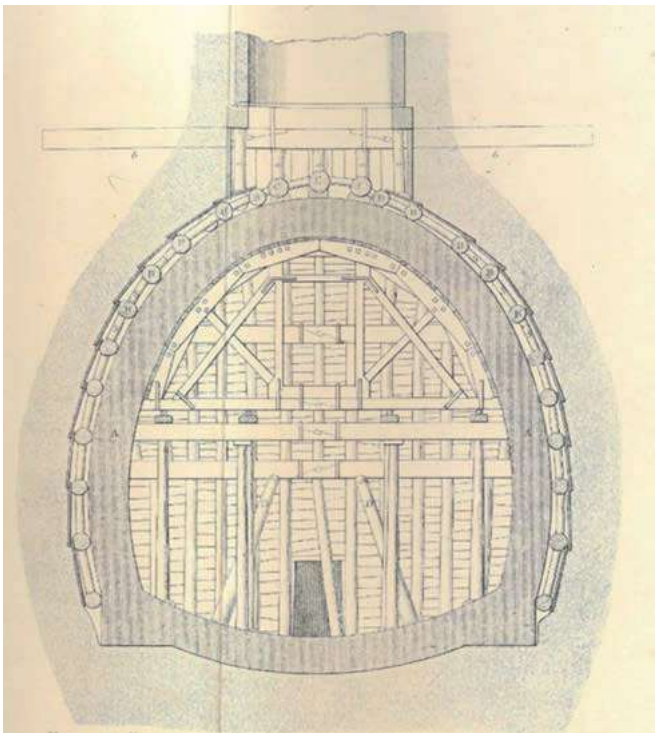
Two different tunnel profiles: Bletchingley on the left and Saltwood on the right – both comprise a series of circular curves that are set out by offset from the vertical centreline

Each length would vary from between 8ft and 15ft (2.4 – 4.6m) depending upon ground conditions. In so-called 'heavy ground' – a term used for weak and water-bearing ground – the length of advance would be shorter. The roof of the excavation was supported by 12 –18in (300-450mm) round tree-trunks; the crown bars that would be dragged forward for each length. Mining teams excavated the tunnel length by length, with each finished length handed over to the bricklayers for lining. Typically, each length would take four to five days of construction. By working from a number of different faces in the tunnel, miners and bricklayers could be continuously employed on its construction.



Miners working the face one length forward, with top heading complete and working on the bench. Massive crown bars in place would be pulled forward from one length to the next

Typically, each length would take four to five days of construction – mining and bricklaying – and the tunnel would be advanced length by length. Gangs were employed on a subcontract lump basis, with each gang being managed by a 'butty man', somewhat similar to being 'on the lump' in the mid-20th century.

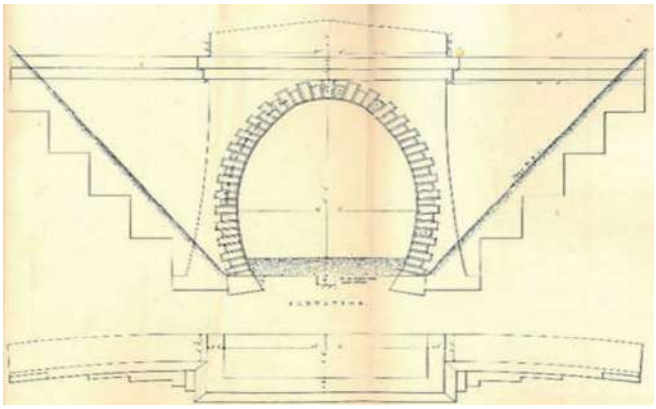


The tunnel's brick roof supported on heavy timber centring. Special-shaped bricks in the lower corners form the tunnel skewback Bricklaying would be worked across from the invert to the skewbacks (at each bottom corner) made out of purpose-shaped brickwork. The sidewalls were laid in free air and only the rood and crown laid on centring.

The most skilled bricklayer was given the job of closing the arch – the most difficult piece of overhead work

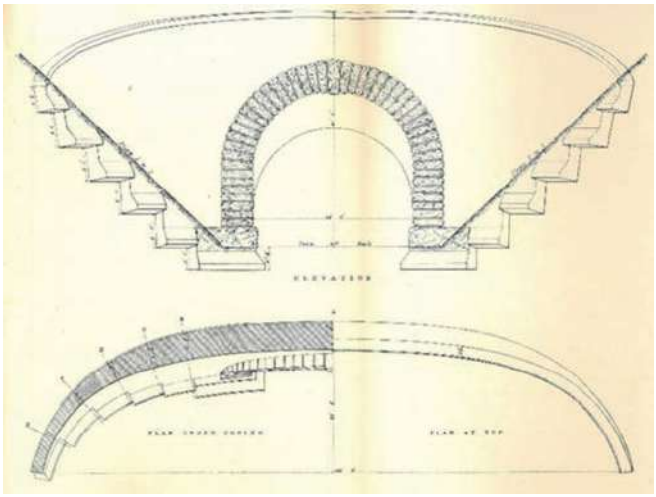
Portal Construction

Once the tunnel bore was complete, work would turn to finish the portal structures. Tunnel portal design varied in terms of the overall concept and effectiveness. Often, for reasons of economy, shallow swept-back, wing walls were used but these did little to brace the portal. Such flat-face portals are prone to cracking and parting from the tunnel lining.



A simple, economic portal structure but not so structurally sound – wing walls are close to perpendicular to the track

Brunel adopted a more structurally competent portal design for his tunnels, providing curved sidewalls so that the portal could act as an arch.

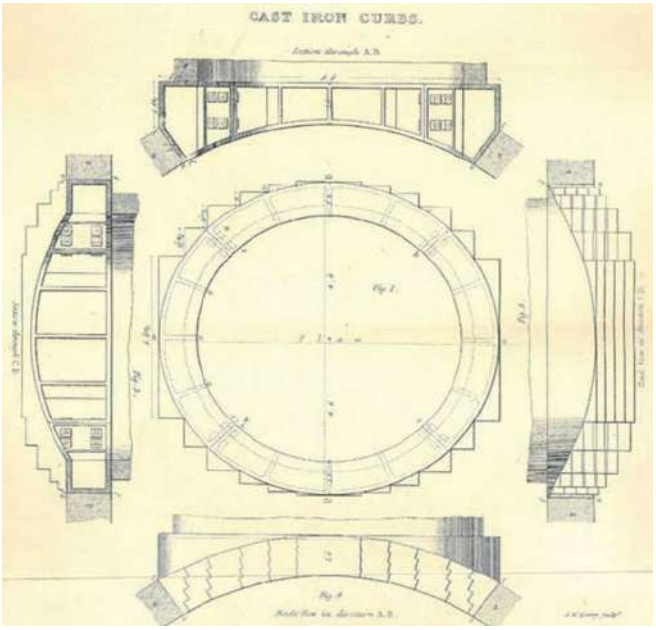


Brunel's more effective portal design acts as an arch in plan. The bell mouth at the tunnel entrance reduces the effect of the pressure wave

An interesting feature of those tunnel portals designed by Brunel is that he often placed a 36ft-long (11m) bell mouth at the entrance and exit. Even in the days of 55mph train speeds, designers were concerned about the effect the air pressure wave would have on passengers as the train entered the confined space of the tunnel. The bell mouth was designed to dissipate the effect of those pressure waves. We now see a similar need for porous portals in the design of High Speed Two (HS2) but for speeds which are considerably higher.

Details

One very interesting element of Harris's talk was seeing the way in which shafts were finished at their intersection with the tunnel crown. It was common practice at that location to place a cast-iron curb or shaft eye. The audience was left wondering how the great pioneers of railway tunnel construction ever managed to install the cast-iron curbs in those positions.



A drawing of a cast iron 'curb' or shaft eye used in the Bletchingley Tunnel

To view the presentation in total visit the BTS You Tube Channel at:http://tiny.cc/944osz.

Questions and Answers

The following questions were asked by the audience and answered by Peter Harris.

How was the void filled between the excavated ground and the extrados of the brickwork?

The sidewalls of the tunnel were generally vertical and required very little fill. However, the real problem was in the roof with significant overbreak, often evident above the brick arch. Drawings consistently show the overbreak filled with mortar. In many cases, these tunnel voids were certainly not filled with mortar. At Standedge [through the Pennine hills] specifically, the drawings show voids filled with mortar but later site investigation showed voids to be filled with loose rubble.

How was ground movement controlled above the tunnel construction?

Fundamentally, there was no system of controlling ground movement. For example, at the Macclesfield Tunnels which were constructed in sand with shallow cover, it is possible to discern the line of the tunnel on the surface marked by a 150mm-deep linear depression along the tunnel alignment. There were of course no sophisticated means of ground settlement control available to builders at that time.

Why were brick piers used to fill the over break above the brick tunnel arch?

Simply because it was easier to build piers than filling with rubble and the piers were considered sufficient at the time.

Is Network Rail still working on tunnel management strategies?

All tunnels on the railway have a tunnel management strategy and these are updated periodically.

What progress is being made on the programme of finding hidden shafts?

Most hidden shafts have now been located and Network Rail is working out what to do with them. This is very much an ongoing process.

Why were circular brick drains adopted on southern railways and not elsewhere?

There is no known reason - just different railway companies and different engineers.

Was lime mortar used in brickwork during the early years?

Yes, it would have been used in the early days but had the disadvantage of low strength. Occasionally, one sees in drawings the requirement for the use of cement mortar and even occasionally a requirement for Roman Cement. Brunel used Roman Cement in his Thames Tunnel to provide a rapid hardening mortar due to high water ingress.

How was the presence of groundwater dealt with?

In soft ground, miners often referred to water-bearing ground as 'heavy ground', requiring heavier timbers as the lengths advanced. The English Method of constructing a heading between shafts at the low level provided a drain. In cases of greater water ingress, additional shafts were constructed just to pump through; such extensive pumping temporary works can be seen at Kilsby Tunnel, Northamptonshire, and described in the TA Walker Severn Tunnel book. Shafts and additional works were often added on an ad hoc basis.

How are these tunnels now maintained?

Maintenance is very variable and tunnel specific. Tunnel maintenance programmes are based on inspection reports. Some now require extensive relining, with the trend moving to more and more repair. With more and more trains using the tunnels, the time to carry out the repairs is very limited.

What is the speaker's favourite tunnel and why?

The Standedge Tunnel, Pennine Hills, England

Standedge – having spent the past 24 years of my career there, supervising various works and innumerable nightshifts in the tunnel, and sleeping in my car at Marsden Station either side of the shift. Between the North and Central Tunnels at Standedge there is a chamber called 'the cathedral' which is supported by cast iron ribs. It is an amazing structure. I would have liked to have been married in that 'cathedral'.

(British Tunnelling Society Lecture, Tunnels and Tunnelling International, September 2020, pp. 12-16, https://secure.viewer.zmags.com/publication/8c1ca6aa#/8c1ca6aa/16)

The potential of Machine Learning for Geotechnical Applications

Naresh M, Dr Varun Dutt and Dr K V Uday

Data is gaining more importance and significance these days. Starting from general information used by various user friendly interfaces like Google, Facebook, Amazon, Flipkart, Airtel, Jio, Tatasky etc., to data from satellite based imaging by satellite on weather, air, wind, precipitation and thereby weather forecasting has been daily to hourly level applications related to data and its analysis. Based on the requirement, this data is processed for retrieving information/mechanism based on tools such as statistical analysis, artificial intelligence, data mining, machine learning, deep learning and neural networks. These tools aid us in generating computational/numerical models, algorithms, processes involving communications, regressions, sensitivity, decision making, automation, cognitive learning, machine learning and various augmenting skills.

Landslides plague the Himalayan region, associated slope movements are common occurrences in the hilly regions. The devastation caused by these slides is huge, incurring loss to life, living and infrastructure. Though, number of theories workout the instability numbers associated with the slope with respect to in-situ parameters, in-situ monitoring measures bridge the gap and improve the validity of the existing theories. Monitoring also can help generating thresholds, above which the severity of the movements can be warned for possible failure. Monitoring of the slopes can be possible by satellite imagery and/or with In-situ equipment collecting data timely on the incidents of rainfall, soil movements and other influencing parameters such as rainfall, infiltration, soil moisture etc., thus leading to huge data and analysis based on the in-situ characteristics of the soil and rock.

In such circumstances, Machine learning serves as a handy tool for handling data of multi-variate parameters obtained from monitoring system. Machine learning (ML) is an area of computer science that deals with development of algorithms that access data and uses it to learn patterns present in data. ML is an application of the broader Artificial Intelligence (AI) discipline, where in AI the goal is to train computers to do things that at present humans can do better. As ML algorithms learn patterns present in data (that is, ML algorithms can help transform data into knowledge), one can use ML algorithms for several applications including those in the geotechnical areas. Thus, generating applicable ML algorithms, prediction of soil movements can be possible, involving historical data about movements, weather, and soil conditions. Among ML algorithms, there has been a recent increase on the use of connectionist (neural network) techniques to learn patterns in data. For example, a kind of neural network (called the multilayer perceptron (MLP)) has been proposed and it contains a relation matrix that has several layers of nodes where successive layers relate to prior layers with weighted edges. Recently, MLPs have been shown to perform well in predicting soil movements considering certain geotechnical and environmental factors.

Connectionist ML algorithms like MLPs and others have also been used to do time-series forecasting in different applications (e.g., predicting soil movements over time). As part of emerging research, it may be good to compare the ability of different ML algorithms in predicting time-series data compared to the traditional statistical moving-average-based algorithms (e.g., Autoregressive Integrated Moving Average (ARIMA) or the Holt-Winters). Such comparisons and the use of ML algorithms in future may help draw important empirical contrasts against the popular physics-based geotechnical methods.

Most researchers established the prominence in ML on prediction ability with different degrees of countenance and comprehensibility. The extremes of this conditions can be framed resorting to 'black box' (Neural Networks) model and/or a 'transparent box' (Regression trees) model. The computation tools such as NN model, whose intention is to mimic the biological characteristics of the human nature learning and consists of interconnected information processing neural elements efficiently working in making decisions, classifications, and prediction techniques. These models have the capability of learning the linear and nonlinear functions and helps in analyzing the complex relations within the data. NN models are arranged with input, output, and hidden layers. Interconnections of these neurons are established by using weightage factors applied to all values passing from one neuron to another and thereby improve the efficiency, adaptability and prediction capability by reassessing the weightage. In the learning process, the input and output data for a specific problem are given, and the aforementioned weights among the neurons are updated without requiring any human development of algorithms. For the validation phase, the trained network makes predictions for a new set of data that has never been introduced during the previous phase. During the learning process, the neural network will provide accurate prediction, as long as large volumes of data covering all possible governing parameters and involves field conditions.

However, the machine learning has major limitations; availability of unbiased and pertinent data from the field is the major shortcoming. For example, the data from the landslide site is mix of data when the slope is stable and moves to instability, however the incidence of landslide at a given location is single set and hence the pertinent data set is less and associated data is huge. Also, the model/algorithm developed from data of one location cannot be directly implied to different location. The quality and quantity of data decides the quality of the algorithm and the learning process. The interpretation of the data and choice of selection of algorithm still is the user's decision which needs to be validated before its application to the problem. Still within the limitations, the application of Machine learning is huge and relevant to heterogeneous, multivariate and multidisciplinary problems associated with the field of Geotechnical Engineering.

(Indian Geotechnical Society News, Vol. 51, No. 02, April-June 2019, p. 4, http://www.igs.org.in:8080/portal/igs-publications/news_letters/2019/IGS-News-Aprl-June-2019.pdf)

First Dam Break in History

Madhav Madhira

We rarely find mention of any aspects of Civil Engineering in historical records. It is with such scientism, it was a pleasant surprise to find the record of a 'Dam Break. That too on a 'Rock Edict'.

'Noticing the great bewilderment caused by the advent of rains, the mountain Urajayat, wishing to do a good turn to great ocean, stretched forth, as it were, a hand, consisting of the River Palasani, decorated with the numerous powers that grew on the edges of the banks.'

Junagadh rock inscription of Skandagupta, 5th century CE.

On a stormy wet monsoon night in or around 456 CE, a lake in the hills of Junagadh in Gujarat, breached its embankment. The lake known as 'Sudarshana' was bounded on one side by the mountain then known as Urajayat but known these days as Girnar. On that fateful night, there was a heavy downpour (as we find occurring once in a while, more recently in Mumbai). The build up of water in the lake forced a rupture of the dam, washed away homes, trees, fields, etc. and the waters flowed to the Arabian sea due South. Note the poetic way some aspects are depicted in the Skandagupta edict: 'the season of the clouds tearing asunder with (its) clouds the season of heat' and the analogy for the water reaching the sea as 'a watery hand stretching from the hills to the sea'.

Extracted from *'Time Pieces'* by Nayanjot Lahiri

(Indian Geotechnical Society News, Vol. 51, No. 02, April-June 2019, p. 5, http://www.igs.org.in:8080/portal/igs-publications/news_letters/2019/IGS-News-Aprl-June-2019.pdf

Ethical guidelines for peer reviewers

Peer review in all its forms plays an important role in ensuring the integrity of the scholarly record. The process depends to a large extent on trust, and requires that everyone involved behaves responsibly and ethically. Peer reviewers play a central and critical part in the peer-review process, but too often come to the role without any guidance and unaware of their ethical obligations. COPE has produced some guidelines which set out the basic principles and standards to which all peer reviewers should adhere during the peer-review process in research publication. The aim has been to make them generic so that they can be applied across disciplines.

Peer reviewers play a role in ensuring the integrity of the scholarly record. The peer review process depends to a large extent on the trust and willing participation of the scholarly community and requires that everyone involved behaves responsibly and ethically. Peer reviewers play a central and critical part in the peer review process, but may come to the role without any guidance and be unaware of their ethical obligations. Journals have an obligation to provide transparent policies for peer review, and reviewers have an obligation to conduct reviews in an ethical and accountable manner. Clear communication between the journal and the reviewers is essential to facilitate consistent, fair and timely review. COPE has heard cases from its members related to peer review issues and bases these guidelines, in part, on the collective experience and wisdom of the COPE Forum participants. It is hoped they will provide helpful guidance to researchers, be a reference for editors and publishers in guiding their reviewers, and act as an educational resource for institutions in training their students and researchers.

Peer review, for the purposes of these guidelines, refers to reviews provided on manuscript submissions to journals, but can also include reviews for other platforms and apply to public commenting that can occur pre- or post-publication. Reviews of other materials such as preprints, grants, books, conference proceeding submissions, registered reports (preregistered protocols), or data will have a similar underlying ethical framework, but the process will vary depending on the source material and the type of review requested. The model of peer review will also influence elements of the process.

Models of peer review

There are different types or models of peer review, all of which have various advantages and disadvantages. See the COPE document Who "owns" peer reviews?1 (section titled 'models of peer review') for an explanation of various peer review models. It is important to be aware of the model of peer review that the journal or platform uses before agreeing to undertake the peer review. The chart below, reproduced with permission from QUT, Australia, identifies key elements of the various models related to processes in peer review. Reviewers should understand their responsibilities related to confidentiality of the process and ownership of the review product based on the model of peer review being used.

There are many different models of peer review. A peer review process may operate to almost any combination in the table in the next column by selecting one option from each row:

Using the chart above, a standard, blinded, peer review process for a journal could be: Pre-publication; Single blind; Editors mediate all interactions between reviewers and authors; Peer reviews are not published; Review is facilitated by a journal; Reviews owned by the authors of the reviews.

TIMING	PrePrints	Pre-publication	Post-Publication
IDENTIFIABILITY	Double blind	Single blind	Open
MEDIATION	Editors mediate all interactions between reviewers and authors	Reviewers interact with one another openly	Reviewers and authors all interact with one another openly
PUBLICATION	Peer reviews are not published	Peer reviews are published but not signed	Peer reviews are published and signed
FACILITATION	Review facilitated by a journal	Review facilitated by a third-party	Review facilitated by authors
OWNERSHIP	Review owned by a journal or third party	Review owned by the authors of the reviews	Shared or mixed ownership of reviews

Being a reviewer

Professional responsibility: Authors who have benefited from the peer review process should consider becoming peer reviewers as a part of their professional responsibilities. Some journals require a formal process of appointment to the review panel, and some require specific expertise; anyone interested in becoming a reviewer should look for the journal guidelines on peer review and follow any requirements posted. In order to assign appropriate reviewers, editors must match reviewers with the scope of the content in a manuscript to get the best reviews possible. Potential reviewers should provide journals with personal and professional information that is accurate and a fair representation of their expertise, including verifiable and accurate contact information. It is important to recognize that impersonation of another individual during the review process is considered serious misconduct (e.g. see COPE Case 12-12: *Compromised peer review in published papers)*. When approached to review, agree to review only if you have the necessary expertise to assess the manuscript and can be unbiased in your assessment. It is better to identify clearly any gaps in your expertise when asked to review.

Competing interests: Ensure you declare all potential competing, or conflicting, interests. If you are unsure about a potential competing interest that may prevent you from reviewing, do raise this. Competing interests may be personal, financial, intellectual, professional, political or religious in nature. If you are currently employed at the same institution as any of the authors or have been recent (e.g., within the past 3 years) mentors, mentees, close collaborators or joint grant holders, you should not agree to review. In addition, you should not agree to review a manuscript just to gain sight of it with no intention of submitting a review, or agree to review a manuscript that is very similar to one you have in preparation or under consideration at another journal.

Timeliness: It is courteous to respond to an invitation to peer review within a reasonable time-frame, even if you cannot undertake the review. If you feel qualified to judge a particular manuscript, you should agree to review only if you are able to return a review within the proposed or mutually agreed time-frame. Always inform the journal promptly if your circumstances change and you cannot fulfil your original agreement or if you require an extension. If you cannot review, it is helpful to make suggestions for alternative reviewers if relevant, based on their expertise and without any influence of personal considerations or any intention of the manuscript receiving a specific outcome (either positive or negative).

Conducting a review

Initial steps: Read the manuscript, supplementary data files and ancillary material thoroughly (e.g., reviewer instructions, required ethics and policy statements), getting back to the journal if anything is not clear and requesting any missing or incomplete items you need. Do not contact the authors directly without the permission of the journal. It is important

to understand the scope of the review before commencing (i.e., is a review of raw data expected?).

Confidentiality: Respect the confidentiality of the peer review process and refrain from using information obtained during the peer review process for your own or another's advantage, or to disadvantage or discredit others (e.g. see COPE Case 14-06: *Possible breach of reviewer confidentiality*). Do not involve anyone else in the review of a manuscript (including early career researchers you are mentoring), without first obtaining permission from the journal (e.g. see COPE Case 11-29: *Reviewer asks trainee to review manuscript*). The names of any individuals who have helped with the review should be included so that they are associated with the manuscript in the journal's records and can also receive due recognition for their efforts.

Bias and competing interests: It is important to remain unbiased by considerations related to the nationality, religious or political beliefs, gender or other characteristics of the authors, origins of a manuscript or by commercial considerations. If you discover a competing interest that might prevent you from providing a fair and unbiased review, notify the journal and seek advice (e.g. see COPE Case 15-05: *Reviewer requests to be added as an author after publication*). While waiting for a response, refrain from looking at the manuscript and associated material in case the request to review is rescinded. Similarly, notify the journal as soon as possible if you find you do not have the necessary expertise to assess the relevant aspects of a manuscript so as not to unduly delay the review process. In the case of double-blind review, if you suspect the identity of the author(s) notify the journal if this knowledge raises any potential competing or conflict of interest.

Suspicion of ethics violations: If you come across any irregularities with respect to research and publication ethics do let the journal know (e.g. see COPE Case 02-11: *Contacting research ethics committees with concerns over studies*). For example, you may have concerns that misconduct occurred during either the research or the writing and submission of the manuscript, or you may notice substantial similarity between the manuscript and a concurrent submission to another journal or a published article. In the case of these or any other ethical concerns, contact the editor directly and do not attempt to investigate on your own. It is appropriate to cooperate, in confidence, with the journal, but not to personally investigate further unless the journal asks for additional information or advice.

Transferability of peer review: Publishers may have policies related to transferring peer reviews to other journals in the publisher's portfolio (sometimes referred to as portable or cascading peer review). Reviewers may be asked to give permission for the transfer of their reviews if that is journal policy. If a manuscript is rejected from one journal and submitted to another, and you are asked to review that same manuscript, you should be prepared to review the manuscript afresh as it may have changed between the two submissions and the journal's criteria for evaluation and acceptance may be different. In the interests of transparency and efficiency it may be appropriate to provide your original review for the new journal (with permission to do so from the original journal), explaining that you had reviewed the submission previously and noting any changes. (See discussion2 with Pete Binfield and Elizabeth Moylan highlighting some of the issues surrounding portable peer review).

Preparing a report

Format: Follow journals' instructions for writing and posting the review. If a particular format or scoring rubric is required, use the tools supplied by the journal. Be objective and constructive in your review, providing feedback that will help the authors to improve their manuscript. For example, be specific in your critique, and provide supporting evidence with appropriate references to substantiate general statements, to help editors in their evaluation. Be professional and refrain from being hostile or inflammatory and from making libellous or derogatory personal comments or unfounded accusations (e.g. see COPE Case 08-13: *Personal remarks within a post-publication literature forum*).

Appropriate feedback: Bear in mind that the editor requires a fair, honest, and unbiased assessment of the strengths and weaknesses of the manuscript. Most journals allow reviewers to provide confidential comments to the editor as well as comments to be read by the authors. The journal may also ask for a recommendation to accept/revise/reject; any recommendation should be congruent with the comments provided in the review. If you have not reviewed the whole manuscript, do indicate which aspects of the manuscript you have assessed. Ensure your comments and recommendations for the editor are consistent with your report for the authors; most feedback should be put in the report that the authors will see. Confidential comments to the editor should not be a place for denigration or false accusation, done in the knowledge that the authors will not see your comments.

Language and style: Remember it is the authors' paper, so do not attempt to rewrite it to your own preferred style if it is basically sound and clear; suggestions for changes that improve clarity are, however, important. In addition, be aware of the sensitivities surrounding language issues that are due to the authors writing in a language that is not their first or most proficient language, and phrase the feedback appropriately and with due respect.

Suggestions for further work: It is the job of the peer reviewer to comment on the quality and rigour of the work they receive. If the work is not clear because of missing analyses, the reviewer should comment and explain what additional analyses would clarify the work submitted. It is not the job of the reviewer to extend the work beyond its current scope. Be clear which (if any) suggested additional investigations are essential to support claims made in the manuscript under consideration and which will just strengthen or extend the work.

Accountability: Prepare the report by yourself, unless you have permission from the journal to involve another person. Refrain from making unfair negative comments or including unjustified criticisms of any competitors' work that is mentioned in the manuscript. Refrain from suggesting that authors include citations to your (or an associate's) work merely to increase citation counts or to enhance the visibility of your or your associate's work; suggestions must be based on valid academic or technological reasons. Do not intentionally prolong the review process, either by delaying the submission of your review or by requesting unnecessary additional information from the journal or author.

If you are the editor handling a manuscript and decide to provide a review of that manuscript yourself (perhaps if another reviewer could not return a report), do this transparently and not under the guise of an anonymous additional reviewer.

What to consider after peer review

If possible, try to accommodate requests from journals to review revisions or resubmissions of manuscripts you have reviewed previously. It is helpful to respond promptly if contacted by a journal about matters related to your review and

to provide the information required. Similarly, contact the journal if anything relevant comes to light after you have submitted your review that might affect your original feedback and recommendations. Continue to respect the confidential nature of the review process and do not reveal details of the manuscript after peer review unless you have permission from the author and the journal (e.g. see COPE Case 13-05: *Online posting of confidential draft by peer reviewer)*. See the COPE discussion document Who "owns" peer reviews?2 for a fuller discussion of the issues.

Peer review training and mentoring

Take advantage of opportunities to enrol in mentorship or training programmes to improve your peer review skills. Offer to mentor early career researchers as they learn the peer review process. Supervisors who wish to involve their students or junior researchers in peer review must request permission from the editor and abide by the editor's decision. In cases where a student performs the review under the guidance of the supervisor, that should be noted and the student should be acknowledged as the reviewer of record. It may also be helpful to read the reviews from the other reviewers, if these are provided by the journal, to improve your own understanding of the topic and the reason for the editorial decision. Sense about Science have a helpful guide for peer review written for early career researchers3. There are also training courses available for those starting out in peer review, for example, Publons provide a free online training course4.

Author Contributions

Tara Hoke, Trevor Lane, Charon Pierson and Elizabeth Moylan revised the 2013 guidelines that were originally conceptualised and written by Irene Hames on behalf of COPE Council. All authors are listed in alphabetical order. We describe contributions to this project as follows:

2013 Version: Conceptualisation – IH, Writing – IH.

2017 Version: Conceptualisation: EM & CP; Writing – original draft preparation: EM & CP. Writing – review and editing: TH, TL, EM, CP. Supervision: CP. Visualisation: EM & CP.

Acknowledgements We are grateful for the feedback and advice received from Kelly Cobey, John Hilton, Mark Hooper and Irene Hames which shaped the 2017 revision.

Further reading

1. https://publicationethics.org/files/u7140/Who_Owns_Peer_Reviews_Discussion_Document__Web.pdf
2. https://www.youtube.com/watch?v=SIOYO4Kau8I
3. http://senseaboutscience.org/activities/peer-review-the-nuts-and-bolts/
4. https://publons.com/community/academy/

COPE Council. Ethical guidelines for peer reviewers. September 2017. www.publicationethics.org

Version 2 Published September 2017
Version 1 Published March 2013 http://bit.ly/2rZVXKT

https://publicationethics.org/resources/guidelines-new/cope-ethical-guidelines-peer-reviewers

About COPE

COPE is committed to educating and supporting editors, publishers and those involved in publication ethics with the aim of moving the culture of publishing towards one where ethical practices becomes a normal part of the publishing culture. Our approach is firmly in the direction of influencing through education, resources and support of our members, alongside the fostering of professional debate in the wider community.

Over 20 years, COPE has grown to support members worldwide, from all academic fields. Our members are primarily editors, but also publishers and related organisations and individuals. After a period of consultation with the Trustees and Council, and feedback from our members, the COPE strategic plan was developed to guide the organisation and its activities.

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ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ ΣΗΡΑΓΓΩΝ και ΥΠΟΓΕΙΩΝ ΕΡΓΩΝ (Ε.Ε.Σ.Υ.Ε.)

Αθήνα, 19 Σεπτεμβρίου 2020

Υποψηφιότητα Διεκδίκησης του World Tunnel Congress 2023
Μετάθεση Ημερομηνίας Ψηφοφορίας

Αγαπητά μέλη

Όπως γνωρίζεται η Ελληνική Επιτροπή Σηράγγων και Υπογείων Έργων κατέθεσε επισήμως στις 10-1-2020 την υποψηφιότητα της Αθήνας (www.athensWTC2023.gr) για τη διοργάνωση του World Tunnel Congress 2023 (WTC2023) της Διεθνούς Ένωσης Σηράγγων & Υπογείων Έργων (ITA-AITES). Το Παγκόσμιο Συνέδριο Σηράγγων (WTC), αποτελεί κορυφαία και διεθνούς εμβέλειας ετήσια διοργάνωση που πραγματοποιείται εντός και εκτός Ευρώπης, εναλλασσόμενα ανά έτος. Η ψηφοφορία της επιλογής του κράτους διοργάνωσης του WTC2023 μεταξύ των δύο μόνων υποψηφίων (Αθήνα / Ελλάδα και Αττάλεια /Τουρκία) ήταν προγραμματισμένη για τη διαδικτυακή Γενική Συνέλευση (Γ.Σ.) της 16ης-9-2020, βάσει της ατζέντας που διανεμήθηκε στα Κράτη Μέλη την 27η-7-2020.

Μόλις προ ολίγων ημερών της προγραμματισμένης Γ.Σ. (1-9-2020), η ΕΕΣΥΕ έλαβε -αιφνιδιαστικά- επιστολή από το Δ.Σ. της ITA-AITES όπου ζητήθηκε η συγκατάθεσή της στη μετάθεση της ψηφοφορίας επιλογής του κράτους μέλους διοργάνωσης του WTC2023. Πέραν αυτού ενημερώθηκε ότι το Δ.Σ. της ITA-AITES προτίθεται να εισηγηθεί στη Γ.Σ. προς ψήφιση την αλλαγή των ισχυουσών κανονισμών που διέπουν τη διοργάνωση των συνεδρίων και την κατάθεση υποψηφιοτήτων για αυτά, με αναδρομική ισχύ και για τις ήδη κατατεθείσες υποψηφιότητες!

Η ΕΕΣΥΕ με τεκμηριωμένα επιχειρήματα (σύνδεσμος απαντητικής επιστολής) αρνήθηκε να συναινέσει σε μεθοδεύσεις που παραβιάζουν το Καταστατικό της ITA–AITES, που θα έχουν πιθανώς απροσδιόριστες επιπτώσεις σε μελλοντικές δραστηριότητες της ITA-AITES, αντίκεινται στην δεοντολογία Μη-Κερδοσκοπικών Οργανισμών και, ταυτόχρονα, δύνανται να βλάψουν την ΕΕΣΥΕ.

Ο αιφνιδιασμός που επεφύλαξε η ITA-AITES προς την ΕΕΣΥΕ, γνωστοποιήθηκε στα 77 λοιπά Κράτη Μέλη μόλις δύο ημέρες προ της Γ.Σ. Κατά τη Γ.Σ. της 16ης-9-2020 η ΕΕΣΥΕ παρουσίασε τα επιχειρήματά της, εισηγούμενη να πραγματοποιηθεί επιτόπου και η ψηφοφορία επιλογής Κράτους Μέλους διοργάνωσης του WTC2023. Η Γ.Σ. τελικώς αποφάσισε να μετατεθεί η ημερομηνία της ψηφοφορίας για μερικούς μήνες, ενσωματώνοντας όρους στις υποψηφιότητες που θα αποφασιστούν το επόμενο χρονικό διάστημα!

Για την ιστορία αναφέρεται ότι η έτερη υποψηφιότητα των γειτόνων μας δέχθηκε, με μεγάλη προθυμία, να ματαιωθεί η ψηφοφορία της προηγούμενης Τετάρτης.

Το Δ.Σ. της ΕΕΣΥΕ (www.eesye.gr)

Athens, 11th September 2020
Prot. No. : εξ130

Dear Distinguished Member of the Advisory Committee of the GTS bid to host WTC2023 in Athens.

On behalf of the Greek Tunnelling Society, please accept our deepest appreciation for your efforts as a member of the advisory committee of the Greek Candidacy.

As per current valid ITA terms, the host member Nation for the WTC2023 was to be voted in the upcoming General Assemply of ITA (next Wednesday 16-9-2020).

Only a few days ago the Greek Tunnelling Society was asked by ITA to consent on the postponement of the upcoming voting since new arrangements – still unknown- will be examined in the near future and will be proposed to apply even for WTC2023.

The Greek Tunnelling Society refused ITA's proposal since it is against the code of ethics of any election process as well as of the current valid ITA Statutes and By-Laws. Moreover, it harms GTS as it violates certain commitments, which unavoidably got into, as a result of the WTC candidacy process, and introduces unpredictable consequences on future activities of ITA as a result of the rapid and possibly non - matured new arrangements.

A more detailed elaboration of the recent communication between GTS and ITA is attached for your information.

Sincerely yours,

Ioannis Fikiris
Chair of the Organizing Committee bid for WTC2023 / ATHENS
President of the Greek Tunnelling Society

SIMSG ISSMGE

International Society for Soil Mechanics and Geotechnical Engineering

ISSMGE News & Information Circular September 2020

https://www.issmge.org/news/issmge-news-and-information-circular-september-2020

1. Webinars

Webinars recently added to the ISSMGE educational resources pages on the ISSMGE website:

a. Prof Mark Jaksa: 2nd John Burland Lecture: Reflections on Some Contemporary Aspects of Geotechnical Engineering Education - From Critical State to Virtual Immersion
b. Prof. Rodrigo Salgado: Forks in the Road: Rethinking Modeling Decisions that Defined Teaching and Practice of Geotechnical Engineering
c. Prof. Susan A. Ambrose: Prior Knowledge, Learning and Common Instructional Practices Grounded in Evidence
d. Prof. Luciano Picarelli: The Classification of Landslides in Soils in a Mechanical Perspective.
e. Prof. Fumio Tatsuoka: Geosynthetics-Reinforced Soil Structures - Developments from Walls to Bridges.
f. Prof. Pijusch Samui: "Machine Learning in Geotechnical Engineering"

2. Corporate Associates Presidential Group:

The August 2020 update of Corporate Associates' varied and exciting activities around the world can be found here https://www.issmge.org/corporate-associates/corporate-associates-presidential-group. Why and how to join as a Corporate Associate are detailed in https://www.issmge.org/corporate-associates/why-how-to-join

3. Bulletin

The latest edition of the ISSMGE Bulletin (Volume 14, Issue 4, August 2020) is available from the website https://www.issmge.org/publications/issmge-bulletin/vol-14-issue-4-august-2020

4. Federation of International Geo-Engineering Societies (FedIGS)

The Federation of International Geo-Engineering Societies (FedIGS) is a collaborative association of international professional societies in the field of "Geo-Engineering" and serves to facilitate cooperation among them. It has launched its revamped website, which can be viewed at https://geoengineeringfederation.org.

The cooperating societies forming the FedIGS Board are:

- International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE)
- International Society for Rock Mechanics and Rock Engineering (ISRM)
- International Association of Engineering Geology and the Environment (IAEG)
- International Geosynthetics Society (IGS)

FedIGS also has a number of Joint Technical Committees:

- JTC1 Natural Slopes and Landslides
- JTC2 Representation of Geo-Engineering Data
- JTC3 Education and Training

Further details about the FedIGS can be found at www.geoengineeringfederation.org.

5. ISSMGE Online Library – Open Access

The ISSMGE Online library (https://www.issmge.org/publications/online-library) is in continuous development – please note the following additions:

1st (2007) and 7th (2019) International Symposium on Geotechnical Safety and Risk

10th International Symposium on Field Measurements in Geomechanics (FMGM2018)

25th European Young Geotechnical Engineers Conference

6. ISSMGE Foundation

The next deadline for receipt of applications for awards from the ISSMGE Foundation is the 30th September 2020. Click **here** for further information on the ISSMGE Foundation.

7. Conferences

For a listing of all ISSMGE and ISSMGE supported conferences, and full information on all events, including deadlines, please go to the Events page at https://www.issmge.org/events. However, for updated information concerning possible changes due to the coronavirus outbreak (ie. postponements, cancellations, change of deadlines, etc), please refer to that specific event's website.

As might be expected, many events have been rescheduled and we update the Events page whenever we are advised of changes.

The following are events that have been added since the previous Circular:

ISSMGE Events

XXV CONGRESO ARGENTINO DE INGENIERÍA GEOTÉCNICA – CAMSIG - 26-05-2021 - 28-05-2021
Parque del Conocimiento - Posadas, Misiones, Argentina; Language: Spanish; Organiser; Sociedad Argentina de Ingeniería Geotécnica; Contact person: Andres Ayala; Address: Av. Ulises López, N3300 Posadas; Email: camsig2020.misiones@gmail.com, secretario@saig.org.ar; Website: https://camsig2020.com/

Non-ISSMGE Events

Buchanan Lecture – Texas A&M University - 06-11-2020 - 07-11-2020
Zoom virtual, College Station, United States; Language: English; Organiser: Texas A&M University; Contact person: Jean-Louis Briaud; Email: briaud@tamu.edu; Website: https://ceprofs.civil.tamu.edu/briaud/

ISRM International Society for Rock Mechanics and Rock Engineering

31st ISRM online lecture by Prof. Frederic Pellet

Dear ISRM Members and Rock Mechanics Colleagues,

For the 31st ISRM Online Lecture the ISRM invited Prof. Frederic Pellet. The title of the lecture is "Damage and Time-Dependent Behavior of Rocks in Underground Construction".

Dr. Pellet is a professor of geomechanics and rock engineering in INSA University of Lyon. He obtained his BSc in civil engineering at the Technical University of Geneva, Switzerland, and his MSc in geotechnical engineering at the University of Grenoble, France (1986). After a few years working for consulting companies in different fields, such as dam engineering and hydroelectric projects, he joined the Ecole Polytechnique Fédérale de Lausanne, Switzerland, where he prepared a doctoral thesis on rocks reinforcement. His thesis received the prize of the French Tunneling Association (AFTES) in 1993.

After another period spent in industry, Dr Pellet became an academic in 1996; first as an associate professor at the University of Grenoble (Lab 3SR) and then, in 2009, as a full professor at the University of Lyon (INSA). His scientific approach is based on a combination of experimental approaches and numerical modeling to enable risk analyzes. It has led him to study various subjects related to time-dependent behavior of rocks such as large transport infrastructures (deep alpine tunnels), underground storage of radioactive waste in close relationship with the French Institute for Radioprotection. Today, he mainly focuses on the exploitation of deep geothermal energy and delayed induced seismicity.

Dr. Pellet has collaborated with numerous institutions such as the Massachusetts Institute of Technology (United States), McGill University and the University of Sherbrooke (Canada) Mines ParisTech (France). He has also worked for several companies in the civil engineering and petroleum industry. At the same time, he is the author of more than 120 technical articles and book chapters on rock engineering and has delivered 35 invited addresses or lectures at national and international conferences. He is on the editorial boards of several international journals.

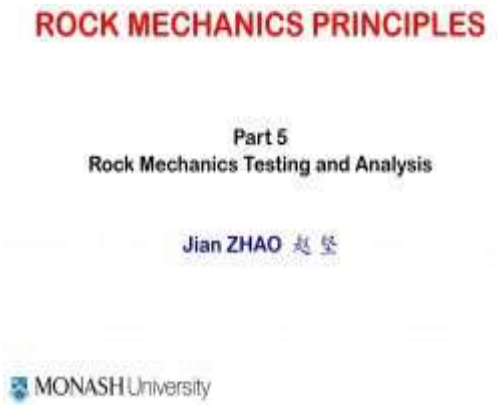
Between 2011 and 2016, Dr Pellet served as Vice-President of the ISRM for Europe and President of the French national group. Since 2010, Dr. Pellet has worked in several countries on various review committees, providing an independent geotechnical study on major civil engineering projects.

The lecture will remain online so that those unable to attend at this time will be able to do it later. As usual, the attendees will be able to ask questions to the lecturer by e-mail during the subsequent five days. All online lectures are available from **this page**.

Rock Mechanics Principles, a complete video course by Professor Jian Zhao available from the ISRM website

Rock Mechanics Principles, an on-line course by Professor Jian Zhao, provides an introduction to rock mechanics principles including the mechanics of rock materials, rock joints and rock masses, rock mechanics characterization and rock mass classifications. The course was now completed with the 5th part on rock mechanics testing and analysis.

The course is prepared for students of civil and mining engineering, and other science and engineering disciplines concerning rocks.



The course is an on-line course, with approximately 30 hours of lectures. It covers 5 parts:

1. Origin of rocks and rock masses (online in March 2016);
2. Properties and mechanics of rock materials (online in March 2016);
3. Properties and mechanics of rock joints (online in June 2016);
4. Rock mass classifications and properties (online in June 2016);
5. Rock mechanics testing and analysis (online in July 2020).

The lectures are given by Professor Jian Zhao, who has been teaching rock mechanics and rock engineering since 1990, first at Nanyang Technological University of Singapore, then at Ecole Polytechnique Fédérale de Lausanne of Switzerland, and currently at Monash University in Melbourne of Australia. He is a Fellow of the International Society for Rock Mechanics since 2015.

Rock Engineering, a sequential on-line course to Rock Mechanics Principles given by the same lecturer, will be made available very soon.

Click here (https://www.isrm.net/gca/index.php?id=1235) to go to the online course webpage on the ISRM website.

Three new ISRM Suggested Methods were published on the ISRM website

Three new ISRM Suggested Methods were published on the ISRM website:

- ISRM Suggested Method for the Lugeon Test (2019)
- ISRM Suggested Method: Determining Deformation and Failure Characteristics of Rocks Subjected to True Triaxial Compression (2019)
- ISRM Suggested Method for In Situ Acoustic Emission Monitoring of the Fracturing Process in Rock Masses (2019)

Click here to go to the ISRM Suggested Methods webpage. (ISRM member's credentials required)

Hydrophobic & Pore Blocking Ingredient for use in Tunnel Construction

Ken Howes – Sales Manager Cementaid Middle East
Alistair McDonald – Sales Manager Cementaid UK

Cementaid UK is part of the Internationally renowned Cementaid Group of Companies, founded in 1954. Cementaid pioneered the use of its unique Caltite HPI (Hydrophobic & Pore-Blocking Ingredient) in the early 1960's since which time it has been successfully used in millions of cubic metres of concrete, in 100's of thousands of Projects around the world. The talk will focus on :

- How the use of HPI technology can solve many of the problems associated with waterproofing tunnels;
- Enhancing durability, especially in potentially corrosive environments;
- How HPI will fundamentally alter both the absorption and pressure permeability characteristics of concrete and in doing so, enhance construction programmes and simplify design; and,
- The data presented will be backed up with actual field experience discussion and photographic details of many of the Caltite HPI tunnels that have been constructed around the world and how they have stood the test of time.

BTS Evening Presentation on Thursday 17th September 2020 online at https://youtu.be/5XplR3uSrqU.

Lessons Learned as A Trenchless Litigation Expert and Designer

Mark Knight PhD, Consulting Engineer, P.Eng., M.ASCE
Associate Professor, University of Waterloo, Civil and Environmental Engineering

The use of trenchless construction methods for the installation of underground water and gas pipelines and tunnels have become a common and well accepted alternative to traditional continuous open cut. Every trenchless construction project starts with the completion of a geotechnical site investigation and completion of a geotechnical report. Geotechnical reports are used by the "Engineer of Rec-ord" to design the pipeline and project and provided in the project tender pack-age.

This presentation will discuss the need for improved geotechnical investigations for trenchless construction projects that are very different than traditional foun-dation and open cut pipeline projects. This will be accomplished by presenting details of several case studies where the presenter was retained as technical "expert" or "designer". The presentation will also discuss common geotechnical industry fallacies, industry good practices, and how you can reduce your risk of litigation and exposure to claims.

BTSYM Presentation on Monday 28th September 2020 online at https://youtu.be/mHQmwD1ZfYo

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

Cancelled EUROCK 2020 Hard Rock Excavation and Support, 12-14 October 2020, Trondheim, Norway, www.eurock2020.com

Società Italiana Gallerie
Italian Tunnelling Society

Tunnelling 4.0: New Technologies and Future Perspectives for Maintenance, Upgrading and Refurbishment of Tunnels
15-16 October 2020, Bologna, Italy
www.societaitalianagallerie.it

Every year more than 2 000 km of tunnels in Italy and more than 10 000 km worldwide, belonging to the widespread existing network of infrastructure, undergo to daily maintenance, and some of them undergo to significant renewal or enlargement works, often without interrupting the serviceability to maintain operational and structural safety a regular inspections, monitoring and maintenance activities are required.

The monitoring consists of inspections, visual and measurement control, function and material tests often carried out during closure periods or during night shifts.

For safety and economic reasons, the reduction of time spent in the field as well as the increase of the effectiveness of the maintenance works are nowadays primary goals for large infrastructure owners.

Innovation has always characterized the Tunnelling industry. The research and development of new machinery and materials in the recent years have had a great impact in terms of safety, risk management, cost effectiveness and constructability. Challenging projects have been made possible and computer-aided tools for survey activities and data analysis were successfully developed, driving a sensible growth of the tunnelling industry worldwide.

The time ahead will be characterized by a technological revolution. We will see a radical and rapid change of design and construction practices as well as new innovative ways in using the underground space in a smart manner. This evolution must not lead to forgetting the enormous number of existing tunnels in Italy which terribly needs important control and maintenance works. And recent facts, bring us back to the need to tackle this important challenge with new resources and technologies.

The **International Tunnelling Association** (ITA) and the **Italian Tunnelling Society** (SIG) recognize such projected transformation and encourage knowledge sharing, research and synergies within the Industry in order to guide Tunnelling into the future. In this regard, **SIG Young Member Group decided to organize an International Conference in Bologna**, during SAIE 2020, on "Tunnelling 4.0: New Technologies and Future Perspectives for Maintenance, Upgrading and Refurbishment of Tunnels".

The conference, which will take place on the 15nd and 16rd of October 2020, will explore the latest advances and future challenges in maintenance, in monitoring and prediction technologies, in the automation of the inspection of Tunnel and Underground Spaces and it will be an opportunity to learn about the recent projects and innovations though the presentation of interesting case studies from infrastructure owners and managers, from engineering company in charge for the inspection, monitoring and refurbishment projects ("diagnosis" and "therapy"), from specialists that will illustrate the innovation in in surveying and monitoring techniques and material and from construction company in charge of the rehabilitation works often performed under exercise.

Speakers will represent both national and international experiences. The main topics, which will be discussed during the conference, are the following ones:

- inspection and monitoring of tunnels: new technologies, digital image processes and digital visual inspections, predictive monitoring;
- maintenance of tunnels: new technologies and automatic processes;
- upgrading and refurbishment of tunnels: new technologies, materials and applications.

Besides the individual presentations, the event will give the possibility for the industry players to gather together and discuss about potential ideas which will take tunnel design and construction to new levels in the next future.

In addition to the opportunity to attend the presentations of the speakers, the event will allow the players of the sector to meet, update and discuss, integrating approaches and experiences in a field, that of the maintenance and preservation of existing galleries, which is rapidly changing towards automated approaches systems capable of using the new frontiers of analysis (Big data analysis, IoT, Digital twins).

The Italian Tunnelling Society awaits you numerous!

E-UNSAT 2020 4th European Conference on Unsaturated Soils - Unsaturated Horizons, 19 to 21 October 2020, Lisbon, Portugal, fully online, https://eunsat2020.tecnico.ulisboa.pt

Cancelled GEO-EXPO 2020 Scientific and Expert Conference, 22-23 October 2020, Prijedor, Bosnia and Herzegovina www.geotehnika.ba

HYDRO 2020 Strategies for future progress, 26-28 October 2020, Strasbourg, France, www.hydropower-dams.com/hydro-2020 (on-line)

GeoAmericas2020 4th Pan American Conference on Geosynthetics, 26-31 October 2020, Rio de Janeiro, Brazil, www.geoamericas2020.com (on-line)

5th Symposium of the Macedonian Association for Geotechnics, 29-31 October 2020, Ohrid, North Macedonia, mag@gf.ukim.edu.mk

3rd Conference of the Arabian Journal of Geosciences (CAJG), 2-5 November 2020, Sousse, Tunisia, https://cajg.org (on-line)

5TH World Landslide Forum Implementation and Monitoring the USDR-ICL Sendai Partnerships 2015-2015, 2-6 November 2020, Kyoto, Japan, http://wlf5.iplhq.org

Postponed Fourth GeoMEast©2020 International Underground Structures Conference (IUSC), 8-12 November 2020, Cairo, Egypt, http://underground.geomeast.org

www.ucaofsmecuttingedge.com

Explore Advances in Tunneling Technology

The Cutting Edge conference provides you with the knowledge you need to stay up-to-date on the latest trends and techniques being used today on tunneling projects throughout the world.

From the East to the West Coast, North America's tunneling industry is flourishing. The annual Cutting Edge Conference examines the latest advances in tunneling technology, its methodology and how they can be harnessed to assist the nation's major upcoming underground projects.

Organized in partnership by North American Tunneling Journal and the UCA, the Cutting Edge Conference features a tailored, high-end technical sessions focusing on innovation and practical knowledge, this dynamic event connects industry professionals leading the way in technology and process development.

Find cutting edge perspectives on are range of topics, including workplace culture, industry challenges, and create collaborative networks - all from the convenience of your home, office or job site.

- Interact directly with industry trailblazers sharing the latest in technology, innovations and safety.
- Earn PDH credit and maintain the professional development requirements for professional credentials.
- Expand your network and form meaningful new connections with chat and video conferencing opportunities.

Cutting Edge is a great opportunity to learn about the next generation of underground construction projects in North America and meet the owners building them.

Conference Organizer & General Information

UCA
12999 E. Adam Aircraft Circle
Englewood, CO 80112
Tel: 303.948.4200 or 1.800.763.3132 (US Only)
Email: cs@smenet.org

CouFrac2020 goes fully virtual!! CouFrac 2020 - International Conference on Coupled Processes in Fractured Geological Media: Observation, Modeling, and Application, November 11-13, 2020, Seoul, Korea, http://coufrac2020.org

Postponed 10th International Conference on Scour and Erosion (ICSE-10), November 15-18, 2020, Arlington, Virginia, USA, www.engr.psu.edu/xiao/ICSE-10 Call for abstract.pdf

The second European conference
on tunnel renovation
November 27th 2020
https://beyondatunnelvision.eu

The conference will be fully digital! The plenary and parallel sessions are broadcasted live online from several European countries. You can now sign up as participant … for free.

Tunnels play a vital role in infrastructure. Many of them are aging and in need of major renovations. They cannot be shut down due to required high availability. Because of the volume and urgency of the tasks, this challenge needs to be addressed at an international scale.

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

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

ASIA 2020 Eighth International Conference and Exhibition on Water Resources and Renewable Energy Development in Asia, 8-10 December 2020, Kuala Lumpur, Malaysia, www.hydropower-dams.com/asia-2020

6th ICFGE 2020 Forensic Geotechnical Engineering & Geo-Disaster Documentation, December 10-12, 2020 IIT Delhi, India, http://tc302-issmge.com

Postponed ISGPEG 2020 International Conference on Innovative Solutions for Geotechnical Problems in Honour of Prof. Erol Guler, 2021, Istanbul, Turkey, www.isgpeg2020.org/en

BSGC 2020 is going virtual! 14th Baltic Sea Geotechnical Conference 2020 Future Challenges for Geotechnical Engineering, 18-20 January 2021, Helsinki, Finland, www.ril.fi/en/events/bsgc-2020.html

NGM 2020 is going virtual! Nordic Geotechnical Meeting Urban Geotechnics, 18-20 January 2021, Helsinki, Finland, www.ril.fi/en/events/ngm-2020.html

PanAm Unsat 2021 3rd Pan-American Conference on Unsaturated Soils, 25-28 January 2021, Rio de Janeiro, Brazil, https://panamunsat2021.com

Deep Inspirations
3-4 February 2021
www.ril.fi/en/events/acuus-2020.html

Due to the spread of the COVID-19 and because the World Tunneling Congress WTC 2020 changed its congress date to September 11-17, we have decided to reschedule ACUUS 2020 Helsinki Conference. ACUUS 2020 Helsinki Conference will be organized on February 2-4, 2021.

We wanted to react to the overlap of these two major events as soon as possible and we hope that the change of the date does not affect to your participation to the event. We are working hard to make the ACUUS 2020 Helsinki as successful as possible and we now invite you to experience the real Finnish winter!

Themes

- Architecture
- City Development
- Climate-friendly Solutions
- Construction Aspects
- Design
- Economics
- Geothermal Energy
- Hazardous Waste Disposal
- Legislation
- Reuse of Underground Spaces
- Safety & Human Factors
- Sustainability and Environment
- Technical Approaches & Innovations
- Underground Farming
- Underground Infrastructure
- Urban Planning

ACUUS: Associated research Centers for Urban Underground Space

Contact us

ACUUS Secretariat: Email: info@acuus.org

XIII International Symposium on Landslides - Landslides and Sustainable Development, 21-26 February 2021, Cartagena, Colombia, www.scg.org.co/xiii-isl

88th ICOLD Annual Meeting & Symposium on Sustainable Development of Dams and River Basins, 24-27 February 2021, New Delhi, India, https://www.icold2020.org

2021 GEOASIA7 - 7th Asian Regional Conference on International Geosynthetics Society, March 1-4, 2021, Taipei, Taiwan, www.geoasia7.org

www.btsconference.com

With Crossrail and the Lee Tunnel completed, and the Thames Tideway Tunnel, HS2, Crossrail 2, Silvertown, The Lower Thames Crossing, and Gallions Reach Tunnels, and Bakerloo Line Extensions and LU Station Upgrades all ramping up or already in construction, London is unquestionably still the tunnelling capital of Europe. Add to that further afield the ambitious Trans-Pennine Tunnel, Hinckley Point C Nuclear Power Tunnels, Stonehenge Tunnel, and various power tunnels in planning, and you can see why the industry focus is firmly set on the UK. To this end the tunnelling and excavation community will converge once again at the prestigious QE11 Conference Centre in the heart of London for BTS 2020 in March 2021.

This British Tunnelling Society "BTS 2020" event combines the high-profile two-day conference with the UK's largest tunnelling and underground space exhibition.

Industry professionals can expect to see world-class suppliers from all corners of the globe, and experience the very latest in tunnelling technology, including equipment, processes, ancillary services, and technical support.

The BTS 2020 Conference and Exhibition will be the biggest tunnelling industry gathering in the UK. On 2nd – 3rd March 2021, the QE11 Conference Centre, London … is the place to be!

Session and Themes

The conference programme is being put together as we speak. Tunnelling Journal is working with the BTS Conference Committee to finalise the programme and speakers will be invited to present.

Contact

Please contact one of the BTS 2020 team below with any questions or assistance we can help with.

Tris Thomas

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Email: tris@tunnellingjournal.com

3rd International Symposium on Coupled Phenomena in Environmental Geotechnics, 17 – 19 March 2021, Kyoto, Japan, https://cpeg2020.org

ICEGT-2020 2nd International Conference on Energy Geotechnics, 28-31 March 2021, La Jolla, California, USA, https://icegt-2020.eng.ucsd.edu/home

International Conference on Challenges and Achievements in Geotechnical Engineering
31.03.2021 – 02.04.2021, Tirana, Albania

The Albanian Geotechnical Society (AGS) is pleased to invite you to the International Conference on Challenges and Achievements in Geotechnical Engineering, to be held at POLIS University (Tirana, Albania). This conference is organized on the occasion of the 20th anniversary of the foundation of the Albanian Geotechnical Society. This is the 5th international event organized by AGS, following the two conferences held in 2011 and 2015, and the two workshops held in 2004 and 2007. The event is organized in collaboration with POLIS University and is supported by the International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE).

The conference aims to highlight various aspects of geotechnical engineering problems and challenges faced by geotechnical professionals in their everyday practice. We hope to provide an international interactive platform for discussion and collaboration for geotechnical professionals and applicants from all countries are welcomed. Practicing engineers, researchers and students are invited and encouraged to participate, to submit written contributions and also to present their works.

Organiser: Albanian Geotechnical Society
Contact person: Erdi Myftaraga
Phone: +355699336911
Email: emy@greengeotechnics.com

EUROENGEO 3RD EUROPEAN REGIONAL CONFERENCE OF IAEG, 8 - 12 April 2021, Athens, Greece, www.euroengeo2020.org

AFRICA 2021 Water Storage and Hydropower Development for Africa, 13-15 April 2021, Lake Victoria, Uganda, www.hydropower-dams.com/africa-2021

2nd Vietnam Symposium on Advances in Offshore Engineering – Sustsainable Energy & Marine Planning, 22-24 April 2021, Ho Chi Minh City, Vietnam, https://vsoe2021.sciences-conf.org

16th International Conference of the International Association for Computer Methods and Advances in Geomechanics – IACMAG - CHALLENGES and INNOVATIONS in GEOMECHANICS, 03-05-2021, Torino, Italy, www.symposium.it/en/events/2020/16th-international-conference-of-iacmag?navbar=1

ATS 2020 AUSTRALASIA TUNNELLING CONFERENCE, 10th – 13th May 2021, Melbourne, Australia, https://www.ats2020.com.au

EUROGEO WARSAW 2020 7th European Geosynthetics Congress, 16-19 May 2021, Warsaw, Poland, www.eurogeo7.org

TISOLS Tenth International Symposium on Land Subsidence, Living with Subsidence, 17-21 May 2021, Delft - Gouda, the Netherlands, www.tisols2020.org/tisols2020

7th International Conference on Industrial and Hazardous Waste Management 18 - 21 May, 2021, Chania, Crete, Greece, http://hwm-conferences.tuc.gr

2020 CHICAGO ICTG International Conference on Transportation Geotechnics, May 23 - 26, 2021, Chicago, Illinois, USA, http://conferences.illinois.edu/ICTG2020

Fifth International Conference on New Developments in Soil Mechanics and Geotechnical Engineering, 27 – 29 May 2021, Nicosia, Northern Cyprus https://zm2020.neu.edu.tr/

Joint meeting of ISSMGE TC201 and TC210, ICOLD TC E and TC LE "Dams and Levees: Particle Movements – Case Studies, Experiments, Theory", June, 2020, Budapest, Hungary, www.isc6-budapest.com

6th International Conference on Geotechnical and Geophysical Site Characterization "Toward synergy at site characterisation", June 2021, Budapest, Hungary, www.isc6-budapest.com

2021 ICOLD MARSEILLE - ICOLD 27th Congress - 89th Annual Meeting Sharing Water: Multipurpose of Reservoirs and Innovations, 4 - 11 June 2021, Marseille, France, https://cigb-icold2021.fr/en/

International Airfield and Highway Pavements Conference, June 6-9, 2021, Austin, Texas, USA, www.pavementsconference.org

MSL 2021 The 1st Mediterranean Symposium on Landslides SLOPE STABILITY PROBLEMS IN STIFF CLAYS AND FLYSCH

FORMATIONS, 7-9 June 2021, Naples, Italy, https://medsymplandslides.wixsite.com/msl2021

9th International Conference on Computational Methods for Coupled Problems in Science and Engineering (COUPLED PROBLEMS 2021), 13-16 June 2021, Sardinia, Italy, coupledproblems_sec@cimne.upc.edu

www.retc.org

RETC is the only conference with a dedicated focus on the developments, technology, trends, and innovations that directly affect the tunneling and underground construction industry. Featuring a wide variety of technical sessions and speakers combined with our expansive exhibit hall, RETC will be a professional event you will truly enjoy and remember.

The Rapid Excavation and Tunneling Conference (RETC) is sponsored by the Society for Mining, Metallurgy & Exploration (SME). Held every two years, RETC is the renowned international forum for the exchange and dissemination of developments and advances in underground construction. The RETC advances the engineering and scientific knowledge of rapid underground excavation and tunneling through interdisciplinary meetings, publications, technical-educational exhibitions and encouragement of research. It also provides innovative solutions to the unique engineering challenges associated with the tunneling industry.

Topics

- Contract Practices
- Project Planning
- Design
- Design/Build Projects
- Difficult Ground
- Drill and Blast
- Environment, Health and Safety
- Tunnel Rehabilitation
- Future Projects
- Geotechnical Considerations
- Ground Support and Final Lining
- Ground Control, Face Support and Monitoring
- Grouting and Ground Modification
- Hard Rock TBMs
- Large Span Tunnels and Caverns
- Microtunneling and Trenchless Tunneling
- International Projects
- Insurance
- Impacts of COVID-19 on Tunneling Industry
- New and Innovative Technologies
- Pressure Face TBM Case Histories
- Pressure Face TBM Technology
- Risk Management
- SEM/NATM
- Shafts and Mining
- Tunneling for Sustainability

Contact Us

The Society for Mining, Metallurgy & Exploration Inc. (SME) is a professional society (nonprofit 501(c)(3) corporation) whose more than 15,000 membership represents all professionals serving the minerals industry in more than 100 countries. View More >>

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Englewood, CO 80112
Phone: 303.948.4200
Email: cs@smenet.org

Cities on Volcanoes 11 - Volcanoes and Society: environment, health and hazards, 14-18 June 2021, Heraklion, Crete, https://pcoconvin.eventsair.com/volcanoes11

EGRWSE 2020 - 3rd International Conference on Environmental Geotechnology, Recycled Waste Materials and Sustainable Engineering, 17-19 June 2021, Izmir, Turkey, www.egrwse2020.com

2nd ICPE 2021 The Second International Conference on Press-in Engineering, 19-21 June 2021, Kochi, Japan, https://icpe-ipa.org/

1st International Conference on Sustainability in Geotechnical Engineering, ICSGE, 27-30 June 2021, Lisboa, Portugal, http://icsge.lnec.pt/#

IS-Cambridge 2020 10th International Symposium on Geotechnical Aspects of Underground Construction in Soft Ground, 28 June to 01 July 2021, Cambridge, United Kingdom, www.is-cambridge2020.eng.cam.ac.uk

ICONHIC2021: THE STEP FORWARD - 3rd International Conference on Natural Hazards & Infrastructure, 22 – 24 June 2021, Athens, GREECE, https://iconhic.com/2021

DFI Deep Mixing, 5-8 July 2020, TBD, Gdansk, Poland, www.dfi.org/DM2020

II International Seminar "Tailings and Waste Rock Disposal", July 12 – 14, 2021, Lima, Peru, www.geoingenieria.org.pe

7th ICRAGEE International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, 12-17 July 2021, Bengaluru, India, http://7icragee.org

GEOCHINA 2021 - 6th GeoChina International Conference Civil & Transportation Infrastructures: From Engineering to Smart & Green Life Cycle Solution, July 19 to 21, 2021, Nan-Chang, China, http://geochina2021.geoconf.org

37th General Assembly of the European Seismological Commission, September 2021, Corfu, Greece, www.escgreece2020.eu

ACE 2020 14th International Congress on Advances in Civil Engineering, September 2021, Istanbul, Turkey, www.ace2020.org/en

www.aftes2020.com

The AFTES (French Tunnelling and Underground Space Association) is pleased to inform you that its next International Congress will be held from 6 to 8 September 2021 again at the Palais des Congrès (Porte Maillot) in Paris. The Grand Paris construction sites will then be in full operation and we have looked for our Congress to be held close to all the actors responsible for this exceptional project.

The last edition in November 2017 was a success both in terms of the number of congress-goers and exhibitors. A record number of visitors was recorded, with a strong contingent of foreign representatives. In all, the congress attracted over 4,000 participants over these days. The challenge for all of us for 2021 is to do at least as well, if not even better, than in 2017.

The underground, a space of innovation

The central theme of this edition is "the underground, a space of innovation". The underground in fact offers very many opportunities, on the urban planning level - with the creation of a range of facilities and new activities-, with regard to the design of studies - in particular with the assistance of numerical modelling - and also with respect to the great strides that are being continuously made in boring and construction plant, equipment and products.

A large number of captivating prospects are therefore on the horizon for this AFTES 2020 Congress!

Themes of the conferences

At a time when the use of underground space has become crucial for the sustainable development of our cities, and when new technologies are resulting in far-reaching changes to all professions, our Congress wishes to be an opportunity for decision-makers, infrastructure managers, designers, builders and suppliers to share their experiences and projects involving underground space.

They are invited to offer their contributions on the following themes:

A. The contribution of underground space in the city of the future

- How have projects which include underground space become key assets of urban development?
- What new ideas, what innovations will enable them to go even further?
- What elements directly oriented towards sustainable development, adaptation to climate change, and more generally resiliency have been implemented and with what results?

B. Changes in the design of underground spaces and structures

- What new methods have arisen from the development of new digital technologies?
- How have new methods of modelling, risk management and project management changed and improved practices and dialogue between the actors of the project?
- How have these developments been able to influence projects from the preliminary steps through to construction and, beyond that, the operation of the structures?

C. Innovation in building underground structures

- What innovative techniques have been used for them? What issues did they address? What have been the results? What prospects do they offer?
- What lessons have been learned as regards controlling risks?
- What role has the integration of new digital technologies played in steering construction work?
- How has the contribution of augmented reality, the processing of data streams, artificial intelligence and robotisation been put to good use, and what are the prospects for the future?

D. The operation and maintenance of underground works serving sustainable development

- How are the subjects of the operation and maintenance of the underground structures integrated into projects?
- What gains in terms of sustainability of the structures and response to the concerns of operators have been obtained thanks to innovative, digital or other techniques? What prospects do these innovative developments open up?

Our Congress aims to provide a forum for all the actors of underground space and, as such, is ready to study any offer of contributions, including those not strictly related to the proposed topics.

RMEGV 2021 - 5th International Workshop on Rock Mechanics and Engineering Geology in Volcanic Fields, 9÷11 September 2021, Fukuoka, Japan, https://ec-convention.com/rmegv2021

SYDNEY 7iYGEC 2021 7th International Young Geotechnical Engineers Conference A Geotechnical Discovery Down Under, 10-12 September 2021, Sydney, Australia, http://icsmge2021.org/7iygec

SYDNEY ICSMGE 2021 20th International Conference on Soil Mechanics and Geotechnical Engineering, 12-17 September 2021, Sydney, Australia, www.icsgme2021.org

International Conference on Textile Composites and Inflatable Structures (MEMBRANES 2021), 13-15 September 2021,

Munich, Germany, https://congress.cimne.com/membranes2021/frontal/default.asp

EUROCK TORINO 2021 - ISRM European Rock Mechanics Symposium Rock Mechanics and Rock Engineering from theory to practice, 20-25 September 2021, Torino, Italy, http://eurock2021.com

ARMS11 11th Asian Rock Mechanics Symposium, Challenges and Opportunities in Rock Mechanics, 21-25 October 2021, Beijing, China, www.arms11.com

October 27th - 29th, 2021, Bochum, Germany
http://eurotun2021.rub.de

EURO:TUN 2021 will be held at Ruhr University Bochum, Germany, on **October 27th - 29th, 2021** and will be concerned with innovative computational concepts and strategies for optimised design and construction of tunnels.

Conference Objectives

Computational methods and information models have experienced increasing application in the design and construction of underground infrastructure. Tunneling is characterized by a high degree of uncertainty and complex interactions between the tunneling process and its environment. In addition, new tunneling technologies and changing requirements for the construction of tunnels (e.g. larger diameters, tunneling in difficult ground conditions, safety concerns, life time prognoses) are constituting new challenges for adequate computational methods to be used for prognoses and decisions to be made in the design, construction, service and maintenance of tunnels. Information models and BIM concepts are increasingly used and combined with computational models for a seamless workflow in digital design and construction. These challenges need continuous research and new solutions in the field of information and computational modeling in tunneling.

Beyond advances in computational methods for the simulation of the advancement process and soil-structure interacttions, logistics and construction processes of tunnels, and model-based lining designs also advances in applications of information modeling, advanced sensing technologies, machine learning methods, and big data analytics in tunneling and underground infrastructure will be topics of **EURO:TUN 2021**.

EURO:TUN 2021 is a follow-up conference after the four previous successful EURO:TUN organized as ECCOMAS Thematic conferences (2007 & 2017 in Austria; 2009 & 2013 in Germany). Like the previous conferences, EURO:TUN 2021 aims to provide a forum for scientists, developers and engineers to review and discuss novel research findings and to assess the suitability and robustness of advanced computational methods and information models for the design, construction and maintenance of tunnels.

Conference Topics

EURO:TUN 2021 will be concerned with innovative computational concepts and strategies for optimised design and construction of tunnels. Topics to be addressed are:

- integration of computational and information models for tunnel planning and design,
- modeling of machine-ground and soil-structure interaction,
- numerical models for tunnel excavation, ground-tool interaction and face stability,
- process and logistics simulation,
- data driven modeling, machine learning, data mining, and expert systems in subsurface engineering,
- model-based design of lining systems,
- multi-phase and multi-scale models for soils and rocks and the temporary and permanent support in tunneling,
- procedures for parameter identification, and methods of inverse analysis,
- sensitivity analysis, uncertainty modeling and risk analysis,
- other related topics.

EURO:TUN 2021 is one of the Thematic Conferences of the European Community in Computational Methods in Applied Science (ECCOMAS).

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ISFOG 2020 4th International Symposium on Frontiers in Offshore Geotechnics, 8 – 11 November 2021, Austin, United States, www.isfog2020.org

2021 GEOASIA7 - 7th Asian Regional Conference on International Geosynthetics Society, November 22-26, 2021, Taipei, Taiwan, www.geoasia7.org

ICGE – Colombo – 2020 3rd International Conference in Geotechnical Engineering, 6-7 December 2021, Colombo, Sri Lanka, http://icgecolombo.org/2020/index.php

WTC 2021 World Tunnel Congress 2021 - Underground solutions for a world in change, 16-19 May 2021, Copenhagen, Denmark, www.wtc2021.dk

GeoAfrica 2021 - 4th African Regional Conference on Geosynthetics Geosynthetics in Sustainable Infrastructures and Mega Projects, Spring 2022, Cairo, Egypt, https://geoafrica2021.org

LARMS 2021 – IX Latin American Rock Mechanics Symposium Challenges in rock mechanics: towards a sustainable development of infrastructure, 15 – 18 May 2022, Asuncion, Paraguay, https://larms2021.com

CPT'22

5th International Symposium on Cone Penetration Testing
8-10 June 2022, Bologna, Italy

The Italian Geotechnical Society (AGI) and the University of Bologna are pleased to announce the 5th International Symposium on Cone Penetration Testing, CPT'22, to be held in Bologna, Italy, on June 8-10, 2022. CPT'22, organized under the auspices of the ISSMGE Technical Committee TC102, follows the successful symposia held in Delft, The Netherlands (2018), Las Vegas, Nevada USA (2014), Huntington Beach, California USA (2010) and Linköping, Sweden (1995).

As tradition of the CPT events, which foster a lively debate on recent advancements on cone penetration testing, the Symposium aims at providing Researchers, Practitioners and Contractors with a unique opportunity of sharing up-to-date knowledge in equipment, testing procedures, data interpretation and related applications, as well as discussing emerging solutions and new ideas with the largest gathering of world's experts, academics and non-academics, working in the broad and dynamic area of CPTs.

Organizer

Italian Geotechnical Society (AGI) and University of Bologna (endorsed by TC102)

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Prof. Guido Gottardi (University of Bologna)

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Eurock 2022

Rock and Fracture Mechanics in Rock Engineering and Mining
13÷17 June 2022, Helsinki, Finland

Contact Person: Lauri Uotinen
E-mail: lauri.uotinen@aalto.fi

3rd European Conference on Earthquake Engineering and Seismology (3ECEES), 19-24 June 2022, Bucharest, Romania, https://3ecees.ro

9th International Congress on Environmental Geotechnics
Highlighting the role of Environmental Geotechnics in Addressing Global Grand Challenges
26-29 June 2022, Chania, Crete island, Greece
www.iceg2022.org

The 9th International Congress on Environmental Geotechnics is part of the well established series of ICEG. This conference will be held on an outstanding resort in the town of Chania of the island of Crete in Greece. The theme of the conference is "Highlighting the role of Environmental Geotechnics in Addressing Global Grand Challenges" and will highlight the leadership role of Geoenvironmental Engineers play on tackling our society's grand challenges.

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UNSAT2022
8th International Conference on Unsaturated Soils
June or September 2022, Milos island, Greece

XII ICG - 12th International Conference on Geosynthetics, September 18 – 22, 2022, Rome, Italy, www.12icg-roma.org

28th EYGEC

28th European Young Geotechnical Engineers Conference and Geogames
15 – 17 December 2022, Moscow, Russia
https://t.me/EYGEC2020

Russian Society for Soil Mechanics, Geotechnics and Foundation Engineering is pleasured to announce the 28th European Young Geotechnical Engineers Conference that will be held from the 15th to 17th September 2022. The conference will take place at National Research Moscow State University of Civil Engineering in Moscow, Russia.

GeoGames is a competition for young geotechnical engineers and scientists which is traditionally held as part of a Youth Conference RSSMGFE.

Organizer

Russian Society for Soil Mechanics, Geotechnics and Foundation Engineering

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15th ISRM

International Congress in Rock Mechanics
9÷14 October 2023, Salzburg, Austria

Contact Person: Prof. Wulf Schubert
E-mail: salzburg@oegg.at

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Couldn’t resist stopping by this beautifully sliding coastline in northern Jutland, Denmark #clifferosion

Birling Gap danger warning over crumbling cliff edge photo

A photo of a woman posing for a picture across a large crack at Birling Gap has led to fresh warnings to people to keep away from dangerous cliff edges.

In the photograph, the woman is seen next to a section of the chalk cliffs on the south coast near Eastbourne that has already broken away.

The woman is seen stretching across a large crack in the chalk cliffs

RNLI coxwain Mark Sawyer said authorities understood it was a beautiful place with stunning views. But he said the cliffs were crumbling and could fall at any time.

Mr Sawyer said: "It does look fine from the top but what [people] can't see - as we do from the lifeboats - [is] how it's underpinned. "They can't see the erosion underneath them. There's some huge holes underneath the earth and the grass up there. "There's no chalk at all. It's a matter of time before those cliffs go." He said there had been two recent cliff falls, one near the spot where the photograph was taken.

Geologists have said cracks can stretch back 10m (33ft) to 15m (49ft) into the cliffs.

Safety advice from the National Trust, which owns Birling Gap, states that cliff falls and erosion are part of the landscape but visitors are advised to act sensibly and stay away from the edge. Its website states that permanent signs are in place warning visitors of dangers.

(BBC, 6 September, https://www.bbc.com/news/uk-england-sussex-54049513)

Cracks have opened up in the chalk cliff at Seaford Head prompting safety concerns

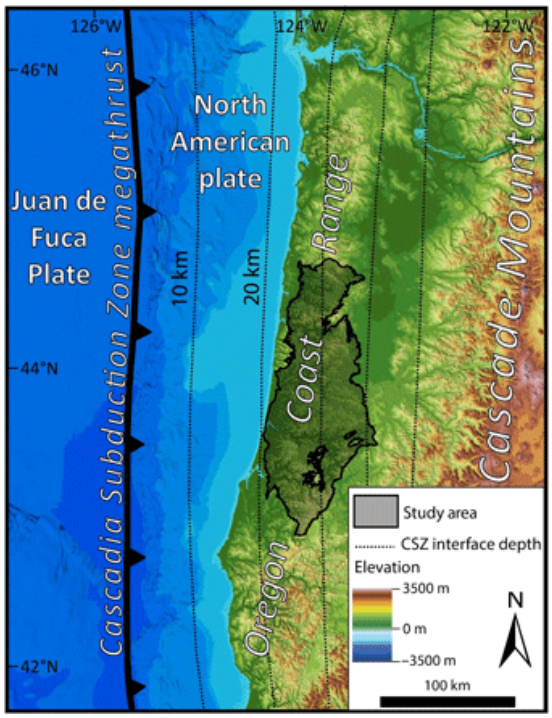
Rain and frost could be to blame for the appearance of cracks in the cliff

A number of cracks have been spotted

(BBC, 17 March 2016, https://www.bbc.com/news/uk-england-sussex-35832023)

Rainfall triggers more deep-seated landslides than Cascadia earthquakes in the Oregon Coast Range, USA

S. R. LaHusen, A. R. Duvall, A. M. Booth, A. Grant, B. A. Mishkin, D. R. Montgomery, W. Struble, J. J. Roering and J. Wartman



Black outline depicts the central Oregon Coast Range (OCR) study area, which is underlain by the Eocene Tyee Formation and overlying Elkton Formation. The CSZ runs roughly north to south for over 1100 km just offshore. Shaded relief base map compiled from U.S. Geological Survey 30-m elevation data and National Oceanic and Atmospheric Administration bathymetry by the state of Oregon. Depth contours show the interface between the Juan de Fuca Plate and the overlying North American plate.

Abstract

The coastal Pacific Northwest USA hosts thousands of deep-seated landslides. Historic landslides have primarily been triggered by rainfall, but the region is also prone to large earthquakes on the 1100-km-long Cascadia Subduction Zone megathrust. Little is known about the number of landslides triggered by these earthquakes because the last magnitude 9 rupture occurred in 1700 CE. Here, we map 9938 deep-seated bedrock landslides in the Oregon Coast Range and use surface roughness dating to estimate that past earthquakes triggered fewer than half of the landslides in the past 1000 years. We find landslide frequency increases with mean annual precipitation but not with modeled peak ground acceleration or proximity to the megathrust. Our results agree with findings about other recent subduction zone earthquakes where relatively few deep-seated landslides were mapped and suggest that despite proximity to the megathrust, most deep-seated landslides in the Oregon Coast Range were triggered by rainfall.

(*Science Advances*, 16 Sep 2020, Vol. 6, no. 38, eaba6790, DOI: 10.1126/sciadv.aba6790, https://advances.sciencemag.org/content/6/38/eaba6790)

Interesting facts and figures for TBMs

Tunnel boring machine at the Bözberg tunnel, Switzerland

The fourth tube of the **Hamburg Elbe Tunnel** was built between 1997 and 2000 with the 2000 tons heavy TRUDE shield tunnel boring machine with an outer diameter of 14.20 m. The world's largest tunnel boring machine at the time, with 111 scraper blades for soft rock and 31 roller bits for hard rock, extended the tunnel by an average of 6 m/day.

Tunnel boring machine built in 1965

In Switzerland, smaller sections were initially produced in the 1960s using tunnel boring machines. From 1970 onwards, large tunnels for road and rail traffic were also driven with tunnel boring machines. By the end of the 1990s, 19 large road or double-track railway tunnels with a total length of 83 km had been driven with TBMs. The **Gotthard base tunnel** was built between 2002 and 2010 with the 400 m long and 2700 t heavy gripper tunnel boring machines Heidi (S 211) and Sissi (S 210) from Herrenknecht AG. The drill heads of the machines had a diameter of around 9.5 m and were

equipped with more than 60 roller bits. They were driven by ten motors with 350 kW each.

The **largest tunnel boring machine in the world** dug a highway tunnel in Seattle. It was almost 18 metres high, weighed 70 tonnes and was around 100 metres long. The Americans gave the drill a nickname reminiscent of earlier war jargon: "Fat Bertha". The machine had a diameter of 17.5 metres and even had its own Twitter account. Bertha's mission is now finished. Parts of the machine are to be recycled; another part will be shipped back to the designer in Japan. Impressive photos and fascinating images of the TBM are available on the Flickr account of the Washington State Department of Transportation: www.flickr.com.

https://hagerbach.ch/news-events/hagerbach-news/news/tunnel-boring-machines-tbm-roadheaders-tsm/

White Papers by Robbins

Hybrid TBM Excavation in Challenging Mixed Ground Conditions at the Mumbai Metro

Excavation in mixed ground conditions is always a challenge, but under a densely urban environment the stakes become even higher. At India's Mumbai Metro, two 6.65 m hybrid-type rock/soft ground Single Shield TBMs are successfully boring parallel 2.8 km [...] **more**

TBM Excavation in Himalayan Geology: Over 1,200 Meters per Month at the Bheri Babai Diversion Multipurpose Project

A Double Shield TBM achieved in 17 months what was projected to have taken 12 years with Drill & Blast: The 12.2 km long Bheri Babai Diversion Multipurpose Project (BBDMP). Bored in Himalayan geology including sandstone, mudstone, and conglomerate, the [...] **more**

Tunneling through 48 Fault Zones and High Water Pressures on Turkey's Gerede Water Transmission Tunnel

The December 2018 breakthrough of a 5.5 m diameter hybrid-type Single Shield/EPB TBM at the Gerede Water Transmission Tunnel in Central Turkey was a feat of modern construction. The Crossover XRE TBM was assembled and launched more than 7 km from the tunn [...] **more**

Overcoming Multiple Caverns: Successful TBM Tunneling in Karst Geology at Galerie des Janots

In April 2019, a 3.5 m diameter open-type, Main Beam TBM and its crew broke through at the Galerie des Janots Tunnel in La Ciotat, France after encountering two large, uncharted caverns up to 8,000 cubic meters in size. [...] **more**

(Robbins White Papers | September 9, 2020, https://www.therobbinscompany.com/news-and-media/white-papers/)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ

How a 'forgotten' 600-year-old tsunami changed history

Historic grave markers revealed by the 2004 Indian Ocean tsunami prompted researchers to look for evidence of earlier tsunamis.

New evidence shows a disaster similar to the 2004 Indian Ocean tsunami battered the same region centuries ago and may have given rise to a powerful Islamic kingdom.

On Dec. 26, 2004, roiling tides as high as 100 feet rushed onto the shores of Aceh, the Indonesian province on the northwest tip of Sumatra.

An undersea earthquake had struck just off the coast and triggered a destructive tsunami, which hit shorelines all along the Indian Ocean as far away as Somalia. More than 160,000 people were killed in Aceh alone, and even more were displaced.

A similar tsunami appears to have wiped out coastal villages in Aceh more than 600 years ago, and the resulting devastation may have played a role in the rise of the powerful Aceh Sultanate, according to new evidence, published today in the *Proceedings of the National Academy of Sciences*.

In 2006, archaeologist Patrick Daly was working with Acehnese authorities to preserve cultural and religious sites damaged by the 2004 tsunami when he saw beautifully carved historic Muslim gravestones toppled over and eroding away along the coastline.

"To see them thrown up and tossed aside, that was quite heartbreaking," he says.

Daly started wondering how often these tsunamis had happened in the past, and if so, how they affected the people living in Aceh. The northwest tip of Sumatra, where Aceh's capital Banda Aceh is now, was either the first or last port of call for ships crossing the Bay of Bengal, and the Aceh Sultanate that arose there in the 16th century became one of the few southeast Asian powers to successfully resist colonialism for centuries. Archaeologists, however, didn't have much hard evidence for settlements in the area before the 17th century.

Daly, who works at the Earth Observatory of Singapore, and his colleagues at Syiah Kuala University in Aceh began systematically studying the coast, fanning out to about 40 coastal villages to sit down with elders and map any traces of historic human presence, such as gravestones, ceramic fragments, and old mosque foundations.

"The very first map I got back told most of the story," Daly says. "It was stunning. We can see all these very discrete concretions of material along the coast. Ten settlements came up really distinctly."

Based on the age of the ceramic scatters in these settlements, the researchers found something even more striking. The coastal villages all seem pop up around the 11th and 12th centuries, but then all nine low-lying settlements along a 25-milesection of coast seem to have been abandoned around 1400.

Recently discovered geologic evidence suggested that a tsunami had struck the region in 1394, but, Daly says, ""We had no idea of the extent of it—how big, how powerful, how destructive was it." The new archaeological evidence suggests the tsunami, possibly par with the 2004 event, destroyed all the low-lying villages in the region.

The one Acehnese settlement that seemed to survive the 1394 tsunami was a hilltop site out of reach of the tides. Daly and his colleagues have identified the settlement as Lamri, a trading site known from historic records on the medieval maritime Silk Road. At Lamri, the researchers found high-end ceramics from all different parts of China and even as far away as Syria that they didn't see in the low-lying villages.

Lamri, however, went into rapid decline around the beginning 16th century. Just a few decades earlier, people had started rebuilding in the villages that had been destroyed by the tsunami. Trade was getting rerouted to those low-lying areas, as evidenced by the uptick in higher quality ceramics and gravestones with names of elites from other parts of the Straits of Malacca, which separates Sumatra from the Malay Peninsula.

Daly and his colleagues don't think the low-lying coastal areas were resettled by local survivors moving back home. Rather, they believe the tsunami destruction offered prime, vacated real estate for Muslim traders who were being displaced elsewhere as Europeans started vying for influence in the region. (The Portuguese conquered the nearby state of Malacca in 1511.) These newcomers may have formed the core of what became the Aceh Sultanate, a powerful Islamic kingdom.

"You can have a tsunami event followed by a period of absolute renaissance and construction," says Beverly Goodman, a geoarchaeologist at the University of Haifa in Israel, who also studies past tsunamis. (Goodman was not part of the study.)

Geologists and archaeologists hope that reconstructing past tsunamis can help us better understand modern risks.

"If we rely only on the record that we're aware of, we end up significantly underestimating how often and how big the impact of tsunamis is around the world," says Goodman.

She noted that because of the 2004 event, Aceh was shown to be very vulnerable. But the same methods of this new study, which Goodman wasn't involved in, could help recognize vulnerability in places that haven't had a recently recorded event.

"This type of research is really important for getting those older records together to better understand what the risk factors are," Goodman says. "Using sediment records and archaeological records is really critical for filling in those gaps."

The greater challenge is perhaps figuring out how to appropriately adapt to very rare events.

"If you tell people that some time in the next couple of centuries there could be another tsunami, but we can't tell you when, and it will wipe the whole area out, a lot of people are willing to live with that risk," Daly says.

(Megan Gannon / NATIONAL GEOGRAPHIC, May 27, 2019, https://www.nationalgeographic.com/culture/2019/05/how-forgotten-600-year-old-tsunami-changed-history)

Archaeological evidence that a late 14th-century tsunami devastated the coast of northern Sumatra and redirected history

Patrick Daly, Kerry Sieh, Tai Yew Seng, Edmund Edwards McKinnon, Andrew C. Parnell, Ardiansyah, R. Michael Feener, Nazli Ismail, Nizamuddin, and Jedrzej Majewski

Abstract

Archaeological evidence shows that a predecessor of the 2004 Indian Ocean tsunami devastated nine distinct communities along a 40-km section of the northern coast of Sumatra in about 1394 CE. Our evidence is the spatial and temporal distribution of tens of thousands of medieval ceramic sherds and over 5,000 carved gravestones, collected and recorded during a systematic landscape archaeology survey near the modern city of Banda Aceh. Only the trading settlement of Lamri, perched on a headland above the reach of the tsunami, survived into and through the subsequent 15th century. It is of historical and political interest that by the 16th century, however, Lamri was abandoned, while low-lying coastal sites destroyed by the 1394 tsunami were resettled as the population center of the new economically and politically ascendant Aceh Sultanate. Our evidence implies that the 1394 tsunami was large enough to impact severely many of the areas inundated by the 2004 tsunami and to provoke a significant reconfiguration of the region's political and economic landscape that shaped the history of the region in subsequent centuries.

PNAS June 11, 2019 116 (24) 11679-11686; first published May 28, 2019 https://doi.org/10.1073/pnas.1902241116

Proceedings of the National Academy of Sciences of the United States of America, https://www.pnas.org/content/116/24/11679

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΓΕΩΛΟΓΙΑ

Study Sheds New Light on Growth of Mysterious Stone Forests

A new study, published in the *Proceedings of the National Academy of Sciences*, reveals a mechanism that may contribute to the formation of sharply pointed rock spires in striking landforms called stone forests.

Stone forest in Yunnan province, China.

Stone forests are pointed rock formations resembling trees that populate regions of China, Madagascar, and many other locations worldwide.

They are as majestic as they are mysterious, created by uncertain forces that give them their shape.

"Our work reveals a mechanism that explains how these sharply pointed rock spires, a source of wonder for centuries, come to be," said senior author Dr. Leif Ristroph, a researcher in the Courant Institute of Mathematical Sciences at New York University.

"Through a series of simulations and experiments, we show how flowing water carves ultra-sharp spikes in landforms."

The study also illuminates a mechanism that explains the prevalence of sharply pointed rock spires in karst, a topography formed by the dissolution of rocks, such as limestone.

The authors simulated the formation of these pinnacles over time through a mathematical model and computer simulations that took into account how dissolving produces flows and how these flows also affect dissolving and thus reshaping of a formation.

To confirm the validity of their simulations, they conducted a series of experiments in the lab.

They replicated the formation of these natural structures by creating sugar-based pinnacles, mimicking soluble rocks that compose karst and similar topographies, and submerging them in tanks of water.

Interestingly, no flows had to be imposed, since the dissolveing process itself created the flow patterns needed to carve spikes.

Natural pinnacles and stone forests: (A-C) photographs showing limestone structures of different scales in the Tsingy de Bemaraha National Park in Madagascar; (D) similar limestone formations in the Gunung Mulu National Park in Malaysia.

The experimental results reflected those of the simulations, thereby supporting the accuracy of the team's model.

"These same events happen — albeit far more slowly — when minerals are submerged under water, which later recedes to reveal stone pinnacles and stone forests," the scientists said.

Jinzi Mac Huang *et al*. Ultra-sharp pinnacles sculpted by natural convective dissolution. *PNAS*, published online September 8, 2020; doi: 10.1073/pnas.2001524117

(SCINEWS, Sep 8, 2020, http://www.sci-news.com/othersciences/geophysics/stone-forests-08828.html)

Ultra-sharp pinnacles sculpted by natural convective dissolution

Jinzi Mac Huang, Joshua Tong, Michael Shelley, and Leif Ristroph

Significance

This work reveals a mechanism that may contribute to the formation of sharply pointed rock spires in karst or dissolved landforms such as stone forests. We show that solids dissolving into liquids in the presence of gravity naturally produce flows that carve ultra-sharp spikes. Better understanding the origin of these delicate structures may aid in natural conservation efforts. Our experimental and theoretical techniques may also be applied to other problems in geomorphology and phase-change processes such as ice melting. The mechanism could be used to manufacture fine-scale structures, and our theory provides the relevant control parameters.

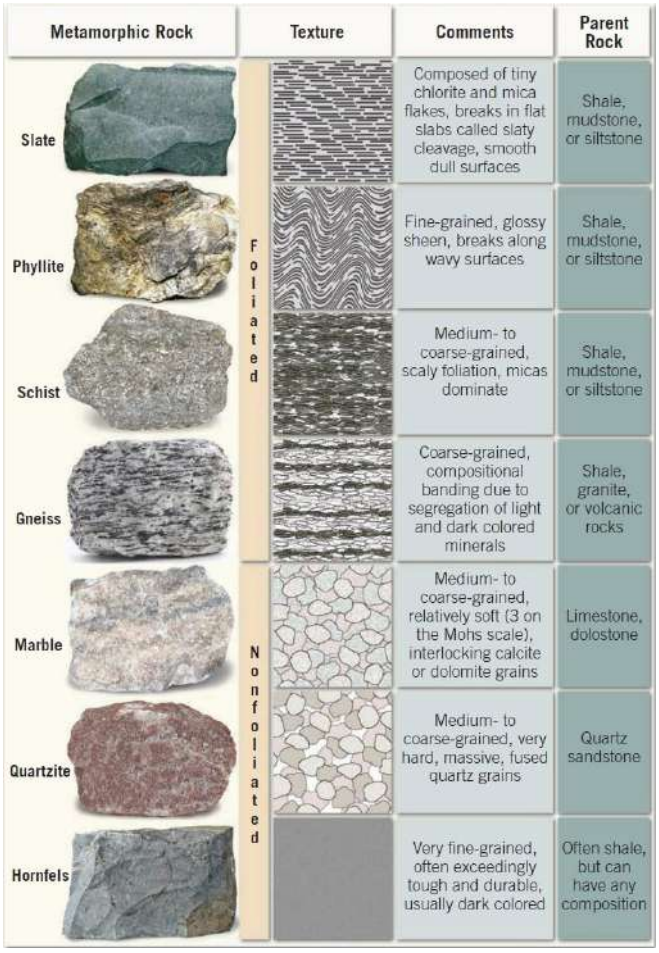
Abstract

The evolution of landscapes, landforms, and other natural structures involves highly interactive physical and chemical processes that often lead to intriguing shapes and recurring motifs. Particularly intricate and fine-scale features characterize the so-called karst morphologies formed by mineral dissolution into water. An archetypal form is the tall, slender, and sharply tipped karst pinnacle or rock spire that appears in multitudes in striking landforms called stone forests, but whose formative mechanisms remain unclear due to complex, fluctuating, and incompletely understood developmental conditions. Here, we demonstrate that exceedingly sharp spires also form under the far-simpler conditions of a solid dissolving into a surrounding liquid. Laboratory experiments on solidified sugars in water show that needlelike pinnacles, as well as bed-of-nails-like arrays of pinnacles, emerge robustly from the dissolution of solids with smooth initial shapes. Although the liquid is initially quiescent and no external flow is imposed, persistent flows are generated along the solid boundary as dense, solute-laden fluid descends under gravity. We use these observations to motivate a mathematical model that links such boundary-layer flows to the shape evolution of the solid. Dissolution induces these natural convective flows that, in turn, enhance dissolution rates, and simulations show that this feedback drives the shape toward a finite-time singularity or blow-up of apex curvature that is cut off once the pinnacle tip reaches microscales. This autogenic mechanism produces ultra-fine structures as an attracting state or natural consequence of the coupled processes at work in the closed solid-fluid system.

PNAS September 22, 2020 117 (38) 23339-23344; first published September 8, 2020;
https://doi.org/10.1073/pnas.2001524117

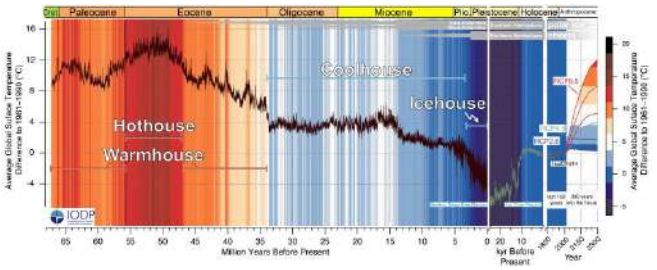
PNAS Proceedings of the National Academy of Sciences of the United States of America, https://www.pnas.org/content/117/38/23339

Classification of common metamorphic rocks



ΕΝΔΙΑΦΕΡΟΝΤΑ - ΠΕΡΙΒΑΛΛΟΝ

66 Million Years of Earth's Climate Changes Revealed in Unprecedented Detail From Ocean Sediments



The CENOGRID shows Earth has experienced four distinct climate states over the last 66 million years. The detailed climatic changes of the past can be studied like a colorful barcode and provide context for ongoing anthropogenic change and how exceptional it is. Earth's climate has gradually cooled for the last 50 million years, but unmitigated anthropogenic changes reverse this cooling trend and far exceed the warmest climates of the last 66 million years. Credit: Thomas Westerhold

Changes in the Earth's climate over the last 66 million years have been revealed in unprecedented detail by a team involving UCL researchers, highlighting four distinctive climatic states and the natural million- and thousand-year variability that Earth's climate has experienced.

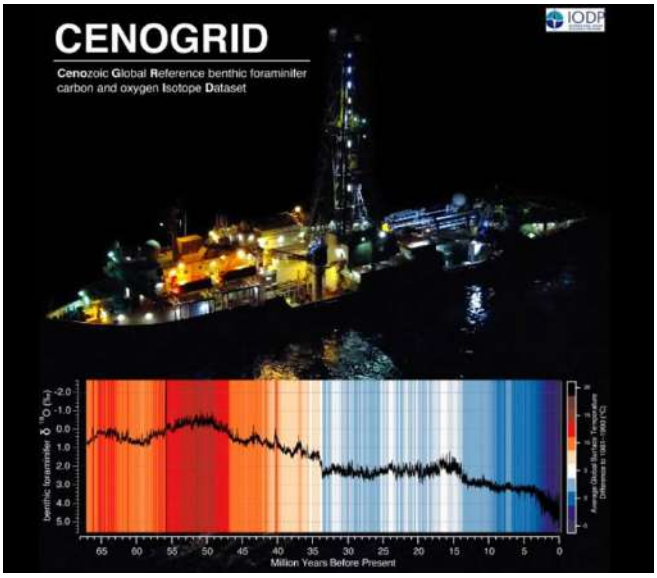
Published this month in *Science*, the new global "climate reference curve" created by the team is the first record to continually and accurately trace how the Earth's climate has changed since the great extinction of the dinosaurs 66 million years ago.

It was achieved by bringing together research from 12 international laboratories using sample material from the ocean floor collected over more than five decades of international scientific drilling expeditions by the International Ocean Discovery Program (IODP) and its predecessors.

Led by researchers from MARUM — Center for Marine Environmental Sciences at the University of Bremen, the Potsdam Institute for Climate Impact Research (PIK) and UCL, the authors used advanced mathematical analysis of this highly accurate climate reference curve to identify four climatic states, classified as "Hothouse," "Warmhouse," "Coolhouse," and "Icehouse." These states are recognized by the characteristic pattern of their climate variability. The distinctive climatic "beat' of each state is driven by greenhouse gas concentrations and polar ice volume, with higher CO2 and little-to-no global ice volume during the Hothouse and Warmhouse compared to the Coolhouse and Icehouse.

To generate the climate reference curve, called CENOGRID (CENOzoic Global Reference benthic foraminifer carbon and oxygen Isotope Dataset), the team analyzed and compiled the oxygen and carbon isotopes from tiny microfossils found in deep-sea sediments. For the first time, this period of Earth's history was accurately dated by identifying the imprint of semi-periodical changes in Earth's orbit around the sun in CENOGRID.

The CENOGRID is the clearest and most accurate view of past climate conditions to date, providing information about past deep-sea temperatures, global ice volumes, and the carbon cycle. These detailed climatic changes can be studied like a colorful barcode and used to draw comparisons between the past, present, and future.



The new global climate record CENOGRID (lower panel) is the first to continually and accurately trace how Earth's climate has changed since the great extinction of the dinosaurs 66 million years ago. The record was generated using the oxygen (shown) and carbon isotopes from tiny microfossils found in deep-sea sediments collected by the IODP ship R/V JOIDES Resolution (shown in the photo) and shows the natural range of climate change and variability over the last 66 million years.

Co-author Dr. Anna Joy Drury (UCL Earth Sciences), said: "We use CENOGRID to understand what Earth's normal range of natural climate change and variability is and how quickly Earth recovered from past events. While we show that the Earth previously experienced warm climate states, these were characterized by extreme climate events and were radically different from our modern world. Since the peak warmth of the Hothouse, Earth's climate has gradually cooled over the last 50 million years, but the present and predicted rapid anthropogenic changes reverse this trend and, if unabated, far exceed the natural variability of the last 66 million years. CENOGRID's window into the past provides context for the ongoing anthropogenic change and how exceptional it is."

While the rough framework of a global climate reference curve has existed since 2001, climate records from many new sediment cores greatly improved in recent years. Over the last two decades, scientific drilling specifically targeted older geological strata, especially older than 34 million years, giving researchers access to better material for reconstructing global climate in much greater detail than ever before.

Lead author, Dr. Thomas Westerhold (MARUM, University of Bremen), said: "We now know more accurately when it was warmer or colder on the planet and have a better understanding of the underlying dynamics and the processes that drive them. The time from 66 to 34 million years ago, when the planet was significantly warmer than it is today, is of particular interest, as it represents a parallel in the past to what future anthropogenic change could lead to."

For more on this research see 66 Million Years of Earth's Climate History Uncovered.

Reference: "An astronomically dated record of Earth's climate and its predictability over the last 66 million years" by Thomas Westerhold, Norbert Marwan, Anna Joy Drury, Diederik Liebrand, Claudia Agnini, Eleni Anagnostou, James S. K. Barnet, Steven M. Bohaty, David De Vleeschouwer, Fabio Florindo, Thomas Frederichs, David A. Hodell, Ann E. Holbourn, Dick Kroon, Vittoria Lauretano, Kate Littler, Lucas J. Lourens, Mitchell Lyle, Heiko Pälike, Ursula Röhl, Jun Tian, Roy H. Wilkens, Paul A. Wilson and James C. Zachos, 10 September 2020, *Science*. DOI: science.aba6853

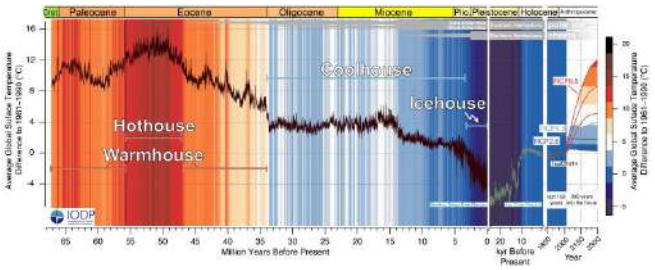
CENOGRID is a lasting international legacy of 50 years of scientific ocean drilling now led by IODP. The authors see CENOGRID as a basis for researchers worldwide to correlate their data to and place it within the context of Earth's climate history. With more data, it is now possible to not only further refine the picture of the climatic past, but also to identify regional intricacies. The authors emphasize that this is fundamental for testing the reliability of climate models for the future.

The UCL contribution was funded by a Horizon 2020 Marie Skłodowska-Curie Action Fellowship to Anna Joy Drury.

By University College London September 28, 2020

(SciTech Daily, https://scitechdaily.com/66-million-years-of-earths-climate-changes-revealed-in-unprecedented-detail-from-ocean-sediments/)

66 Million Years of Earth's Climate History Uncovered – Puts Current Changes in Context



Past and future trends in global mean temperature spanning the last 67 million years. Oxygen isotope values in deep-sea benthic foraminifera from sediment cores are a measure of global temperature and ice volume. Temperature is relative to the 1961-1990 global mean. Data from ice core records of the last 25,000 years illustrate the transition from the last glacial to the current warmer period, the Holocene. Historic data from 1850 to today show the distinct increase after 1950 marking the onset of the Anthropocene. Future projections for global temperature for three Representative Concentration Pathways (RCP) scenarios in relation to the benthic deep-sea record suggest that by 2100 the climate state will be comparable to the Miocene Climate Optimum (~16 million years ago), well beyond the threshold for nucleating continental ice sheets. If emissions are constant after 2100 and are not stabilized before 2250, global climate by 2300 might enter the hothouse world of the early Eocene (~50 million years ago) with its multiple global warming events and no large ice sheets at the poles.

A continuous record of the past 66 million years shows natural climate variability due to changes in Earth's orbit around the sun is much smaller than projected future warming due to greenhouse gas emissions.

For the first time, climate scientists have compiled a continuous, high-fidelity record of variations in Earth's climate extending 66 million years into the past. The record reveals four distinctive climate states, which the researchers dubbed Hothouse, Warmhouse, Coolhouse, and Icehouse.

These major climate states persisted for millions and sometimes tens of millions of years, and within each one, the climate shows rhythmic variations corresponding to changes in Earth's orbit around the sun. But each climate state has a distinctive response to orbital variations, which drive relatively small changes in global temperatures compared with the dramatic shifts between different climate states.

The new findings, published today (September 10, 2020 in the journal *Science*, are the result of decades of work and a large international collaboration. The challenge was to determine past climate variations on a time scale fine enough to see the variability attributable to orbital variations (in the eccentricity of Earth's orbit around the sun and the precession and tilt of its rotational axis).

"We've known for a long time that the glacial-interglacial cycles are paced by changes in Earth's orbit, which alter the amount of solar energy reaching Earth's surface, and astronomers have been computing these orbital variations back in time," explained coauthor James Zachos, distinguished professor of Earth and planetary sciences and Ida Benson Lynn Professor of Ocean Health at UC Santa Cruz.

"As we reconstructed past climates, we could see long-term coarse changes quite well. We also knew there should be finer-scale rhythmic variability due to orbital variations, but for a long time it was considered impossible to recover that signal," Zachos said. "Now that we have succeeded in capturing the natural climate variability, we can see that the projected anthropogenic warming will be much greater than that."

For the past 3 million years, Earth's climate has been in an Icehouse state characterized by alternating glacial and interglacial periods. Modern humans evolved during this time, but greenhouse gas emissions and other human activities are now driving the planet toward the Warmhouse and Hothouse climate states not seen since the Eocene epoch, which ended about 34 million years ago. During the early Eocene, there were no polar ice caps, and average global temperatures were 9 to 14 degrees Celsius higher than today.

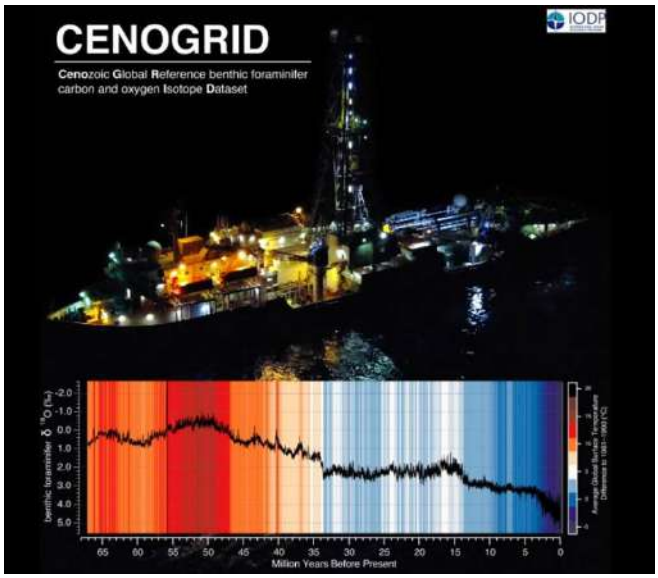
"The IPCC projections for 2300 in the 'business-as-usual' scenario will potentially bring global temperature to a level the planet has not seen in 50 million years," Zachos said.

Critical to compiling the new climate record was getting high-quality sediment cores from deep ocean basins through the international Ocean Drilling Program (ODP, later the Integrated Ocean Drilling Program, IODP, succeeded in 2013 by the International Ocean Discovery Program). Signatures of past climates are recorded in the shells of microscopic plankton (called foraminifera) preserved in the seafloor sediments. After analyzing the sediment cores, researchers then had to develop an "astrochronology" by matching the climate variations recorded in sediment layers with variations in Earth's orbit (known as Milankovitch cycles).

"The community figured out how to extend this strategy to older time intervals in the mid-1990s," said Zachos, who led a study published in 2001 in *Science* that showed the climate response to orbital variations for a 5-million-year period covering the transition from the Oligocene epoch to the Miocene, about 25 million years ago.

"That changed everything, because if we could do that, we knew we could go all the way back to maybe 66 million years ago and put these transient events and major transitions in

Earth's climate in the context of orbital-scale variations," he said.



The new global climate record CENOGRID (lower panel) is the first to continually and accurately trace how Earth's climate has changed since the great extinction of the dinosaurs 66 million years ago. The record was generated using the oxygen (shown) and carbon isotopes from tiny microfossils found in deep-sea sediments collected by the IODP ship R/V JOIDES Resolution (shown in the photo) and shows the natural range of climate change and variability over the last 66 million years.

Zachos has collaborated for years with lead author Thomas Westerhold at the University of Bremen Center for Marine Environmental Sciences (MARUM) in Germany, which houses a vast repository of sediment cores. The Bremen lab along with Zachos's group at UCSC generated much of the new data for the older part of the record.

Westerhold oversaw a critical step, splicing together overlapping segments of the climate record obtained from sediment cores from different parts of the world. "It's a tedious process to assemble this long megasplice of climate records, and we also wanted to replicate the records with separate sediment cores to verify the signals, so this was a big effort of the international community working together," Zachos said.

Now that they have compiled a continuous, astronomically dated climate record of the past 66 million years, the researchers can see that the climate's response to orbital variations depends on factors such as greenhouse gas levels and the extent of polar ice sheets.

"In an extreme greenhouse world with no ice, there won't be any feedbacks involving the ice sheets, and that changes the dynamics of the climate," Zachos explained.

Most of the major climate transitions in the past 66 million years have been associated with changes in greenhouse gas levels. Zachos has done extensive research on the Paleocene-Eocene Thermal Maximum (PETM), for example, showing that this episode of rapid global warming, which drove the climate into a Hothouse state, was associated with a massive release of carbon into the atmosphere. Similarly, in the late Eocene, as atmospheric carbon dioxide levels were dropping, ice sheets began to form in Antarctica and the climate transitioned to a Coolhouse state.

"The climate can become unstable when it's nearing one of these transitions, and we see more deterministic responses to orbital forcing, so that's something we would like to better understand," Zachos said.

The new climate record provides a valuable framework for many areas of research, he added. It is not only useful for testing climate models, but also for geophysicists studying different aspects of Earth dynamics and paleontologists studying how changing environments drive the evolution of species.

"It's a significant advance in Earth science, and a major legacy of the international Ocean Drilling Program," Zachos said.

Reference: "An astronomically dated record of Earth's climate and its predictability over the last 66 million years" by Thomas Westerhold, Norbert Marwan, Anna Joy Drury, Diederik Liebrand, Claudia Agnini, Eleni Anagnostou, James S. K. Barnet, Steven M. Bohaty, David De Vleeschouwer, Fabio Florindo, Thomas Frederichs, David A. Hodell, Ann E. Holbourn, Dick Kroon, Vittoria Lauretano, Kate Littler, Lucas J. Lourens, Mitchell Lyle, Heiko Pälike, Ursula Röhl, Jun Tian, Roy H. Wilkens, Paul A. Wilson and James C. Zachos, 10 September 2020, *Science*. DOI: science.aba6853

Coauthors Steven Bohaty, now at the University of Southampton, and Kate Littler, now at the University of Exeter, both worked with Zachos at UC Santa Cruz. The paper's coauthors also include researchers at more than a dozen institutions around the world. This work was funded by the German Research Foundation (DFG), Natural Environmental Research Council (NERC), European Union's Horizon 2020 program, National Science Foundation of China, Netherlands Earth System Science Centre, and the U.S. National Science Foundation.

By University of California - Santa Cruz September 10, 2020

(SciTech Daily, https://scitechdaily.com/66-million-years-of-earths-climate-history-uncovered-puts-current-changes-in-context/)

Why Are 96,000,000 Black Balls on This Reservoir?

https://www.youtube.com/watch?v=uxPdPpi5W4o&feature=youtu.be

I took a boat through 96 million black plastic balls on the Los Angeles reservoir to find out why they're there. The first time I heard about shade balls the claim was they reduce evapo-

ration. But it turns out this isn't the reason they were introduced.

Huge thanks to LADWP for arranging this special tour for me. Next time let's put the GoPro on the submersible!

The balls are made of high density polyethylene (HDPE) which is less dense than water so they float on the surface of the reservoir even if they break apart. They are 10cm (4 inches) in diameter and contain about 210ml of water. So the main reason they are on the reservoir is to block sunlight from entering the water and triggering a chemical reaction that turns harmless bromide into carcinogenic bromate. This effect occurs with prolonged exposure to bromate so regulators insist that levels be kept below 10 microgram per liter on average over a 12 month period.

EarthTalk — Would underground be better for world?

If we lived in underground buildings and cities, would it be better for the environment?

It's certainly true that moving more of our infrastructure, let alone work and live space, underground would relieve some of the pressure that our conventional above-ground development and habitation puts on the environment. While building below the surface presents its own set of challenges, underground spaces are less susceptible to external influences and their overall impact (including carbon emissions) tends to be less than the equivalent amount of space above ground. Indeed, given the environmental problems we're experiencing, moving more below the surface does indeed have the potential to make things safer, healthier and more sustainable for all of us.

In and of themselves, underground buildings have a built-in advantage in regard to energy usage for heating/cooling, given their typically more constant temperature, humidity, heat insulation, shading and airtightness. Furthermore, underground buildings are much less affected by wind, rain, frost, snow, sun radiation or other external conditions. At the same time, the temperature fluctuation range of underground space is small, especially as compared to the "hot-and-cold load" in above-ground buildings. In short, underground buildings use only a fraction of the energy required by conventional buildings to keep the interior environment comfortable, with most of the energy consumption concentrated instead on less power-intensive lighting and ventilation systems.

Beyond being better for the planet in some ways as compared to above-ground buildings, just having some underground buildings in the mix—even below regular cities—could yield vast benefits. "Underground solutions can solve or help improve multiple of the problems that urban developments face: traffic congestion; environmental problems; lack of (green) space; need for protection against disasters; lack of infrastructure for food, energy, water and sanitation," reports Dutch researcher Wout Broere.

"Placement of infrastructure and other facilities underground presents an opportunity for realizing new functions in urban areas without destroying heritages or negatively impacting the surface environment, and at the same time brings opportunities for long-term improvements in the environmental impact of cities and more efficient use of space and resources," adds Broere.

Many cities around the world — from Helsinki to Moscow to Montreal to Beijing — are developing underground space to alleviate population and environmental pressures. Helsinki, for instance, has adopted a strategic "Underground City Plan" which calls for the construction of some 200 more underground buildings there to accompany the city's existing subterranean swimming complex, shopping area and hockey rink.

Meanwhile, Russian developers are converting a defunct 550-meter-deep mine shaft in Eastern Siberia into an eco-friendly underground city under a huge glass dome. The ambitious project — replete with vertical farms, forests and recreation areas in addition to climate controlled underground offices and housing — promises to eventually accommodate 100,000 residents.

While many of us shudder at the thought of living a subterranean lifestyle, at least making the option available to those who choose it willingly could be a big win for the environment.

EarthTalk is written by Roddy Scheer and Doug Moss. Send questions to question@earthtalk.org.

(myJOURNALCOURIER, Wednesday, August 26, 2020, https://www.myjournalcourier.com/opinion/article/Commentary-EarthTalk-8212-Would-underground-15515365.php)

Underground Construction

Underground construction has been around for thousands of years, mostly developed through mining and more recently through transport, housing and commercial industries. The Channel Tunnel, London Underground, British Library, and various shopping centres are all examples of underground construction.

Underground housing (sometimes called earth sheltered housing) refers specifically to homes that have been built underground, either partially or completely. These subterranean homes have grown increasingly popular over the last thirty years and are an important sector in the green building movement.

Thousands of people in Europe and America live in underground homes. In Russia there is more development below the ground than above it. Countries like Japan and China, where development space is at a premium, are particularly keen to build underground living places. In the UK, the movement is much slower, with less than a hundred underground homes in existence. This is partly due to a misinformed belief that underground homes are dirty, damp, dark, claustrophobic and unstable places to live. But it is also due to a lack of guidance and information about building regulations and specifications, and a lack of knowledge about their potential as a sustainable building practice.

Underground Dwelling Design

To a certain extent the design of an underground home is determined by the conditions of the site. Soil type, topography, precipitation, ground water levels, load-bearing properties, and slope stability all need to be carefully considered. Construction materials need to be waterproof, durable and strong enough to withstand underground pressure (concrete is frequently used). Water is a particular consideration in underground building, and special drainage techniques may need to be implemented around the site, particularly along the roof areas.

There are several methods of building for subterranean living:

- Constructed Caves - made by tunnelling into the earth. Although popular around the world, this can be an expensive and dangerous procedure.
- Cut and Cover - also called culvert homes, these are made by assembling precast concrete pipes and containers into the required design of the living space, and then burying them in the ground.
- Earth Berm - house is first built on flat land or a small hill, and then buried, leaving a wall or roof open for light.
- Elevational - house is built into the side of a hill with the front of the home left open.
- Atrium - also called courtyard homes, the rooms are built below the ground around a sunken garden or courtyard that lets light in.
- PSP - stands for post, shoring and polyethylene. House is built by excavating the ground, sinking in posts, placing shoring (boards) between the posts and the earth, and placing polyethylene plastic sheets (for waterproofing) behind the shoring.
- Shaft - an ambitious project in Japan called Alice City plans the construction of a wide and deep cylindrical shaft sunk into the earth with a domed skylight covering, and different levels for business and domestic use built around the shaft.

All underground homes need well-designed ventilation systems to control indoor air quality and humidity. Natural daylight design using light atriums, shafts and wells can also be used to improve the quality of underground living.

Advantages of Building Underground

Underground houses have many advantages over conventional housing. Unlike conventional homes, they can be built on steep surfaces and can maximise space in small areas by going below the ground. In addition the materials excavated in construction can be used in the building process.

Underground houses have less surface area so fewer building materials are used, and maintenance costs are lower. They are also wind, fire and earthquake resistant, providing a secure and safe environment in extreme weather.

One of the greatest benefits of underground living is energy efficiency. The earth's subsurface temperature remains stable, so underground dwellings benefit from geothermal mass and heat exchange, staying cool in the summer and warm in the winter. This saves around 80% in energy costs. By incorporating solar design this energy bill can be reduced to zero, providing hot water and heat to the home all year round. An additional benefit of the surrounding earth is noise insulation. Underground homes are exceptionally quiet places to live.

Finally, underground houses blend with the natural landscape, and have minimum impact on the local ecology. This is not only aesthetically pleasing but ensures that the maximum habitat is left alone for wildlife.

Designing Down for a Sustainable Future

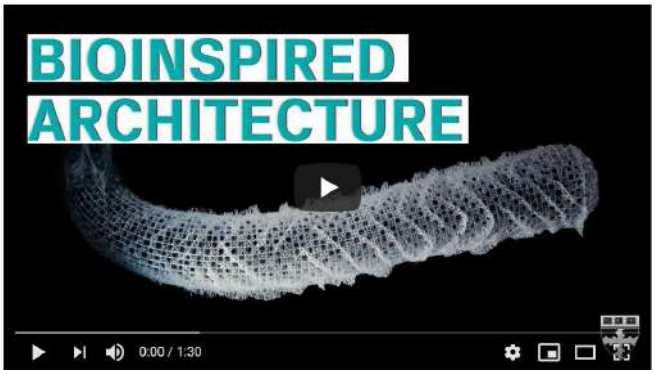
Underground construction is not a new industry, but it is often overlooked as a design strategy for sustainable building. A well-designed underground home can be a stylish, comfortable, secure, bright and inspiring place to live. More than that it is an excellent example of the eco-home ideal, demonstrating energy efficiency, low-impact design and harmony with its natural surroundings. With the increasing demand for more development sites and ever-diminishing green spaces, along with the enforcement of stricter regulations for greener homes, building underground seems the obvious way down.

(Jennifer Gray / Sustainable Build, 19 Aug 2020, http://www.sustainablebuild.co.uk/constructionunderground.html)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Marine sponges could inform structure of future buildings

Researchers are using the skeletons of marine sponges as inspiration for stronger and taller buildings, longer bridges, and lighter spacecraft.



https://www.youtube.com/watch?v=H0jb-fT6tz0&feature=emb_logo

In a paper published in *Nature Materials*, the researchers showed that the diagonally-reinforced square lattice-like skeletal structure of Euplectella aspergillum has a higher strength-to-weight ratio than the traditional lattice designs that have been used for centuries in the construction of buildings and bridges.

"We found that the sponge's diagonal reinforcement strategy achieves the highest buckling resistance for a given amount of material, which means that we can build stronger and more resilient structures by intelligently rearranging existing material within the structure," said Matheus Fernandes, a graduate student at Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) and first author of the paper.

"In many fields, such as aerospace engineering, the strength-to-weight ratio of a structure is critically important," said James Weaver, a Senior Scientist at SEAS and one of the corresponding authors of the paper. "This biologically-inspired geometry could provide a roadmap for designing lighter, stronger structures for a wide range of applications."

Diagonal lattices in structures use small, closely spaced diagonal beams to evenly distribute applied loads. This geometry was patented in 1820 by the architect and civil engineer, Ithiel Town.

"Town developed a simple, cost-effective way to stabilise square lattice structures, which is used to this very day," Fernandes said in a statement. "It gets the job done, but it's not optimal, leading to wasted or redundant material and a cap on how tall we can build. One of the main questions driving this research was, can we make these structures more efficient from a material allocation perspective, ultimately using less material to achieve the same strength?"

To answer this question the team looked to Euplectella aspergillum's tubular body, which employs two sets of parallel diagonal skeletal struts that intersect and are fused to an underlying square grid.

"We've been studying structure-function relationships in sponge skeletal systems for more than 20 years, and these species continue to surprise us," said Weaver.

In simulations and experiments, the researchers are said to have replicated this design and compared the sponge's skeletal architecture to existing lattice geometries. The sponge design outperformed them all, withstanding heavier loads without buckling. The researchers showed that the paired parallel crossed-diagonal structure improved overall structural strength by over 20 per cent, without the need to add additional material.

"Our research demonstrates that lessons learned from the study of sponge skeletal systems can be exploited to build structures that are geometrically optimized to delay buckling, with huge implications for improved material use in modern infrastructural applications," said Katia Bertoldi, the William and Ami Kuan Danoff Professor of Applied Mechanics at SEAS and a corresponding author of the study.

(THE ENGINEER, 22nd September 2020, https://www.theengineer.co.uk/marine-sponges-harvard-seas)

Mechanically robust lattices inspired by deep-sea glass sponges

Matheus C. Fernandes, Joanna Aizenberg, James C. Weaver & Katia Bertoldi

Abstract

The predominantly deep-sea hexactinellid sponges are known for their ability to construct remarkably complex skeletons from amorphous hydrated silica. The skeletal system of one such species of sponge, *Euplectella aspergillum*, consists of a square-grid-like architecture overlaid with a double set of diagonal bracings, creating a chequerboard-like pattern of open and closed cells. Here, using a combination of finite element simulations and mechanical tests on 3D-printed specimens of different lattice geometries, we show that the sponge's diagonal reinforcement strategy achieves the highest buckling resistance for a given amount of material. Furthermore, using an evolutionary optimization algorithm, we show that our sponge-inspired lattice geometry approaches the optimum material distribution for the design space considered. Our results demonstrate that lessons learned from the study of sponge skeletal systems can be exploited for the realization of square lattice geometries that are geometrically optimized to avoid global structural buckling, with implications for improved material use in modern infrastructural applications.

(*Nature Materials*, 21 September 2020, https://www.nature.com/articles/s41563-020-0798-1)

Ελληνικές παραλίες με εντυπωσιακούς βραχώδεις σχηματισμούς

Όταν μιλάμε για παραλίες είναι γεγονός ότι τίποτα δεν μπορεί να αντικαταστήσει τις απέραντες εκτάσεις με χρυσαφένια, ψιλή αμμουδιά και κρυστάλλινα νερά. Μάλιστα, είναι η πρώτη εικόνα που σχηματίζουμε στο μυαλό μας στο άκουσμα της λέξης «παραλία».

Και μπορεί οι αμμώδεις ακρογιαλιές να αποτελούν και τις δημοφιλέστερες επιλογές για τους περισσότερους, στον αντί-

ποδα στέκουν επάξια όρμοι και κόλποι με έντονο το βραχώδες τοπίο και επιβλητικούς, πέτρινους σχηματισμούς που καθηλώνουν το βλέμμα. Όσο για τα νερά της θάλασσας; Πιο καθαρά, κρυστάλλινα και γαλαζοπράσινα από ποτέ.

Αβλέμονας, Κύθηρα

Τα αρκετά σοφιστικέ Κύθηρα κρύβουν πολλές εκπλήξεις σε όσους τα επιλέξουν για τις καλοκαιρινές διακοπές τους, ανάμεσα στις οποίες και το παραθαλάσσιο χωριουδάκι του Αβλέμονα, στο ανατολικό τμήμα του νησιού και σε απόσταση περίπου μισής ώρας με το αυτοκίνητο από τη Χώρα των Κυθήρων. Εδώ, το κινηματογραφικό σκηνικό της παραλίας του οικισμού μοιάζει να έχει ξεπηδήσει από ελληνική ταινία της δεκαετίας του '60, με τους λουόμενους να απολαμβάνουν την ηλιοθεραπεία τους πάνω σε βράχια και να πραγματοποιούν βουτιές στα κρυστάλλινα, τιρκουάζ νερά του μικρού κολπίσκου, που μοιάζει με πισίνα, απευθείας από αυτά.

Στα όσα αξίζει κανείς να επισκεφτεί στον οικισμό το ηλιακό ρολόι στην οικία Cavallini, ένα από τα πιο χαρακτηριστικά και εμβληματικά κτίρια όχι μόνο στον Αβλέμονα, αλλά σε ολόκληρο το νησί, στον μικρό κολπίσκο πίσω ακριβώς από το κέντρο του χωριού. Ο οικισμός φημίζεται για τις ψαροταβέρνες με θέα στον μικρό, γραφικό κόλπο.

Πόρτο Λιμνιώνας, Ζάκυνθος

Το Πόρτο Λιμνιώνας χαρακτηρίζεται από το απίστευτου κάλλους φυσικό τοπίο που το περιβάλλει. Πρόκειται για μία από τις πιο «άγριες» και ταυτόχρονα πιο όμορφες ακτές της Ζακύνθου, που ξεχωρίζει για τη βραχώδη μορφολογία της, η οποία άλλωστε το καθιστά και τόσο ιδιαίτερο. Θα το συναντήσετε στο δυτικό τμήμα του νησιού, σε απόσταση 25 χλμ. (περίπου 35 λεπτά με το αυτοκίνητο) από το κέντρο της πόλης της Ζακύνθου. Αν μάλιστα είστε λάτρεις των καταδύσεων, θα το προτιμήσετε για τα κρυστάλλινα, καταγάλανα σαν πισίνας, βαθιά νερά του. Σε απόσταση περίπου 30 μ. από την ακτή λειτουργεί ταβέρνα που σερβίρει φρέσκο ψάρι και πιάτα της ζακυνθινής κουζίνας.

Καβουρότρυπες, Χαλκιδική

Μετά τη Βουρβουρού και πριν τη Σάρτη, θα συναντήσετε μία από τις πιο φημισμένες παραλίες όχι μόνο στη χερσόνησο της Σιθωνίας αλλά και σε ολόκληρη τη Χαλκιδική. Οι Καβουρότρυπες είναι καλά κρυμμένες μετά το δρόμο, πίσω από ένα πλούσιο πευκοδάσος. Μπορεί να δυσκολευτείτε να τις εντοπίσετε, καθώς δεν υπάρχουν πινακίδες.

Η πρόσβαση στην ακτή γίνεται μέχρι ενός σημείου με το αυτοκίνητο και εν συνεχεία με τα πόδια, κατηφορίζοντας στο πευκοδάσος. Καλό είναι να γνωρίζετε ότι βρίσκεται περίπου 1 χλμ. μετά το Πλατανίτσι, όπως έρχεστε από Σάρτη, και ότι στον πρώτο χωματόδρομο που θα συναντήσετε, πρέπει να στρίψετε δεξιά για να πάρετε μια γεύση παραδείσου. Η ακτή θα μπορούσε να χαρακτηριστεί εξωτική, αφού διαθέτει κρυστάλλινα, διαυγή νερά που εισέρχονται στους εντυπωσιακούς σχεδιασμούς των βράχων.

Τριόπετρα, Ρέθυμνο

Μια παραλία απίστευτου φυσικού κάλλους, που εντυπωσιάζει με τους φυσικούς σχηματισμούς των βράχων τους επισκέπτες της, συναντάται σε απόσταση 52 χλμ. περίπου από το Ρέθυμνο, στο νότιο τμήμα του νομού. Τρεις χαρακτηριστικοί, εντυπωσιακοί βράχοι που μοιάζουν να αναδύονται από τα νερά του Λιβυκού πελάγους, έχουν δώσει το όνομά τους στην παραλία. Εντυπωσιακή και η σπηλιά σε σχήμα Δ που σχηματίζεται δίπλα από αυτούς.

Η Μεγάλη και η Μικρή Τριόπετρα, δυτικά και ανατολικά των βράχων, προσφέρουν στιγμές απόλυτης χαλάρωσης για όσους θέλουν να απολαύσουν τα μακροβούτια τους μακριά από πολυπληθείς και πολυσύχναστες ακρογιαλιές του νομού.

Η Μεγάλη παραλία της Τριόπετρας, γνωστή και ως «στου Χατζή», απλώνεται σε μια έκταση δύο χιλιομέτρων και διακρίνεται για τα βαθιά νερά και την χοντρή αμμουδιά της. Στο δυτικό τμήμα της υπάρχει σχετική οργάνωση, ωστόσο ποτέ δεν κατακλύζεται από κόσμο, ώστε να φαίνεται «πνιγμένη» από τους λουόμενους. Η μικρή παραλία, οι ντόπιοι την αποκαλούν και «στου Κουμάντω», σχηματίζεται μέσα σε έναν κλειστό κόλπο

με αμμουδιά και αρκετούς βράχους.

Canal d' Amour, Κέρκυρα

Η πιο χαρακτηριστική παραλία της Κέρκυρας δεν είναι άλλη από το Canal d' Amour στο Σιδάρι, στο βορειοδυτικό τμήμα του νησιού. Σε απόσταση 36 χλμ. από το κέντρο της Κέρκυρας θα συναντήσετε ένα εντυπωσιακό τοπίο, το οποίο θα σας μεταφέρει σε μέρη εξωτικά. Το βλέμμα κλέβουν τα αμμώδη, λευκά, σμιλεμένα βράχια μέσα στα καταπράσινα νερά του Ιονίου, τα οποία, λόγω της επαφής τους με τα κύματα, δημιουργούν ποικίλους και εντυπωσιακούς σχηματισμούς. Σύμφωνα με το μύθο, όποιο ζευγάρι κολυμπήσει μαζί στο Κανάλι του Έρωτα, θα είναι για πάντα μαζί!

Αμάραντος, Σκόπελος

Ποιος θα έλεγε όχι σε δροσιστικές βουτιές σε υπέροχα γαλαζοπράσινα σαν ψεύτικα νερά, σε ένα τοπίο μοναδικής φυσικής ομορφιάς; Επιβλητικοί κάθετοι βράχοι δημιουργούν ένα εντυπωσιακό ακρωτήρι, ενώ καταπράσινα πεύκα κατηφορίζουν σχεδόν μέχρι τη θάλασσα.

Το Ακρωτήρι του Αμάραντου στο νοτιοδυτικό τμήμα της Σκοπέλου αποτελεί ένα μαγευτικό τοπίο, το οποίο μάλιστα έγινε γνωστό στο ευρύ κοινό από την διεθνούς παραγωγής επιτυχημένη ταινία «Mamma Mia», καθώς δεν ήταν λίγες οι σκηνές που γυρίστηκαν στην συγκεκριμένη περιοχή. Σήμα κατατεθέν του ακρωτηρίου τα δύο κυρτά πεύκα στην άκρη του βράχου, αγαπημένο σημείο για την τέλεση γάμων κυρίως ξένων επισκεπτών της Σκοπέλου.

Οι κάτοικοι του νησιού αποκαλούν την παραλία «πισίνα», τόσο για τα υπέροχα καταγάλανα νερά του, όσο και για την ηρεμία που επικρατεί εδώ σχεδόν πάντα. Όσοι την επιλέξουν δεν θα αντικρίσουν μια συνηθισμένη αμμώδη ακρογιαλιά, αλλά μικρούς συνεχόμενους βραχώδεις κόλπους που ενδείκνυνται κυρίως για βουτιές και ψάρεμα.

Ιδιαίτερο ενδιαφέρον παρουσιάζει και ο βυθός της θάλασσας, με φυσικά λαξευμένα βράχια πάνω από τον αμμώδη πυθμένα να κλέβουν τις εντυπώσεις. Μάλιστα, στο νότιο τμήμα του ακρωτηρίου ένας απόκρημνος τοίχος αγγίζει ακόμη και τα 30 μέτρα βάθους. Η περιοχή προσεγγίζεται μέσω χωματόδρομου που ξεκινά λίγο πριν τον Αγνώντα, αφού έχετε αφήσει πίσω σας τις παραλίες Σταφύλου και Βελανιού.

Καλυψώ, Ρέθυμνο

Στο νότιο τμήμα του Ρεθύμνου, μεταξύ της παραλίας του Πλακιά και εκείνης της Πρέβελης, συναντάται το εντυπωσιακό φιόρδ της Κρήτης, ένα καλά κρυμμένο μυστικό της περιοχής, που προκαλεί δέος και θαυμασμό σε εκείνους που θα το ανακαλύψουν. Στον κόλπο του Κάραβου, περίπου 100 μέτρων, ανάμεσα σε επιβλητικούς και μεγάλους κάθετους βράχους, δημιουργείται ένα μικρό φυσικό λιμανάκι και μια μικρή παραλία όνειρο.

Οι ντόπιοι αποκαλούν τον συγκεκριμένο κόλπο και «πειρατικό φιόρδ», καθώς σε αυτόν έβρισκαν καταφύγιο οι πειρατές κατά την βυζαντινή περίοδο.

Επιπλέον, σύμφωνα με την μυθολογία, πρόκειται για το μέρος όπου ο Οδυσσέας έμεινε για επτά χρόνια πριν επιστρέψει στην Ιθάκη, μαγεμένος τόσο από την ομορφιά του τόπου, όσο και από την βασίλισσα Καλυψώ. Στην τελευταία μάλιστα οφείλεται και η ονομασία της παραλίας «Καλυψώ».

Πεντακάθαρα γαλαζοπράσινα νερά, πιο καθαρά ακόμα και από πισίνας, εντυπωσιακοί σχηματισμοί των βράχων και ένας ονειρικός βυθός στα χαρακτηριστικά της παραλίας που την κάνουν μοναδική στο είδος της.

Η Καλυψώ, σήμερα, είναι μια οργανωμένη παραλία, που συναντάται στα όρια σύγχρονου ξενοδοχείου το οποίο την έχει εξοπλίσει με ομπρέλες και ξαπλώστρες.

Γκιόλα, Θάσος

Στο καταπράσινο νησί της Θάσου, διεθνή μέσα το έχουν χαρακτηρίσει και ως «επίγειο παράδεισο», ο επισκέπτης έχει να ανακαλύψει πανέμορφες ακρογιαλιές με το πράσινο να φτάνει σχεδόν μέχρι τα νερά του Αιγαίου. Αυτό, ωστόσο, που θα του μείνει για πάντα χαραγμένο στη μνήμη είναι το άγριας ομορφιάς τοπίο που θα αντικρίσει μόλις προσεγγίσει τη Γκιό-λα, την φυσική πισίνα του νησιού.

Ένα πραγματικό μικρό θαύμα, το οποίο από τους κατοίκους της Θάσου ερμηνεύεται ως «δώρο». Στο νοτιοανατολικό τμήμα του νησιού, λοιπόν, κοντά στην Αστρίδα, η φυσική πισίνα που έχει δημιουργηθεί μέσα σε βράχο, με τα κρυστάλλινα νερά και τον πετρώδη βυθό μια ανάσα από το μπλε του Αιγαίου, αφήνει τον επισκέπτη στην κυριολεξία άναυδο.

Η Γκιόλα σχηματίστηκε με το πέρασμα των αιώνων με τα κύματα της θάλασας και τους βράχους που την περικυκλώνουν να αποτελούν στην πραγματικότητα τους «δημιουργούς» της. Με βάθος τριών μέτρων, τα νερά της είναι πιο ζεστά από εκείνα της θάλασσας που αγκαλιάζουν την εξωτερική πλευρά της και τα οποία εντοπίζονται 8 μέτρα πιο κάτω αναλαμβάνοντας να ανεφοδιάζει την πισίνα με τα κύματά της.

Σύμφωνα, μάλιστα, με το μύθο, η φυσική πισίνα της Γκιόλας δημιουργήθηκε από τον Δία προκειμένου να απολαμβάνει σε αυτή το μπάνιο της η Αφροδίτη. Γι αυτό θα ακούσετε και πολλούς να την αποκαλούν και ως το «δάκρυ της Αφροδίτης». Ωστόσο, ένας άλλος μύθος υποστηρίζει ότι ήταν το μάτι του Δία για να την παρακολουθεί.

Σαρακήνικο, Μήλος

Η παραλία «σταρ» όχι μόνο της Μήλου, αλλά ολόκληρων των Κυκλάδων, δεν θα μπορούσε να λείπει από την λίστα, καθώς αποτελεί κορυφαίο παράδειγμα βραχώδων σχηματισμών στη θάλασσα. Στο νησί που μετρά περισσότερες από 70 εκπληκτικές ακρογιαλιές (όλες τους μία και μία), λοιπόν, αδιαμφισβήτητος πρωταγωνιστής είναι το Σαρακήνικο. Το ιδιαίτερο σεληνιακό τοπίο του –η φήμη του κάνει το γύρο του κόσμου και συγκεντρώνει κάθε χρόνο στο νησί αμέτρητους τουρίστες που έρχονται να το ανακαλύψουν από κοντά– οφείλεται στους ενδιαφέροντες βραχώδεις σχηματισμούς των ασβεστολιθικών πετρωμάτων και εντοπίζεται στο βόρειο τμήμα του νησιού, σε απόσταση 10' με το αυτοκίνητο από τον Αδάμαντα, το λιμάνι της Μήλου.

Χαρακτηριστικές, μάλιστα, είναι και οι σπηλιές που δημιουργούνται από την διείσδυσή των βράχων στα νερά του Αιγαίου. Στο Σαρακήνικο υπάρχει μία μικρή αμμώδης ακτή για τους λάτρεις της αμμουδιάς, ενώ στην πλειοψηφία του το μέρος κατακλύζεται από τα πανέμορφα βράχια, όπου μπορείτε να απλώσετε τις πετσέτες σας. Στα συν το γεγονός ότι τα νερά του είναι πεντακάθαρα και κρυστάλλινα.

(newsbeast, 16.08.2020, https://www.newsbeast.gr/weekend/arthro/6526191/exopragmatikes-ellinikes-paralies-me-entyposiakoys-vrachodeis-schimatismoys)

Εντυπωσιακές θαλάσσιες σπηλιές στα ελληνικά νησιά

Οι θαλάσσιες σπηλιές αποτελούν μοναδικά αξιοθέατα της φύσης που εντυπωσιάζουν τους λάτρεις των εξερευνήσεων. Οι ακτίνες του ήλιου αντανακλώνται στους βράχους δημιουργώντας μια μυστηριακή ατμόσφαιρα, τα κρυστάλλινα νερά λάμπουν, ο βυθός μοιάζει να αλλάζει συνέχεια χρώματα και η μαγεία ξεδιπλώνεται... Από την Κέρκυρα μέχρι το Καστελόριζο, οκτώ από τις πιο εντυπωσιακές θαλασσοσπηλιές των ελληνικών νησιών μάς προσκαλούν για δροσερές βουτιές.

Γαλάζιες Σπηλιές, Ζάκυνθος

Οι Γαλάζιες Σπηλιές, που βρίσκονται στο βόρειο τμήμα της Ζακύνθου, είναι από τις πιο πολυφωτογραφημένες της Ελλάδας. Οι εντυπωσιακές αυτές σπηλιές αρχίζουν αμέσως μετά τον Άγιο Νικόλαο για να τελειώσουν κοντά στο ακρωτήριο Σχοινάρι. Οι επιβλητικοί βράχοι, τα απίστευτα χρώματα και η ομορφιά της θάλασσας δημιουργούν ένα υπερθέαμα που συναρπάζει τους επισκέπτες. Μπορείτε να τις επισκεφθείτε είτε με δικό σας σκάφος, είτε με μια από τις οργανωμένες εκδρομές με βάρκα.

Γράβες, Παξοί

Η θαλάσσια περιήγηση στις εκπληκτικές «γράβες» (δηλαδή ενάλιες σπηλιές) θα σας κάνει να αγαπήσετε τους Παξούς ακόμα περισσότερο. Οι σμαραγδένιες αυτές σπηλιές βρίσκονται στη δυτική πλευρά του νησιού και συνολικά ξεπερνούν τις τριάντα. Θα δείτε διαδοχικά τις σπηλιές στο Μογγονήσι, τον Τρυπητό με τη φυσική γέφυρα, τον Ορθόλιθο (όρθιο βράχο μέσα στη θάλασσα), το Αχάι με τις συνεχόμενες σπηλιές και τον Ερημίτη με την τεράστια σπηλιά της Υπαπαντής. Οι σπηλιές των Παξών είναι επισκέψιμες με εκδρομικά σκάφη που κάνουν ημερήσιες κρουαζιέρες.

Σπηλιές Παλαιοκαστρίτσας, Κέρκυρα

Ο όρμος της Παλαιοκαστρίτσας στην Κέρκυρα θεωρείται ένα από τα ωραιότερα μέρη του νησιού. Δεν γίνεται να επισκεφθείτε την Παλαιοκαστρίτσα και να μην πάτε μια βόλτα με βάρκα στις υπέροχες θαλασσινές σπηλιές που βρίσκονται στην περιοχή. Κάθε σπηλιά έχει τη δική της ιστορία. Η πιο διάσημη από αυτές είναι η σπηλιά της Ναυσικάς. Οι ακτίνες του ήλιου καθώς αντανακλώνται στους βράχους και τα βαθιά, κρυστάλλινα νερά θα σας ξεσηκώσουν σίγουρα για μια δροσερή βουτιά.

Σπήλαιο Παπανικολή, Μεγανήσι

Στο Μεγανήσι, μια ανάσα από τη Λευκάδα, βρίσκεται το περίφημο Σπήλαιο του Παπανικολή, το οποίο οφείλει την ονομασία του στο ιστορικό ομώνυμο υποβρύχιο που χρησιμοποιούσε το σπήλαιο ως καταφύγιο και ορμητήριο κατά τη διάρκεια του Β' Παγκοσμίου Πολέμου. Έχει μήκος 120 μ. και πλάτος 60 μ., ενώ στο βάθος δημιουργείται μια μικρή αμμουδιά. Βρίσκεται στο νοτιοδυτικό άκρο του νησιού και μπορείτε να φτάσετε εκεί που αναχωρούν από τη Λευκάδα.

Χύτρα, Κύθηρα

Ένα από τα ποιο εντυπωσιακά μέρη των Κυθήρων είναι η βραχονησίδα Χύτρα ή αλλιώς Αυγό, η οποία βρίσκεται σε μικρή απόσταση απέναντι από το λιμάνι του Καψαλίου. Διαθέτει μια θαλάσσια σπηλιά από τη νότια πλευρά της με χρώματα που σε μαγεύουν έξω αλλά και μέσα στο βυθό. Στο τέλος αυτής της σπηλιάς υπάρχει ένα καταφύγιο για φώκιες.

Σπηλιές στο Πορί, Κουφονήσια

Η παραλία Πορί στο Πάνω Κουφονήσι ξεχωρίζει για τα διάφανα τιρκουάζ νερά και τη χρυσαφένια άμμο της. Πολύ κοντά στο Πορί υπάρχουν μαγευτικές θαλασσινές σπηλιές και μικρές παραλίες σαν πισίνες, που είναι προσβάσιμες μόνο από τη θάλασσα: οι σπηλιές του Ξυλομπάτη, το Γάλα και η σπηλιά Το Μάτι του Διαβόλου. Αξίζει να τις εξερευνήσετε!

Παπάφραγκας, Μήλος

Δίπλα στα ερείπια της αρχαίας πόλης της Φυλακωπής, στη βόρεια πλευρά της Μήλου, βρίσκονται οι τρεις σπηλιές του Παπάφραγκα. Πρόκειται για ένα μοναδικό τοπίο με άγρια ομορφιά. Εδώ θα κολυμπήσετε σε γαλαζοπράσινα νερά ανάμεσα σε γκριζόλευκα βράχια που οδηγούν στην ανοιχτή θάλασσα. Το κατέβασμα στη μικρή παραλία χρειάζεται προσοχή, αλλά το κολύμπι με τους απότομους βράχους να υψώνονται γύρω σου είναι μοναδική εμπειρία.

Γαλάζια Σπηλιά, Καστελόριζο

Η Γαλάζια Σπηλιά (γνωστή και ως Σπηλιά του Παραστά ή Φώκιαλη), που μπορείς να επισκεφτείς μόνο με βάρκα, είναι ένα από τα πιο γοητευτικά σημεία του ακριτικού Καστελόρι-ζου. Το σπήλαιο βρίσκεται στη νοτιοανατολική ακτή του νη-σιού, έχει ύψος 35 μέτρα, πλάτος 40 μέτρα και το μήκος του εσωτερικά είναι 75 μέτρα. Οι επισκέπτες εντυπωσιάζονται από τους λευκούς σταλακτίτες και το εκθαμβωτικό μπλε χρώμα του σπηλαίου.

https://www.reader.gr/life/travel/proorismoi/301702/okto-entyposiakes-thalassies-spilies-sta-ellinika-nisia-pics

Κλέφτικο και Συκιά Μήλος

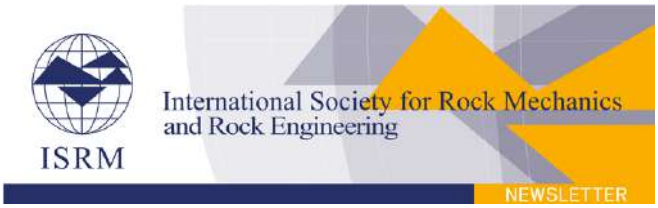
Ξακουστή για τους ιδιαίτερους γεωλογικούς σχηματισμούς, η Μήλος κρύβει από τα πιο εντυπωσιακά θαλάσσια σπήλαια σκορπισμένα στο πολύμορφό της ανάγλυφο. Το Κλέφτικο, το πιο φωτογραφημένο αξιοθέατο της Μήλου, είναι μια συστάδα θαλάσσιων σπηλαίων γύρω από έναν τεράστιο αψιδωτό βράχο που καρφώνεται στη θάλασσα και κάποτε αποτελούσε, πράγματι, λημέρι πειρατών. Εδώ σας περιμένουν απίθανες βουτιές και μαγευτικές εξερευνήσεις από σπηλιά σε σπηλιά! Στη θαλάσσια διαδρομή για το Κλέφτικο, θα συναντήσετε τη Συκιά, μια μεγάλη θαλάσσια σπηλιά παραμυθένιας ομορφιάς με έναν τεράστιο κρατήρα στην οροφή, στο βάθος της οποίας υπήρχε κάποτε μια συκιά. Κολυμπώντας στο εσωτερικό της ως την άλλη άκρη, θα φτάσετε σε μια λιλιπούτεια παραλία από πολύχρωμα βότσαλα.

και μία «στεργιανή» σπηλιά…

Μελισσάνη Κεφαλονιά

Πρόκειται για ένα λιμνοσπήλαιο μοναδικής φυσικής ομορφιάς στην ανατολική πλευρά του νησιού, που δεν πρέπει να χάσετε αν βρεθείτε στην Κεφαλονιά! Κατεβείτε τα σκαλιά της εισόδου και αφήστε τους βαρκάρηδες να σας οδηγήσουν σε έναν μαγευτικό υπόγειο κόσμο, με καφετί-μελιά τοιχώματα διάστικτα από αμέτρητους σταλακτίτες. Το φως που εισέρχεται από την οροφή, καθώς αντανακλάται στα ήρεμα νερά της λίμνης δημιουργεί έναν μαγευτικό χρωματικό καμβά σε όλες τις πιθανές αποχρώσεις του μπλε. Δυστυχώς, λόγω της ιδιαιτερότητας της μορφολογίας του σπηλαίου, το κολύμπι δεν επιτρέπεται αλλά η ομορφιά του θα σας ανταμείψει.

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ



Κυκλοφόρησε το Τεύχος 51, Σεπτεμβρίου 2020, του Newsletter της ISRM με τα παρακάτω περιεχόμενα:

- Message from the President
- 31st ISRM online lecture by Prof. Frederic Pellet
- Rock Mechanics Principles, a complete video course by Professor Jian Zhao available from the ISRM website
- EUROCK 2021 - work in progress
- Winner of the John Hudson Rock Engineering Award is 3GSM GmbH
- Winner of the ISRM Science Achievement Award 2020 is Prof. Jianping Zuo
- Three new ISRM Suggested Methods were published on the ISRM website
- 2020 DDA and Rock Mechanics Cloud Forum
- ISRM Specialized Conference CouFrac2020 goes fully virtual - Seoul, November 2020
- Information on the Geomechanics Colloquium 2020 regarding the Covid-19 situation
- Bolivian Geomechanics Association - 10 years
- ISRM Rocha Medal 2022 - nominations to be received by 31 December 2020
- Pierre Duffaut 1924-2020
- Rock Report - Quarterly Newsletter of the Institute of Rock Mechanics and Tunnelling, Graz, Austria
- ISRM Sponsored Conferences

https://powow4.iroquois.fr/web_browser.php

Κυκλοφόρησε το Τεύχος 32, Σεπτεμβρίου 2020, του ITACET Newsletter με τα παρακάτω περιεχόμενα:

- President's address
- MOU signed by ITA and ITACET Foundation
  - Training session reports
  - Innovations in Tunnelling – Geotechnical Engineering and Project Management – Online
- Road Tunnel Safety
- Forthcoming sessions
  - Maitrise de l'excavation et instabilités en méthode conventionnelle
- Other events in preparation
  - China (Tongji University): **"Tunnelling 4.0 and Intelligent Construction"**
  - Switzerland: **"TBM Pilot training"**
  - Brazil: **"Innovations in Tunnelling"**
  - Chile: **"Mechanized tunnelling and shafts"**
  - Colombia: **"Mechanized Tunnelling"**
  - India: **"Structural use of fibre reinforced concrete in precast segments"**
  - Mexico: **"Underground Urban Facilities"**
  - Thailand: **"Contractual practices"**
- Foundation scholarship recipients
- Other news
  - A Bright Future for the Tunnelling Association of Kenya
  - Tunnel Safety Management Training in Dubai

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

IGS NEWSLETTER – September 2020

Helping the world understand the appropriate value and use of geosynthetics

https://www.geosyntheticssociety.org/newsletters/

- Improving Education and Communication Efforts - A message from our President, Chungsik Yoo READ MORE
- Summer Chapter Chat – Out Now! DOWNLOAD CHAPTER CHAT NOW
- 2019 Chapter Survey Report – Results READ MORE
- IGS Chapter Focus: Australasia READ MORE
- Sustainability On The Agenda In Athens READ MORE
- 10 Questions With… Neil Dixon READ MORE
- Packed Webinar Series For ACigs READ MORE
- Nominations Invited For Renowned Giroud Lecture
- Calendar of Events

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