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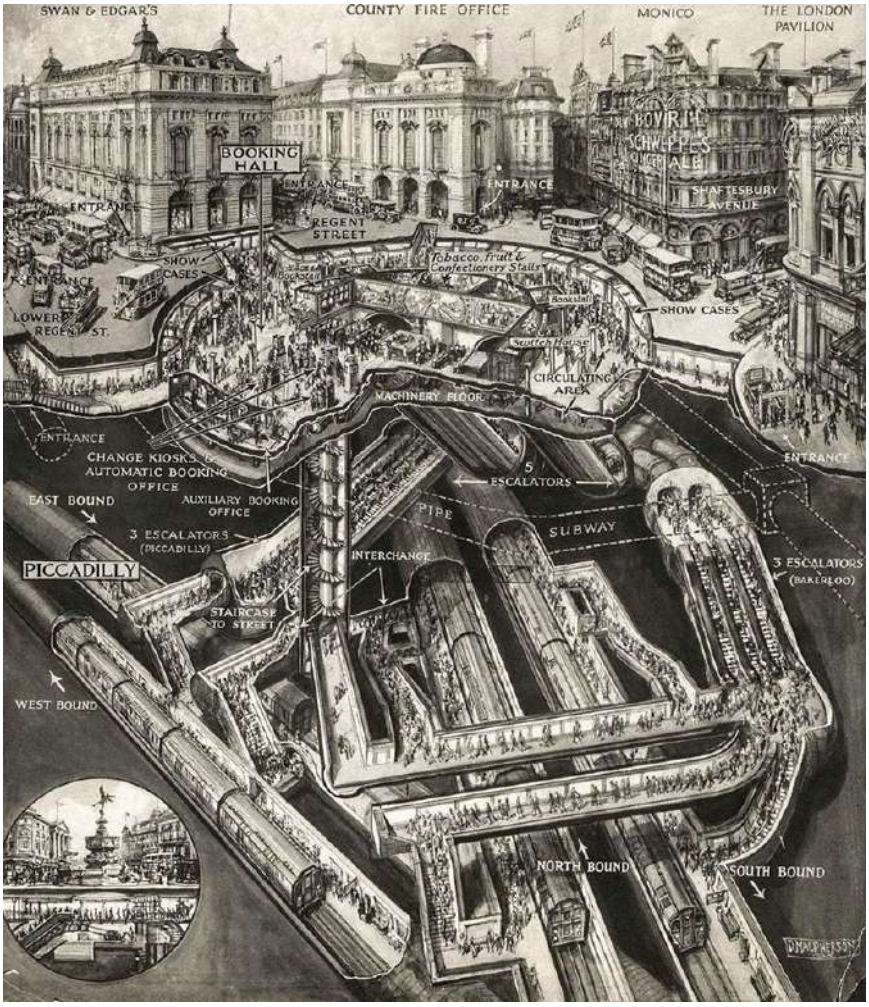


Picadilly Circus, London

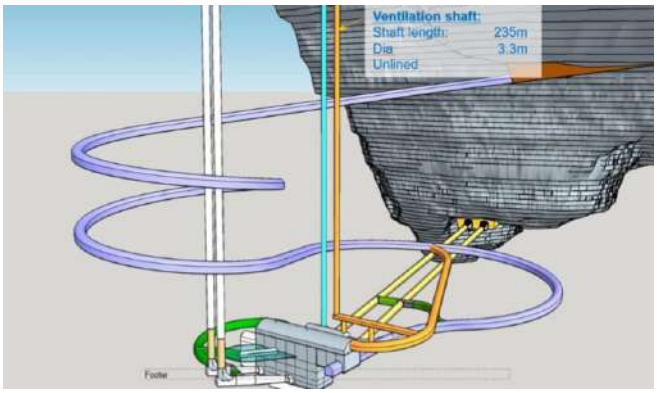
(αλιευθέν από τον Γιάννη Μεταξά)

Π Ε Ρ Ι Ε Χ Ο Μ Ε Ν Α

ΑΡΘΡΑ

Kidston Hydro Project

Offtake deal clears way for Kidston construction
02 Apr 2020



Underground works for Kidston pumped storage project

Construction of the Kidston pumped storage hydro scheme in Australia is now expected to start in the third quarter of 2020 after developer Genex Power signed a new long-term power sales deal with EnergyAustralia.

The binding deal enables financing for the major project that will convert an old gold mine to a power station. Underground excavations will link two surface mine pits that will act as the system reservoirs. Financial close for Kidston has a deadline of the end of the year before drill+blast construction can begin. A JV of McConnell Dowell/John Holland has been developing the project design under an early contractor involvement engagement and assisted by Norconsult and GHD Australia.

Drone view of mine pits that will form the storage reservoirs (Kidston pumped storage reservoirs https://www.youtube.com/watch?v=Xl3qwUwyR6s&feature=emb_logo)

In 2019 EnergyAustralia pulled out of the original 50/50 owner and operator deal with Genex Power and is now back in again under the new deal, securing a way forward into construction. Project development also involves the J-Power Electric Power Development Company.

In a statement, Genex Power CEO James Harding said the 30-year deal with EnergyAustralia provides clarity for its flagship project, which has an economic life of more than 80 years. As with many projects internationally, Genex Power also noted that the project schedule is contingent on how the early 2020 coronavirus impact affects market conditions. Genex has implemented protection measures for staff and workers to minimise the risk of coronorvirus contagion.

References

Kidston hydro set for construction – *TunnelTalk,* August 2019

Snowy Mountains adds long planned element – *TunnelTalk,* May 2019

Kidston hydro set for construction
22 Aug 2019

The Genex Power Kidston pumped storage project in Australia has secured key debt funding that will enable work to start early next year on the complex underground infrastructure. The developer has secured funding of up to AU$610 million (US$410 million) from the Northern Australia Infrastructure Facility (NAIF). It is now finalising the last pieces of funding, hoping to reach financial close by the end of 2019. Genex is also putting AUS$25 million (US$17 million) equity into the project, in which it will be 50:50 co-owner with Energy Australia, an energy retailer.

Aerial view of quarries at Kidston energy hub

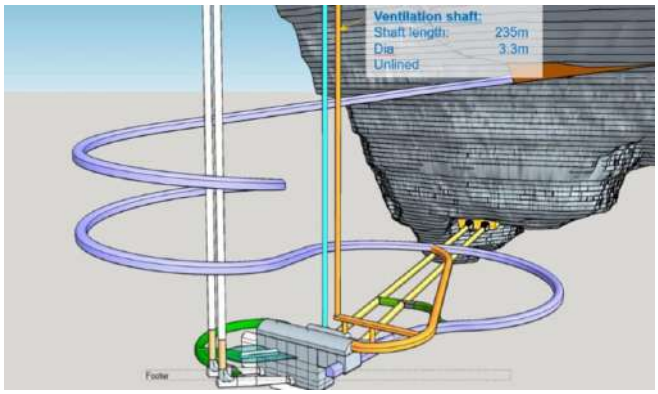
The designer and contractors are already onboard, having been working on project development over the last few years. The Owner's Engineer on the 250MW scheme is Entura, and the EPC contractor is a JV of McConnell Dowell/John Holland, with hydro machinery by Andritz.

The contractor was appointed late 2017 under Early Contractor Involvement (ECI) procurement, with Norconsult and GHD Australia its technical advisors. After its work on final design optimisation, in February 2019, it was given the green light to start early works on hydraulic design and other turbine activities. Following financial close and the notice to proceed, expected before the end of 2019, the EPC contractor will move on to detailed design. Main activities, including excavation, will commence in early 2020, Simon Kidston, Executive Director of Genex Power, said in an interview with *TunnelTalk*.

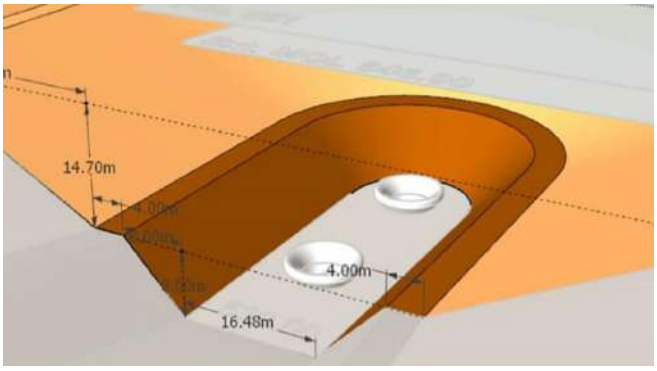
The underground infrastructure, which is based in an old gold mine, has a drop headrace shaft from the upper reservoir to the power cavern complex from which a tailrace tunnel links to the lower reservoir. Other excavations will include an access tunnel, and cable and ventilation shafts. Kidston briefed *TunnelTalk* on the scale of the excavations:

- The power cavern complex has two caverns: the main powerhouse is 82.2m long x 17.5m wide x 44m high and the transformer cavern is 31.8m long x 10m wide x 10m high.
- The 1.5km long access tunnel is 6.5m wide x 6.6m high.

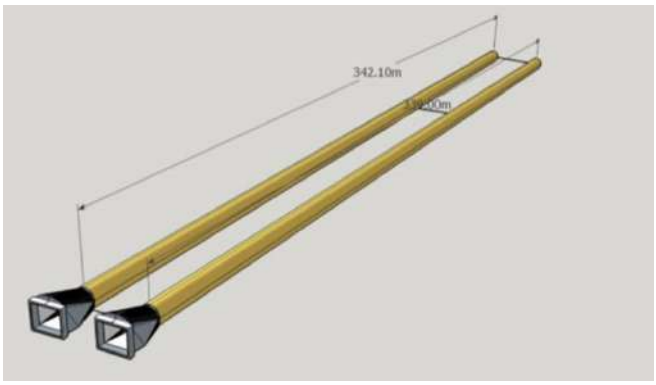
- The intake shaft is 240m deep x 4.8m diameter; the cable shaft is 250m deep x 3.3m diameter; and the ventilation shaft is 235m deep x 3.3m diameter.
- The two tailrace tunnels are each 160m long x 6m wide x 6m high.



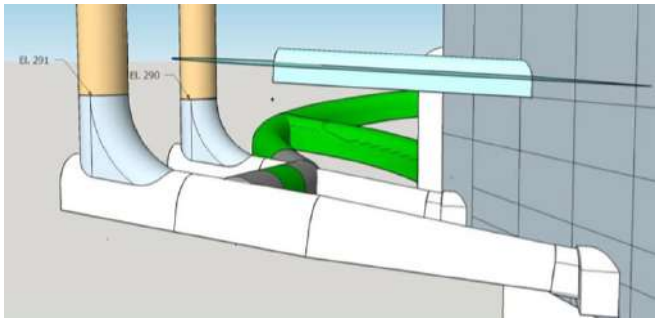
Underground works for Kidston pumped storage project



Reservoir inlet at top of headrace shaft



Tailrace tunnels run to lower reservoir



Headrace shaft links to powerhouse caverns

Geologically, the workings are within a hydrothermal breccia pipe system. The headrace pressure shaft and powerhouse complex caverns will be located within the Einasleigh Metamorphics (gneiss), near the breccia pipe margin, the former being harder than the latter. Most excavation will be by drill+blast, including crown and bench progressive opening of the caverns. Raise boring will be used for all shafts.

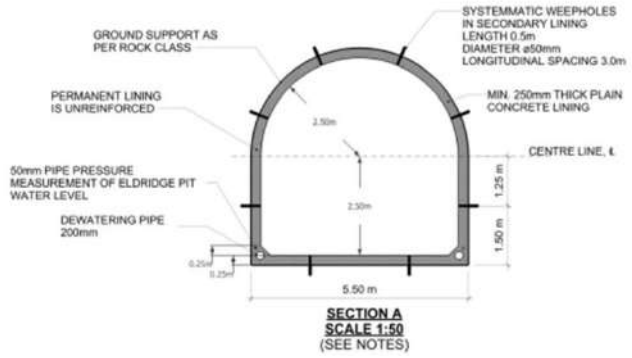
While the groundwater level is high, Kidston said "groundwater modelling predicts minimal flows into the underground excavations. Very little grouting is anticipated." All hydraulic tunnels will be lined: with steel closest to the caverns where water pressures will be highest and with concrete for other conveyance tunnels.

The project is designed to provide about eight hours of generation at constant 250MW output, and then take eight hours pumping water to the upper reservoir at cheaper times for the power grid. The closed-loop hydro scheme reuses the same water, except for occasional top-ups due to evaporation in the dry season.

NAIF is providing the debt funding for the hydro scheme. Its investment is sizeable financially and also a notable share, 12%, of its own resources. Its CEO, Laurie Walker, cited the benefits of the project that attracted its investment, which is subject to government approval, include low emissions, improved energy reliability, reduced transmission losses to supply the local region, and also lower electricity prices.

The pumped storage project is the heart of a renewable energy hub being developed by Genex Power in Queensland, which now includes proposed solar and wind farms. The scheme has received funds from the Australian Renewable Energy Agency and has been designated critical infrastructure by the Queensland Government. It is expected to come online in 2022. Energy Australia will operate the asset.

Other recent hydro developments in Australia include the Snowy 2.0 scheme with contract award to Salini Impregilo.



Cross-section of tailrace tunnel

References

Snowy Mountains adds long planned element – *TunnelTalk,* May 2019

Sydney opens new underground highway – *TunnelTalk,* August 2019

Mega TBM arrives in Melbourne – *TunnelTalk,* March 2019

WestConnex final link awarded – *TunnelTalk,* December 2018

Australia examines terrific regional workload – *TunnelTalk,* November 2017

(Patrick Reynolds for *TunnelTalk*, https://www.tunnel-talk.com/Australia-31Mar2020-A-power-sales-deal-secures-construction-start-of-the-Kidston-pump-storage-scheme.php)

Cement-Treated Base (CTB)

What is a Cement-Treated Base?

Cement-treated base (CTB) is an intimate mixture of aggregate material and/or granular soils combined with measured amounts of portland cement and water that hardens after compaction and curing to form a durable paving material. A bituminous or portland cement concrete wearing course is placed on the CTB to complete the pavement structure. Cement-treated base is widely used as a pavement base for highways, roads, streets, parking areas, airports, and materials handling and storage areas. View or download a CTB fact sheet.

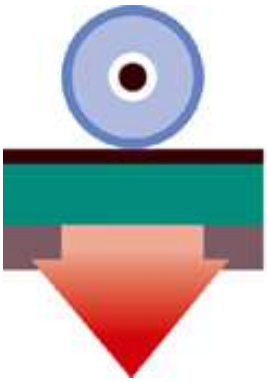
In cement-treated base construction the objective is to obtain a thorough mixture of an aggregate/granular material with the correct quantity of portland cement and enough water to permit maximum compaction. The completed CTB must be adequately cured to both let the cement hydrate and to harden the cement-aggregate mixture. The fundamental control factors for quality CTB are:

1. Proper cement content
2. Adequate moisture content
3. Thorough mixing
4. Adequate compaction
5. Proper curing

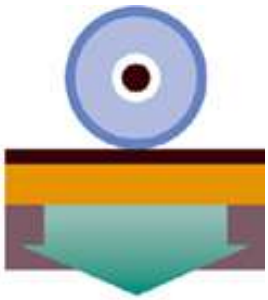
The aggregate/granular material, cement, and water are typically mixed in a central mixing plant. Central plants can either be continuous-flow or batch-type pugmill mixers. CTB can also be mixed-in-place using transverse-shaft pulvermixers or traveling mixing machines.

The thickness of Cement-treated Bases is less than that required for granular bases carrying the same traffic because CTB is a cemented, rigid material that distributes the load over a large area. Its slab-like characteristics and beam strength are unmatched by granular bases that can fail when interlock is lost. This happens when wet subgrade soil is forced up into the base by traffic loads. Hard, rigid CTB is practically impervious. It resists cyclic freezing, rain, and spring-weather damage. Cement-treated base continues to gain strength with age even under traffic. This reserve strength accounts in part for CTB's excellent performance.

A stabilized base spread loads and reduces stress on the subgrade.



Unstabilized Granular Base



Cement-Stabilized Base

CTB Case Histories

View CTB Case Histories.

(https://www.cement.org/cement-concrete-applications/paving/cement-treated-base-(ctb)?fbclid=IwAR0_YpL3jBDUJvy2T79YK9AEycZB7hle4cn-h1dSMCfGhUf3-6GHv2YkpgY)

Custom Refuge Chamber Strengthens Safety on Small TBM

Designing a refuge chamber to fit a 4.4m diameter tunnel boring machine with limited gantry space. Learn about the custom engineering that went into building two 10-person, 24-hour TunnelSAFE refuge stations.

Key takeaways

- The drainage tunnel project will use a 4.4m diameter EPBM
- Personnel on a TBM with limited gantry space can still benefit from a custom-made, high-quality tunnelling refuge chamber
- Two crescent designed refuge chambers were commissioned based on the feedback of a risk assessment

A tunnel project in the Middle East, vital to the enhancement of the country's underground drainage network maintains high safety standards with two custom refuge chambers. The project aims to provide a sustainable solution to stormwater run-off and discharge of surface. The $251 million project is the second phase of development, which includes the construction of a rainwater discharge tunnel, pumping station, and rainwater treatment facility.

A leading Chinese manufacturer will provide the Tunnel Boring Machine (TBM) for this section of the drainage tunnel project.

Due to the terrain, phase two of the project will use an Earth Pressure Balance Machine (EPBM). EPB's are designed to operate in softer ground conditions which contain water under pressure. Geological conditions considered include stratum such as Rus Formation, Midra Shale, and Simsima Limestone as well as varying water table ranges due to the proximity of the tunnel to the shallow coastal waters off the Qatar peninsula.

The project is scheduled to be completed at the end of 2021 in preparation for the 2022 World Cup.

Challenges

- Installing a refuge chamber within a TBM with limited gantry space
- Complying with European Standard (EN 16191:2014)

Solutions

- Custom refuge chamber engineering – crescent design, custom battery box, custom scrubber
- Meeting EN 16191:2014 guidelines

https://minearc.com/blog/custom-refuge-chamber-small-tbm

Ensuring a Site is Emergency Ready

A tunnel project in the Middle East, vital to the enhancement of the country's underground drainage network maintains high safety standards with two custom refuge chambers. The project aims to provide a sustainable solution to storm water run-off and discharge of surface. The $251 million project is the second phase of development, which includes the construction of a rainwater discharge tunnel, pumping station, and rainwater treatment facility.

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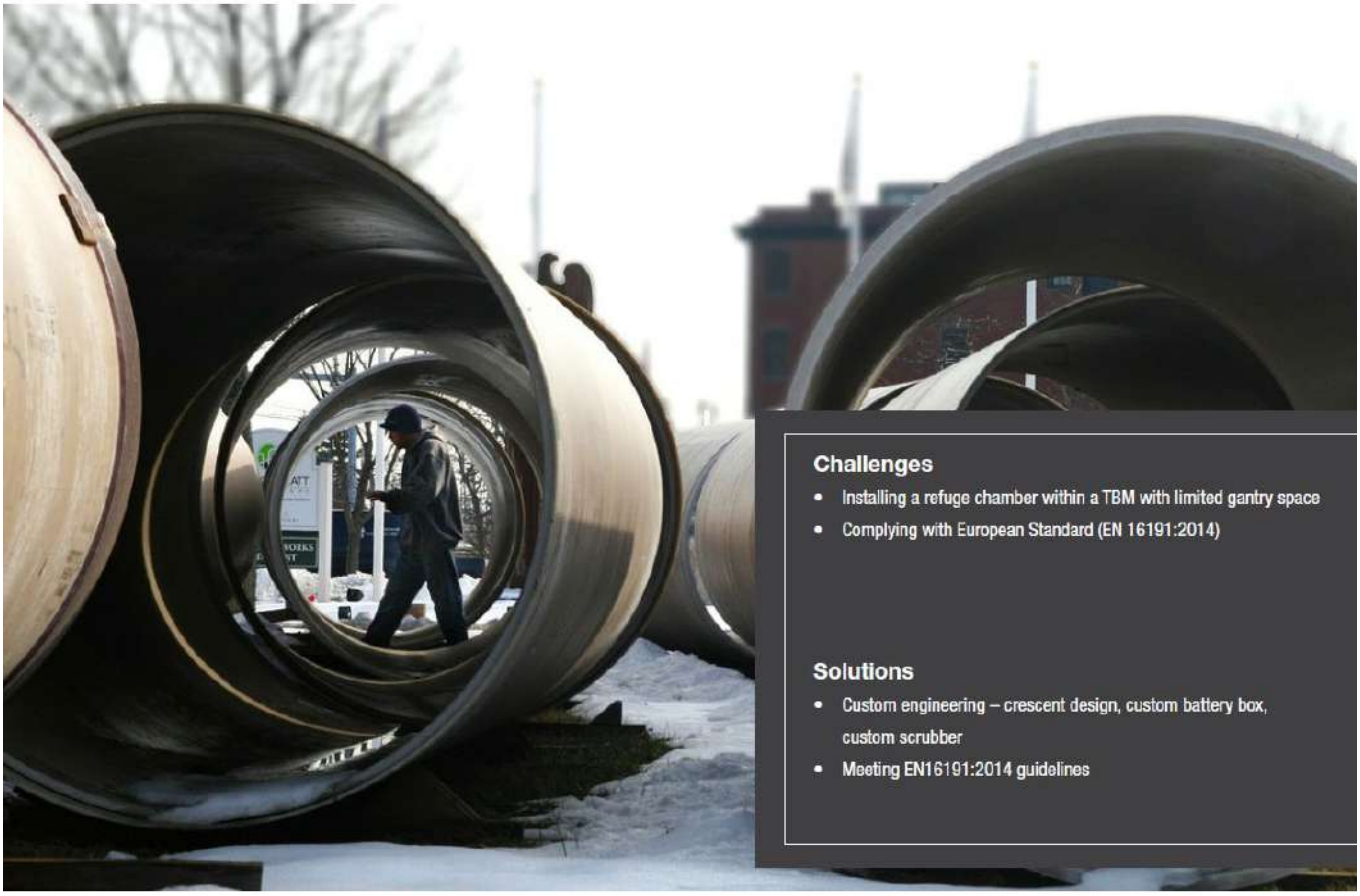
Pictured: Crescent Design Tunnelling Refuge Chamber by MineARC Systems



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Solutions

- Custom engineering – crescent design, custom battery box, custom scrubber
- Meeting EN16191:2014 guidelines

01.

Refuge Chambers for Limited Gantry Space

The TBM has a 4.4m diameter, with limited the space available on the gantry for a refuge chamber. Due to the nature of the tunnelling project, a larger TBM is not necessary; however, ensuring the safety of personnel on board is.

The project opted for the Crescent Design TunnelSAFE Refuge Chamber as it is moulded to the contours of the TBM's cylindrical shape to reduce wasted space between the chamber and the external wall.

Two chambers were designed to meet the maximum size restrictions: H x 2280mm, L x 9750mm. W x 735mm/ Ø3540mm (diameter). They were also required to sustain ten personnel for 24-hours. There are several considerations which need to be met when designing a limited size refuge chamber. These include ensuring sufficient breathable air, effective cooling, and backup power supply within the confined space.

The restricted structure required customised holding places for the life support equipment.

Pictured: Inside the custom, crescent shaped TunnelSAFE Refuge Chamber

The tunnel project complied with the European Standard (EN 16191:2014) Safety Requirements for Tunnelling Machinery. This compliance extends to any refuge chamber* on-site. Annex D of the EN 16191:2014 outlines the minimum requirements for a refuge chamber, from concept and design to instruction prerequisites. The limited available space on the TBM presented a challenge when meeting the needs of the standard, three critical areas requiring redesign were:

- **Chamber Floor Area:** The EN standard requires at least 0.75m2/person of floor area, minimum headroom of 1.6m and a minimum volume of 1.5m3/person, as well as an additional 2m3 for the storage of rescue equipment (e.g. stretchers, toilet) and water. A thorough risk assessment determined that a single 20 person chamber wouldn't meet EN floor space and volume requirements on one gantry. As a result, two ten-person chambers were situated on consecutive separate gantries, one after the other.
- **Backup Power Supply:** Tunnelling refuge chambers must provide a minimum 24hr capacity in standalone mode; this requires the use of an uninterrupted power supply. As a standard MineARC Refuge Chambers host the battery box at the rear of the chamber, this allows easy access for maintenance and protection against passing machinery and traffic. However, the positions and significantly smaller width meant access to the batteries via standard design measures could not be applied. Alternatively, an access door was positioned on the inner side of the chamber to ensure maintenance staff were able to perform a thorough service when required.
- **CO and CO2 Scrubber:** Breathable air involves the removal of hazardous gases such as carbon dioxide and carbon monoxide as well as a fresh supply of oxygen. A scrubber performs removal of these gases. A custom-framed Extra Low Voltage (ELV) style scrubber was installed within each crescent design refuge to ensure no additional floor space was taken, and the MARCISORB chemical cartridges could still be securely placed.

**MineARC's tunnel refuge chamber can also be built to meet the British Standard (BS 6164:2011) Code of Practice for Health and Safety in Tunnelling in the Construction Industry, and the ITA's "Guidelines for the Provision of Refuge Chambers Under Construction".*

02.

Meeting European Safety Guidelines

Underground construction and tunnel design have several known risks. Hazards common to such work include exposure to air contaminants, fire, and other emergencies. Mitigation against these dangers consists of the provision of refuge chambers to provide a safe 'go-to' area. All risks must be taken into account when managing safety underground.

As with tunnel design, refuge chambers can be customised to fit the applicable industry standards and requirements of the project. When a traditional option is not appropriate, thinking outside the box can result in better quality and better safety management. The company worked alongside MineARC to ensure the supplied shelters meet the needs of the project as well as provide exceptional safety measures.

Pictured: CO and CO2 Scrubber with Aura-FX Digital Gas Monitor

www.minearc.com

Tailored Industry Solutions

Refuge Chambers & Toilets
- TunnelSAFE Crescent Design

Life-Supporting Technology
- ELV Scrubber
- Positive Pressure Maintenance System (PPMS)
- Pressurised Access Safety System (PASS)
- GuardIAN Refuge Chamber Monitoring
- Compressed Air Management System (CAMS)
- Aura-FX Digital Gas Monitoring
- MARCISORB Chemical Cartridges

Training & Education
- Dual language signage and operation materials, English and Arabic
- Factory commissioning
- On-site operational training
- On-site certified refuge chamber servicing
- Operational guides
- e-learning access

For More Information
To learn more about how MineARC Systems can support your site, visit minearc.com

Contact Us
e: info@minearc.com.au
p: +61 8 9333 4966

For further information and to download the complete case study please click here.

https://tunnelbuilder.com/News/MineArc-Custom-Refuge-Chamber-Strengthens-Safety-on-Small-TBM.aspx

ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

International Society for Soil Mechanics and Geotechnical Engineering

The Innovation and Development Committee of ISSMGE is pleased to announce that through the initiative of Prof. Hongwei Huang, the 77 papers from the **Proceedings of the 1st International Symposium on Geotechnical Safety and Risk (ISGSR 2007)** held in Shanghai, China, on 18-19 October 2007 are available in the online library here: https://www.issmge.org/publications/online-library

Detailed acknowledgements for the 1st International Symposium on Geotechnical Safety and Risk (ISGSR 2007) can be found at the ISSMGE online library acknowledgements section.

The Innovation and Development Committee of ISSMGE is pleased to announce that through the initiative of Dr. Ernest Olinic, the 49 papers from the **Proceedings of the 25th European Young Geotechnical Engineers Conference** held in Sibiu, Romania, on 21-24 June 2016 are available in the online library here: https://www.issmge.org/publications/online-library

The Innovation and Development Committee of ISSMGE is pleased to announce that through the initiative of Dr. Norma Patricia López Acosta on behalf of the XVI PCSMGE Organizing Committee, the 356 papers from the Proceedings and the invited lectures volumes of **XVI Pan-American Conference on Soil Mechanics and Geotechnical Engineering** (XVI PCSMGE) held in Cancun, Mexico, on November 17-20, 2019 are available in the online library here: https://www.issmge.org/publications/online-library

The Innovation and Development Committee of ISSMGE is pleased to announce that through the initiative of Dr. Andrew Ridley, the 42 papers from the **Proceedings of 10th International Symposium on Field Measurements in Geomechanics (FMGM2018)** held in Rio de Janeiro, Brazil, 16-20 July 2018 are available in the online library here: https://www.issmge.org/publications/online-library

The Innovation and Development Committee of ISSMGE is pleased to announce that through the initiative of the Chair of the ISSMGE African Regional Conference 2019 Scientific Committee Prof. SW Jacobsz, University of Pretoria, the 139 papers from the **Proceedings of the 17th African Regional Conference on Soil Mechanics and Geotechnical Engineering** held in Cape Town, South Africa, 7 – 9 October 2019 are available in the online library here: https://www.issmge.org/publications/online-library

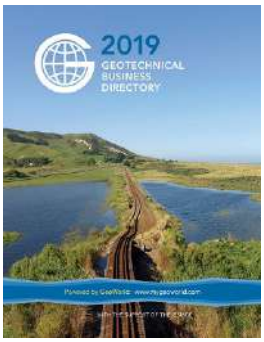
The Innovation and Development Committee of ISSMGE is pleased to announce that through the initiative of the Chair of the Icelandic Geotechnical Society Mr. Haraldur Sigursteinsson, the 675 papers from the **Proceedings of 17th European Conference on Soil Mechanics and Geotechnical Engineering** held in Reykjavík, Iceland, 1 – 6 September 2019 are available in the online library here: https://www.issmge.org/publications/online-library

The Innovation and Development Committee of ISSMGE is pleased to announce that through the initiative of Immediate Past Chair of the Australian Geomechanics Society Dr Hugo Acosta-Martinez, the 199 papers from the **Proceedings of the 13th Australia New Zealand Conference on Geomechanics**, held in Perth (Western Australia), Australia, 1-3 April 2019 are available in the online library here: https://www.issmge.org/publications/online-library

The Innovation and Development Committee of ISSMGE is pleased to announce that through the initiative of Prof. Jianye Ching, the 145 papers from the **Proceedings of the 7th International Symposium on Geotechnical Safety and Risk (ISGSR 2019)** held in Taipei, Taiwan, on 11-13 December 2019 are available in the online library here: https://www.issmge.org/publications/online-library

Detailed acknowledgements for the above conferences can be found at the ISSMGE online library acknowledgements section.

Watch the latest **webinar on Landslide Runout Analysis Current Practice and Challenges** presented by Dr. Scott McDougall on 10th of December 2019. https://www.issmge.org/education/recorded-webinars/landslide-runout-analysis-current-practice-and-challenges



Announcing the Publication of the 2019 Geotechnical Business Directory

Geoworld, the network for geotechnical engineers, has just published the 2019 Geotechnical Business Directory. The directory is published with the support of the International Society for Soil Mechanics and Geotechnical Engineering. This is **the fifth year for the Geotechnical Business Directory, the most comprehensive directory in the geotechnical engineering field!**

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

(a) an Online Interactive Platform,
(b) an e-book, and
(c) in-print through Amazon

The 2019 index has grown significantly since last year and includes **9000+ members**, and **700**+ **geo-companies** and **geo-organizations** from a total of **153 countries**. It is expected to reach 50,000+ professionals through various media channels. The online platform of the directory allows visitors to search for professionals or companies based on location, experience, expertise, industry and other parameters. **There is no other such directory in geotechnical engineering**. The directory is also a "live" publication in the sense that as more members join and complete their profiles, the publication will become more comprehensive.

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

Geoworld's team is already working on the 2020 Business Directory that is expected to include 16,000+ individuals and 800+ companies and organizations.

Income generated from the Geotechnical Business Directory is also directed as a donation to the ISSMGE Foundation.

If you are not a member of GeoWorld, visit the website and join at no cost, so that you can be part of the 2020 Geotechnical Business Directory.

https://www.issmge.org/news/announcing-the-publication-of-the-2019-geotechnical-business-directory

ISSMGE News & Information Circular April 2020

www.issmge.org/news/issmge-news-and-information-circular-april-2020

Message from the President:

We are all under the threat by the COVID-19 and have suffered and affected by it one way or the other. Many universities and training centres are closed. Many students and engineers may not be able to access and receive necessary education and training. This is a serious disruption to their future. However, the free ISSMGE's online "Virtual University" should be able to assist them while they are at home or under quarantine. We have developed seven full courses including:

Course 1: Risk-Mitigation, monitoring & Observational Methods
Course 2: In Situ Testing
Course 3: Earthquake Engineering
Course 4: Foundations
Course 5: Soil Characterization
Course 6: Geo-Engineering Education
Course 7. Unsaturated Soil Mechanics

In addition, there are many webinars available online. Please visit the ISSMGE website to find out more details as follows: http://virtualuniversity.issmge.org/

Please let whoever needs the education and training know in your countries and regions.

Please watch out the COVID-19 and take great care of your health conditions. God bless you all.

Charles Wang Wai Ng

1. SYDNEY 2021 – 20ICSMGE, 7iYGEC – PAPER ALLOCATION INFORMATION AND CALLS FOR ABSTRACTS

All member societies were sent information on paper allocation on the 19th December 2019. If you have not seen these details, please let the ISSMGE Secretariat (secretariat@issmge.org) know as soon as possible.

2. ISSMGE Awards

Member Societies are hereby called to submit nominations for ISSMGE awards for the 20th International Conference on Soil Mechanics and Geotechnical Engineering to be held in Sydney, Australia, in September 2021. Nominations should be submitted to the Secretary General by the closing date of 1 July 2020. For more information and guidelines for the nomination of the various awards please click here.

3. Technical Committees

TC221 – Tailings and Mining Waste – A NEW TECHNICAL COMMITTEE
This is a newly formed TC, and it is actively seeking nominations for members from the Member Societies. Please make sure that your Member Society representative is aware of your interest in joining this committee.

TC217- Land Reclamation
The new chairman of TC217 – Land Reclamation, Prof Jian CHU, has requested that Member Societies nominate (or re-nominate) members. If you are already a member of TC217, please could you advise your Member Society whether you wish to continue in that role.

4. Technical Committee Members

As part of the annual maintenance of the online database, all Technical Committee members were sent an email from the ISSMGE webmasters asking them to confirm their membership by clicking on a link. If you have not received the message, but believe you should have, please contact your Member Society to confirm your email address.

5. Bulletin

The latest edition of the ISSMGE Bulletin (Volume 14, Issue 1, Feb 2020) is available from the website**:** https://www.issmge.org/publications/issmge-bulletin/vol-14-issue-1-february-2020

6. TC Guidelines – update

An updated set of Guidelines for the ISSMGE Technical Committees and Honour Lectures are now available from the website - https://www.issmge.org/filemanager/article/390/Guidelines_for_ISSMGE_Technical_Committees_revised_Nov19.pdf

7. 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:

17th African Regional Conference on Soil Mechanics and Geotechnical Engineering;

17th European Conference on Soil Mechanics and Geotechnical Engineering;

Australia New Zealand conference series back catalogue;

XVI Pan-American Conference on Soil Mechanics and Geotechnical Engineering (XVI PCSMGE 2019)

9th International Symposium on Geotechnical Aspects of

Underground Construction in Soft Ground, Sao Paulo, 2017 (TC204)

8. Are We Overdesigning? A survey of international practice

A joint initiative by the CAPG, the YMPG, TC2015 - Safety and Serviceability and TC304 - Risk. The survey is intended to assess the consistency of calculation models and design methods for a variety of geotechnical structures, and where possible, to compare the results with full scale tests and reliability analyses. To participate in the survey please go to https://www.issmge.org/news/are-we-overdesigning-a-survey-of-international-practice.

9. ISSMGE Foundation

The next deadline for receipt of applications for awards from the ISSMGE Foundation is the 31st May 2020. Click here for further information on the ISSMGE Foundation.

10. 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.

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

ISSMGE Events

THE SECOND INTERNATIONAL CONFERENCE ON PRESS-IN ENGINEERING 2021, KOCHI - 19-06-2021 - 21-06-2021

Kami Campus, Kochi University of Technology, Japan, Language: English; Organiser: International Press-in Association (IPA); Contact person: ICPE2021 Organizing Committee; Address: 5f, Sanwa Konan Bldg, 2-4-3 Konan, Minato-ku; Phone: +81-(0)3-5461-1191; Fax: +81-(0)3-5461-1192; Email: ICPE2021@gmail.com; Website: https://icpe-ipa.org/

TC204: GEOTECHNICAL ASPECTS OF UNDERGROUND CONSTRUCTION IN SOFT GROUND - TC204 CAMBRIDGE 2021 - 05-07-2021 - 07-07-2021

University of Cambridge, United Kingdom; Language: English; Organizer: University of Cambridge; Contact Person: Dr Mohammed Elshafie, Email: me254@cam.ac.uk; Website: https://www.is-cambridge2020.eng.cam.ac.uk/;

9TH INTERNATIONAL CONGRESS ON ENVIRONMENTAL GEOTECHNICS- 26-06-2022 - 29-06-2022

Chania, Crete, Greece. Language: English; Organizer: Dimitrios Zekkos, University of California at Berkeley; Contact person: Dr. Rallis Kourkoulis; Email: rallisko@grid-engineers.com; Website: https://www.iceg2022.org/; Email: zekkos@berkeley.edu

Non-ISSMGE Events

3RD INTERNATIONAL CONFERENCE ON THE MATERIAL POINT METHOD FOR MODELLING SOIL-WATER-STRUCTURE INTERACTION -24-03-2021 - 25-03-2021

Campus Hamburg University of Technology, Germany , Hamburg; Language: English; Organiser: Anura3D MPM Research Community, co-hosted by Hamburg University of Technology; Contact person: Deutsche Gesellschaft für Geotechnik e.V. / German Geotechnical Society; Email: service@dggt.de; Website: http://www.mpm2021.eu

ISRM

International Society for Rock Mechanics and Rock Engineering

The 2019 issue, volume 22, of the ISRM News Journal is now online on the ISRM website. Since 2012 the ISRM distributes the News Journal to all members in electronic version, and prints copies which are available at our sponsored symposia.

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

CIGB ICOLD

International Commission on Large Dams

Message from ICOLD President and Secretary General

Dear Colleagues, Dear Friends, Dear ICOLD Family Members

Greetings from the ICOLD Central Office and the Board. This message is to inform you that we often think of you and your families. Our hope and wish that you are all safe and protected during this stressing period of the COVID-19 Pandemic, which is terrifying for all people in the world.

On behalf of ICOLD, we would like to express our strong solidarity as we offer our thoughts and prayers with families around the world that are currently dealing with this terrible virus. Please take all precautionary measures to stay safe and healthy!

We are living in truly difficult and unpredictable times! Please be assured that we will get through this crisis together. In its 90 years history, ICOLD has had to face other periods of world crisis that challenge us an individuals and nations. We have always emerged from these periods of crisis with a stronger sense of harmony amongst our many members and nations. So we are confident that this crisis too shall pass in time and our ICOLD family will survive and become stronger.

Be assured that ICOLD activity and planning are continuing! We are still open for business and actively planning our ICOLD 2020 Annual Meeting in New Delhi on September 26 to October 1.

We encourage all National Committees and Technical Committees to use any communication tool possible to maintain close links to our ICOLD colleagues.

As ICOLD President and Secretary General, we remain personally at your disposal. Please don't hesitate to contact us directly, or the Central Office for any question, needs or to give us news about you, your family and the members of ICOLD.

Again, we wish that all of our ICOLD family will remain safe and healthy. We look forward to meeting you at the end of September 2020 in New Delhi!

Friendly and warm greetings

Michael ROGERS
President

Michel de VIVO
Secretary General

Financing renewable energy infrastructure – focus on hydropower

Dear ICOLD National Committees: I have received a special request for ICOLD members to participate in a brief survey on **financing renewable energy infrastructure with a focus on hydropower**.

This request comes from Professor Judith Plummer Braeckman, University of Cambridge who is a regular participant and supporter of ICOLD.

The survey can be accessed at: Financing renewable energy infrastructure – focus on hydropower

I have personally taken this important survey and hope that you will take about 10-15 minutes to complete it yourself.

Thank you.
Best regards,
Michael Rogers

UNIVERSITY OF CAMBRIDGE INSTITUTE FOR SUSTAINABILITY LEADERSHIP | Centre for Sustainable Finance

Future DAMS
Design and Assessment of water-energy-food-environment Mega-Systems

You have been invited to participate in this survey because we believe that your experience and expertise will provide important insight into the current and potential role of the private sector in financing renewable energy infrastructure.

The purpose of this survey is to help us understand how financiers make decisions on renewable energy infrastructure projects, with a focus on hydropower.

You will be asked to provide some background information, including your name, company, and position / job title. However, you can select what information will be disclosed in any citation of the results and generally results will be grouped and anonymised for analysis. Your responses are accessible only to the members of the research team at the Cambridge University Institute for Sustainability Leadership. Depending on how much detail you wish to provide in the optional fields and as a response to open-ended questions, the survey will take 10-20 minutes to complete. If you need to leave the survey page, you can return to the survey within seven days using the web link you received via e-mail.

https://cambridge.eu.qualtrics.com/jfe/form/SV_9nrbfZ11vmkWrHf

CHINESE NATIONAL COMMITTEE ON LARGE DAMS

Dear Colleagues,

Greetings from Chinese National Committee on Large Dams (CHINCOLD). During this abnormal time, we sincerely hope that your life have not been much influenced by the coronavirus.

To facilitate your work, we would like to inform that after development of a year, a system namely CHINCOLD Cloud Platform, for the experts and engineers to check valuable dams data and literature, is opening at http://www.chincold-smart.com/en. All the documents as well as the registration process are free of charge. We have uploaded more than 1600 literature, including CHINCOLD publications, conference proceedings and statistics of dams. New literature and data will be keeping updated. The platform is also a fast pass for dam engineers to communicate with experts worldwide directly, and a very useful tool for experience exchanging and practice sharing regarding dams. This platform is also freely open for all the engineers of your country.

Your recommendations will be highly appreciated. If you have any questions or suggestions, we are happy to be contacted at chincold-en@vip.126.com or chincolden@gmail.com.

REGISTER

Literature:

Literature on the platform consists of Conferences Proceedings, Presentation Documents, Data of Dams in the World and Dams in China, CHINCOLD Publications. http://www.chincold-smart.com/en/wisdom-lib/liter/index/1

For instance:

Proceedings : http://www.chincold-smart.com/en/wisdom-lib/liter/china-tech-data/proceedings/list/1/1

1. 8th INTERNATIONAL SYMPOSIUM ON ROLLER COMPACTED CONCRETE (RCC) DAMS (2019)
2. CHINCOLD 2018 Annual Meeting and the 10th East Asia Dam Conference
3. CHINCOLD 2017 Annual meeting & International Symposium on Dam Safety
4. The Ninth EADC Symposium (2016)
5. Technical Progress on Sustainable Hydropower Development and Roller Compacted Concrete (2015)
6. Studies on Modern Technology of Rock-fill Dam Construction and Hydropower Development

Data of Dams in China: http://www.chincold-smart.com/en/wisdom-lib/liter/stat/inter-stat/stat

Projects:

http://www.chincold-smart.com/en/wisdom-lib/project-data/list/all/any/1

The detailed information of some typical dams could be found in this part:

1. USA: Oroville Spillways Recovery Project
2. Turkey: Upper Kalekoy Dam and HEPP
3. Malaysia: Murum Hydropower Project
4. China: Huangdeng Hydropower Project
5. Mexico: La Yesca Dam
6. Malaysia: Bakun Dam
7. Laos: Nam Ngum II Dam
8. Brazil: Sao Simao Dam

Experts:

In this section, we display the profile and achievements of some of the experts of dams.

http://www.chincold-smart.com/en/wisdom-lib/domain-expert/all/list/1

If you would like to introduce your achievements to the colleagues around the world, please click http://www.chincold-

smart.com/en/member-area/individual-member/appExpert to apply.

News:

For latest news, you can:

1. View the latest progress of the dams built by Chinese companies
2. View the "2020 Application Brochure for International Students of China Institute of Water Resources and Hydropower Research (IWHR)" if you are interested in graduate education in China.
3. Download World Bank new publication: Operation and Maintenance Strategies for Hydropower: Handbook for Practitioners and Decision Makers.

Capacity Building:

Round Tables on Sustainable Development of Dams & Hydropower

Conference:

CHINCOLD present some of the previous conferences in this section. We will announce the information about the new upcoming conferences here too. All of our users can apply and file your papers for your interested conference.

Cooperation Center:

Registered users can start or participate in online consultation and interaction here.
http://www.chincold-smart.com/en/wisdom-lib/cooperation/all/list/1

Contact

- Email: chincold-en@vip.126.com
- Tel: +86 10-68585310
- Fax: +86 10-68712208

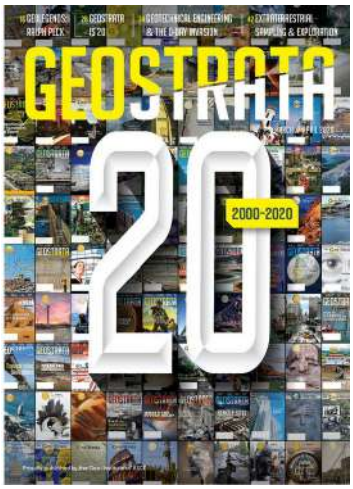
Geo-Institute of ASCE

Our third and final new distinguished member for 2020 is Kerry Rowe of @QueensEngineer

Here's his 2017 Terzaghi Lecture: Protecting the Environment with Geosynthetics: Successes and Challenges. Apr 17

https://www.youtube.com/watch?time_continue=1&v=vyLpkObB1a8&feature=emb_logo

Geo-Institute of ASCE



From the Editorial Board

Twenty years ago, I welcomed readers to the first issue of *Geo-Strata*, and with this issue I have the honor of welcoming you to the 20th anniversary issue of the magazine, now called *GEOSTRATA*. So after publishing 110 issues, we're using this milestone to not only reflect a bit on the past, but to stretch your imagination by listening to a voice from long ago, learning about the geotechnics behind two well-known milestone events, and discovering other interesting stories and features as highlighted below.

What's Inside?

My article, "Did You Know? — *GEOSTRATA* is 20," offers a snapshot of the magazine's history. How did this publication get started? What's happened during the past decade, and what's ahead?

Many have sought the sage advice of Professor James Mitchell, and *GEOSTRATA* has been no exception over the years. In this issue's commentary, Mitchell offers his insights about geotechnology's role in improving life on planet Earth in "Geotechnics in Addressing Engineering Grand Challenges." He

describes how mankind's needs for access to clean water, economical solar energy, carbon sequestration, and urban infrastructure improvement will require significant geotechnical inputs if these problems are to be addressed successfully.

We've been fortunate to publish GeoLegend interviews of more than 40 of the most well recognized and respected people in our profession, but we never interviewed legendary soil mechanics pioneer Ralph Peck, who died two years before the series began. However, we were fortunate to learn about interviews with Peck that were conducted by University of New Mexico professor Fernando Moreu when he was a graduate student at the University of Illinois in the early 2000s. Working with Moreu, we converted his full interview into a memorable GeoLegend article. In it, Peck shares recollections of working with Terzaghi on the Chicago subway and writing their classic text, *Soil Mechanics in Engineering Practice*. His statement "I don't do jobs that I can't visit" should become a lasting reminder to all of us when we're pressed to do something we shouldn't.

World War II dramatically touched virtually all developed regions of the world and the people then living on the planet. There are many stories about the war that only just today are coming to light, and we have one for this anniversary issue. In "Soil Sampling at Sword Beach in Normandy, France, 1943," William Lawson describes the exploits of a pair of brave and gallant British commandos who secretly landed on the beaches around Luc-sur-Mer, France, on New Year's Eve in 1943. Their goal was to learn whether invasion landing craft could maneuver on the beaches' soils — information that proved invaluable five months later on D-Day.

Everyone has those "Do you remember where you were when?" events during their lifetime. One of mine is the first manned moon landing on July 20, 1969. At that time, a great curiosity of the geo-community was the composition and resistance of the lunar soils. In "Big Steps for Mankind," Zachary Mank, Robert Mueller, Marika Santagata, and Kris Zacny recount what was learned during the Apollo explorations, and how that experience was advanced during subsequent explorations of the lunar and Martian landscapes. It's a most interesting recounting.

In their article, "Best Practices for Geotechnical Site Characterization," Don DeGroot and Jason DeJong ask, "Have we regressed from decades past?" While there's been extensive advancement of tools and procedures in recent decades, the authors believe there's been some backsliding, possibly due to a lack of knowledge in how to conduct a reliable site-characterization program, and an underappreciation of the extent to which a poorly conducted program can adversely affect the project design, performance, and cost. They describe an integrated site characterization that folds the site investigation phase into a more comprehensive and holistic assessment of site conditions as a solution.

While we live in a 3D world, geoprofessionals have been trained to think and create in 2D because, until recently, tools just weren't available to do anything else. But times are a-changing. In "Creating Art and Reducing Project Risk with 3D Modeling," Michael Webster and Jennie Byron describe how they have used 3D modeling to help decision making, reduce project risk, and control costs, while revolutionizing client presentation and community engagement. And the outputs can be beautiful besides.

Michael Greenfield has worked at the forefront of recent advances in earthquake geotechnics. In his "What's New in Geo?" article, entitled "Handling Uncertainty in Geotechnical Earthquake Engineering," Greenfield describes how empirical predictive modeling for earthquake impacts has advanced so it's now possible to aggregate the uncertainties in shaking intensity, structural response, and damage into a single, decision-based, design metric of risk that's simple to communicate to stakeholders and can quantify the cost benefits of reducing uncertainty.

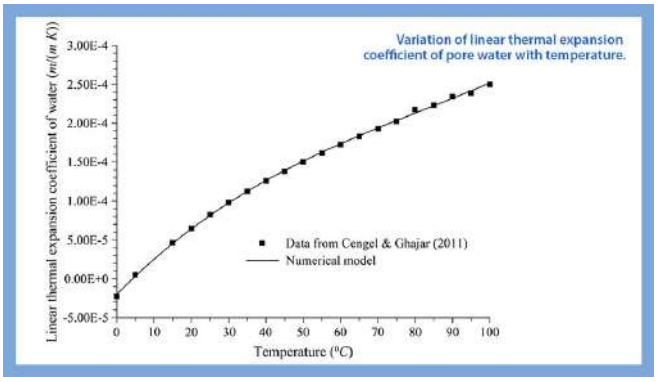
Back in 2007, we learned about a young geotechnical engineer's interest in writing poems for *GEOSTRATA*. We published Mary Nodine's first poem, "Blue Clay Blues," in the January/February 2008 issue. In this anniversary issue, we reprise both "Blue Clay Blues," and her July/August 2010 poem, "Lament of an Ancient Embankment Dam." So what was initially a simple inquiry from a reader has now grown into a collection of more than 60 poems and is one of *GEOSTRATA*'s most popular features.

Τα πολύ μεγάλου ενδιαφέροντος άρθρα, τα οποία δημοσιεύονται στο επετειακό τεύχος του GEOSTRATA, αναδημοσιεύονται στο συμπληρωματικό τεύχος Απριλίου 2020 Αρ. 137Β – Αφιέρωμα στο GEOSTRATA.

ASCE Publishing @ASCEpublishing

#EditorsChoice: @ImperialCiveng researchers study temperature rise in #soils - thermally induced excess pore fluid pressure https://doi.org/10.1061/(ASCE)GT.1943-5606.0002218

@GeoInstitute #Freecontent #ASCEJournals



Numerical Modeling of Time-Dependent Thermally Induced Excess Pore Fluid Pressures in a Saturated Soil

Wenjie Cui; Aikaterini Tsiampousi; David M. Potts; Klementyna A. Gawecka; and Lidija Zdravković

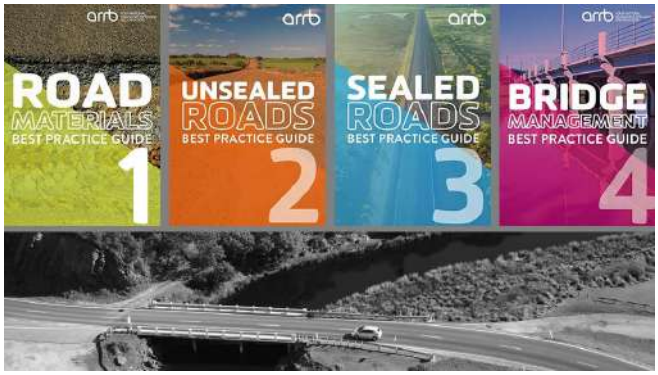
Abstract

A temperature rise in soils is usually accompanied by an increase in excess pore fluid pressure due to the differential thermal expansion coefficients of the pore fluid and soil par-

ticles. To model the transient behavior of this thermally induced excess pore fluid pressure in geotechnical problems, a coupled thermohydro-mechanical (THM) formulation was employed in this study, which accounts for the nonlinear temperature-dependent behavior of both the soil permeability and the thermal expansion coefficient of the pore fluid. Numerical analyses of validation exercises (for which an analytical solution exists), as well as of existing triaxial and centrifuge heating tests on Kaolin clay, were carried out for this research. The obtained numerical results exhibited good agreement with the analytical solution and experimental measurements respectively, demonstrating good capabilities of the applied numerical facilities and providing insights into the mechanism behind the observed evolution of the thermally induced pore fluid pressure. The numerical results further highlighted the importance of accounting for the temperature-dependent nature of the soil permeability and the thermal expansion coefficient of the pore fluid, commonly ignored in geotechnical numerical analysis.

Austroads

ARRB releases local government road asset management guides



The Australian Road Research Board (ARRB) has released four free-of-charge best practice guides for the local government engineering community.

Focusing on road asset management, the guides will assist local government organisations across Australia in applying a consistent approach to their standards and practices.

The guides provide practical advice to local road practitioners, supervisors, engineers and field staff on best practice in the procurement, design and management of materials for road construction, sealed and unsealed roads and structures.

The best practice guides are:

- Guide 1: Best Practice for Road Materials
- Guide 2: Best Practice for Unsealed Roads
- Guide 3: Best Practice for Sealed Roads
- Guide 4: Best Practice for Bridge Management

The guides can be downloaded from the ARRB website at www.arrb.com.au/bestpracticeguides

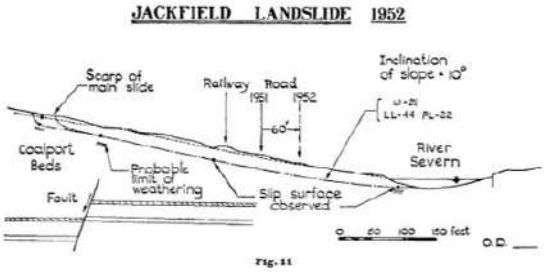
ice Publishing

Géotechnique Rankine Lecture papers

Who was Rankine and which papers have most influenced research and practice?

The Rankine Lecture is widely viewed as the most prestigious invited lecture in geotechnics. Each lecture is subsequently prepared as a marquee paper, to be published in *Géotechnique*. But who was Rankine and which papers over the years have most influenced research and practice?

William John Macquorn Rankine was born in 1820 in Edinburgh, UK. He is best known for his theory for the earth pressure on retaining walls, but he had a varied career prior to that. Rankine studied at the University of Edinburgh and also worked as a practising civil engineer on river improvements, waterworks, harbour works and railways.



In 1855, he was appointed to the Chair of Civil Engineering and Mechanics at Glasgow University, UK, and in 1857 he became the first President of the Institute of Engineers in Scotland. In his inaugural address, when accepting his professorship in 1856, he said:

"In theoretical science, the question is - what are we to think? - and when a doubtful point arises… it is the duty of philosophic minds [to] await patiently the time when these shall be adequate to solve the question. But in practical science the question is - what are we to do? …In doubtful cases, we cannot allow our machines and our works of improvement to wait for the advancement of science; and if existing data are insufficient to give an exact solution of the question, that approximate solution must be acted upon."

This quote was given in the first Rankine Lecture (Casagrande, 1961). Since that time, there have been over 55 lectures, each dedicated to presenting a person's own life work. Three of these which went on to be celebrated lecture papers are (in chronological order): Skempton (1964), Newmark (1965) and Ishihara (1993). What made each of them special?

Skempton's 1964 Rankine Lecture is probably the most important single contribution to the science of slope stability engineering. It popularised the concept of residual strength, establishing the significance of ultimate large deformation shear strength for the stability of clay slopes (Charles and Bromhead 2008).

In 1965, Newmark presented major developments in the prediction of the performance of embankment dams in major seismic events. In his lecture, he emphasised the importance

of estimating the displacements that embankment slopes will undergo during earthquakes (Charles and Bromhead).

Ishihara's 1993 Rankine Lecture explored the phenomenon of 'spontaneous liquefaction'. Based on his work at the University of Tokyo, Japan, he described why huge forces exerted during events such as earthquakes can cause previously stable ground to turn into liquid. Lancellotta and Pappin subsequently provided an overview of earthquake dynamics in their 2008 *Géotechnique* paper.

To this day, the Rankine Lecture – held annually in March at Imperial College London, UK – represents one of the highest achievements in geotechnics. Why name such an event after this engineer? RV Southwell (1956) summarised Rankine's achievement in the following manner:

"His was a time of world-famous engineers; yet Tait [1] *could truthfully write of him in his Memoir: "Few, if any, practical engineers have contributed so much to abstract science, and in no case has scientific study been applied with more effect to practical engineering."*

1. Tait (1881). Miscellaneous Scientific Papers by W. J. Maequorn Rankine (edited by W. J. Millar, with a prefatory Memoir by P.G. Tait). London 1881, Chas. Griffin and Co.

We have put together a full list of past Rankine Lecture papers for you to read.

10 March 2020 by Ben Ramster

Focus on: Biogeotechnics

Working beyond traditional subject boundaries can bring exciting new engineering possibilities. We take a look at the emerging field of biogeotechnics.

Biogeotechnics is an exciting emerging sub-discipline of civil and environmental engineering, linking the established engineering field of geotechnics (or ground engineering) with the life sciences. Interdisciplinary researchers are now looking at what lessons engineers can learn from the world of biological systems to benefit constructed systems.

For example: Can bacteria be used to cement soil particles together? Can bacteria generate small bubbles within the soil to prevent liquefaction? What if building foundations were structured like tree-roots? How do ants move so much soil in one day? Even, could we produce worm-inspired probes that self-penetrate soil?

A milestone event in the field was the Second International Workshop on Bio-Soils Engineering and Interactions. This workshop, held at University of Cambridge, UK, in 2011, assembled 35 leading researchers in the field.

The paper reporting the event's outcomes, published by *Géotechnique*, has been cited over 200 times. Indeed, funding and publication metrics indicate that biogeotechnics is now the fastest growing sub-discipline within geotechnical engineering.

Paper lead author Jason T. DeJong of the University of California, Davis, USA commented:

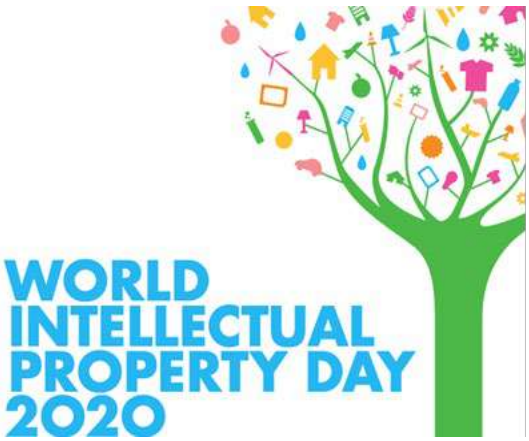
"Since 2011, both individual researcher programs and nationally funded centers in biogeotechnics have now been established worldwide. Several of the technologies presented in the Paper, notably microbially induced carbonate precipitation (MICP), have advanced to field application with industry partnerships."

Perhaps the most important advance in recent years has been the expansion of biogeotechnics beyond bio-mediated processes (the subject of the 2011 workshop) to also include bio-inspired geotechnical engineering design. This is pushing into exciting new areas. One example now being looked at is how snakeskin exhibits different levels of friction (termed anisotropic), depending on the direction that the animal is travelling in. Determining this could provide valuable insights into shear forces, potentially increasing the efficiency of geotechnical applications such as piles and geomembranes.

It will be exciting to see how the field continues to develop.

4 February by Ben Ramster

Top 5 articles mentioned in patents



This World IP day, we look at patents.

World IP Day is an opportunity to highlight the role that intellectual property (IP) rights play in encouraging innovation and creativity. A balanced IP system recognises and rewards inventors and creators for their work and ensures that society benefits from their creativity and ingenuity.

We have written before about publishing ethics, and if you'd like to find out more about our copyright and permissions, we have a dedicated page. To celebrate this year's World IP Day, we will be looking at patents.

A patent is an exclusive right granted for an invention. This could be a product or a process that provides, in general, a new way of doing something, or offers a new technical solution to a problem. To get a patent, technical information about the invention must be disclosed to the public in a patent application.

As the Chair of *Magazine of Concrete Research*, Professor Peter Hewlett, says "research aimed at understanding and new

knowledge is necessary and desirable, but coupling that with beneficial and practical outcomes is even more so". Our articles are written and read by a mix of researchers and practitioners, with many themed issues and invited papers focusing on topics which are of particular interest to practitioners, as such they are often cited in patents.

We have made our five articles most mentioned in patents, according to Altmetric, free to read until 31 May 2020.

5. Fluid-pressure testing of concrete cylinders By N. Clayton, *Magazine of Concrete Research*

4. Hydration of cements based on metakaolin: thermochemistry By P. S. de Silva and F. P. Glasser, *Advances in Cement Research*

3. The mechanics of cemented carbonate sands By M. R. Coop and J. H. Atkinson, *Géotechnique*

2. Isotropic yielding in an artificially cemented soil cured under stress By G. V. Rotta, N. C. Consoli, P. D. M. Prietto, M. R. Coop and J. Graham, *Géotechnique*

1. Study on the suppression effect of natural zeolite on expansion of concrete due to alkali-aggregate reaction By Feng Naiqian, Jia Hongwei and Chen Enyi, *Magazine of Concrete Research*

21 April 2020 by Caitlin Flint

Themed issue on Asiafuge

Eurofuge and Asiafuge, provide opportunities for geotechnical physical modellers to meet more regularly and to disseminate advances in physical modelling techniques and to highlight where physical modelling has improved our understanding of complex geotechnical problems.

This themed issue of *International Journal of Physical Modelling in Geotechnics* is comprised of notable, high quality papers from Asiafuge. It includes Editor's choice paper - Axial response of short pile due to tunnelling-induced soil movement in soft clay and the whole issue is **free to read** until the end of May 2020.

Call for papers

Writing for us will help your work to reach research and industry around the world. Our current open call for papers include upcoming themed issues on:

Application of Smart Sensors in Geoenvironmental Monitoring

Polymers in geoenvironmental engineering: from micro scale to field/engineering applications

Reuse of waste in geotechnical engineering

Can't find one relevant for your paper? Our journals, including *International Journal of Physical Modelling in Geotechnic,* are still accepting submissions.

(http://comms.icepublishing.com/Yq6f3TsGJ8wZlDUx-iSDnE7qWBWHtd2vA5BLdDPXGoSX/WebView.aspx)

As trophy for the ITA Awards, ITA has chosen to ask a sculptor - Sebastien Langloÿs from Toulouse, France - to make a bust of Isambard Kingdom Brunel.

Isambard Kingdom Brunel (9 April 1806 – 15 September 1859) was an English Mechanical and Civil Engineer who is considered "one of the most ingenious and prolific figures in engineering history". With his French father (Marc Brunel), they designed and built the Thames Tunnel in London England, which was the first tunnel to be excavated with a Tunnelling Shield starting in 1825.

Isambard Brunel worked for nearly two years on the excavation of the Thames Tunnel under the river Thames in London, the first sub-aqueous tunnel under a navigable river with the first ever tunnel shield. This accomplishment was even more impressive given the challenging geologic conditions of silty and gravelly soils and constant groundwater inflows.

The Tunnel flooded five times, and in the worst flood, six men drowned and Isambard Brunel barely escaped with his own life. The tunnel finally opened eighteen years later in 1843, but only for pedestrians. The project was funded by Thames Tunnel Company and at the end, was exhausted of money-they could not afford to build the access ramps for originally planned freight.

The East London Railway Company bought the tunnel in 1865 with the intention of excavating new tunnels from the North and South, to link the Thames Tunnel to the national railway network. Four years later, in 1869, trains started to run through the tunnel. Then, for the first time the Thames Tunnel fulfilled its original purpose, providing a transport artery for freight, under and across the River Thames.

Drawing on Brunel's experience with the Thames Tunnel, the Great Western (London-Bristol) Railway, under Brunel's direction, made a series of impressive achievements—soaring viaducts such as the one in Ivy Bridge, specially designed stations, and vast tunnels including the Box Tunnel, which was the longest railway tunnel in the world at that time. Legend has it, that the Box Tunnel may have been deliberately oriented so that the sun shines all the way through it on Brunel's birthday.

https://awards.ita-aites.org/conference/trophy

Tunnel Thoughts

Dear Colleagues,

At this time of uncertainty it has given a number of us time to think and ponder some of the more interesting or controversial areas of tunnelling and life. The ATS will be presenting these pieces of writing from our membership every Tuesday, commencing on the 7th of April. A right of response will be available for readers, should they wish to challenge a statement or idea via a *Letters to the Editor* submission.

The conditions of the article publication are:

- Author must be an ATS member
- Writing must have at least a tenuous link to tunnels and/or tunnelling
- Pieces shall be reviewed and chosen by the ATS Executive

Please submit your article to **ats@engineersaustralia.org.au** with the subject link **"Tunnel Thoughts".**

Regards

ATS

ΔΙΑΚΡΙΣΕΙΣ ΕΛΛΗΝΩΝ ΓΕΩΤΕΧΝΙΚΩΝ ΜΗΧΑΝΙΚΩΝ

50 Seconds on 50 Years - George Leventis

In this video, hear from Langan International Managing Director George Leventis on how diversity has played a role in Langan's expansion worldwide

https://vimeo.com/402981366

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

ICE Virtual Library "Reuse of waste in geotechnical engineering", Upcoming themed issue of *Environmental Geotechnics Journal*, www.icevirtuallibrary.com/page/ice-news/cfp-enge-05-2020

ICED 2020 First International Conference on Embankment Dams: Dam Breach Modeling and Risk Disposal, 5 – 7 June 2020 in Beijing, China, http://iced-2020.host30.voosite.com

International Conference on Challenges and Achievements in Geotechnical Engineering, 11-13 June 2020, Tirana, Albania, emy@greengeotechnics.com

Postponed DFI Deep Mixing 2020, 15 to 17 June 2020, TBD, Gdansk, Poland, www.dfi.org/DM2020

XIII International Symposium on Landslides - Landslides and Sustainable Development, June 15th – 19th 2020, Cartagena, Colombia, www.scg.org.co/xiii-isl

EGRWSE 2020 - 3rd International Conference on Environmental Geotechnology, Recycled Waste Materials and Sustainable Engineering, 18-20 June 2020, Izmir, Turkey, www.egrwse2020.com

June 24-25, 2020, Athens, Greece
www.erasmus.gr/microsites/1168

To: the subscribers of the GEE2020 platform

Subject: GEE 2020 will take place online, with an extra day (23/6)

This is a quick update. We have communicated with the invited speakers and the paper authors about the new online version and will write to you again as soon as we have the details of the new version.

If in the mean time you have questions or input for us, please e-mail us at gee2020athens@gmail.com (all three members of the organizing committee read this e-mail).

the eGEE2020 organizing committee

Marina Pantazidou, Michele Calvello, Margarida Pinho Lopes

16th International Conference of the International Association for Computer Methods and Advances in Geomechanics – IACMAG - CHALLENGES and INNOVATIONS in GEOMECHANICS, 01-07-2020 ÷ 04-07-2020, Torino, Italy, www.symposium.it/en/events/2020/16th-international-conference-of-iacmag?navbar=1

7th ICRAGEE International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, 13 – 16 July 2020, Bengaluru, India, http://7icragee.org

5th Annual Urban Underground Space & Tunnelling conference, 20th – 22nd July 2020, Singapore, www.me-assets.com/HTMLEmail/AS-IF5361%20-%20Flyer.pdf

3rd International Conference on Geotechnical Engineering (ICGE – Colombo -2020), 10 - 11 August 2020, Colombo, Sri Lanka, http://icgecolombo.org/2020/index.php

ISFOH 2020 4th International Symposium on Frontiers in Offshore Geotechnics, 16 – 19 August 2020, Austin, United States, www.isfog2020.org

2020 CHICAGO International Conference on Transportation Geotechnics, August 30 - September 2, 2020, Chicago, Illinois, USA, http://conferences.illinois.edu/ICTG2020

New Date WTC 2020 postponed to September 2020 WTC 2020 ITA-AITES World Tunnel Conference, Kuala Lumpur, Malaysia, www.wtc2020.my

EUROGEO WARSAW 2020 7th European Geosynthetics Congress, 6-9 September 2020, Warsaw, Poland, www.eurogeo7.org

6th International Conference on Geotechnical and Geophysical Site Characterization "Toward synergy at site characterisation", 7 ÷ 11 September, Budapest, Hungary, www.isc6-budapest.com

New Date 10 – 11 September 2020 RTG²EE - Recent Trends in Geotechnical and Geo-Environmental Engineering and Education, **Online Conference**, Bali, Indonesia, https://rtgee.org

7th International Conference on Industrial and Hazardous Waste Management 15th - 18th September, 2020, Chania, Crete, Greece, http://hwm-conferences.tuc.gr

ACE 2020 14th International Congress on Advances in Civil Engineering, 16-18 September 2020, Istanbul, Turkey, www.ace2020.org/en

27th European Young Geotechnical Engineers Conference and Geogames, 17 – 19 September 2020, Moscow, Russia, https://t.me/EYGEC2020

ICEGT-2020 2nd International Conference on Energy Geotechnics, September 20-23, 2020, La Jolla, California, USA, https://icegt-2020.eng.ucsd.edu/home

EUROENGEO 3RD EUROPEAN REGIONAL CONFERENCE OF IAEG, 20-24 September 2020, Athens, Greece, www.euroengeo2020.org

Fourth International DAM WORLD Conference, 21-25th September 2020, Lisbon, Portugal, https://dw2020.lnec.pt

New Date Cities on Volcanoes 11 - Volcanoes and Society: environment, health and hazards, 25-30 September 2020, Heraklion, Crete, https://pcoconvin.eventsair.com/volcanoes11

New Date October 2020 EUROCK 2020 Hard Rock Excavation and Support, Trondheim, Norway, www.eurock2020.com

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

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

Postponed to 2021 ARMS11 11th Asian Rock Mechanics Symposium, Challenges and Opportunities in Rock Mechanics, Beijing, China, www.arms11.com

HYDRO 2020 Strategies for future progress, 24-26 October 2020, Strasbourg, France, www.hydropower-dams.com/hydro-2020

3rd International Symposium on Coupled Phenomena in Environmental Geotechnics, October 29th – 30th, 2020, Kyoto, Japan, https://cpeg2020.org

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

3RD CONFERENCE OF THE ARABIAN JOURNAL OF GEOSCIENCES (CAJG)
2-5 NOVEMBER 2020, SOUSSE, TUNISIA
www.cajg.org

https://cajg.org

First and foremost, we would like to express our heartfelt appreciation to all authors of the Arabian Journal of Geosciences (AJGS) for their trust in us and to our reviewers and editors for their continued support. It was only with their co-operation, enthusiasm, and spirit that we have been able make the AJGS a great success.

In continuation of the 2nd Conference of the Arabian Journal of Geosciences (CAJG) which was successfully organized in 2019, it is a pleasure and an honor to invite you to attend the 3rd CAJG, which will be held on 2–5 November 2020 on the waterfront of the Port El Kantaoui in Sousse, Tunisia.

The conference covers a wide range of topics that reflect the AJGS's multiple scientific interests. It is an opportunity to invite and thank the authors, reviewers and editors who have supported and been associated with the AJGS from the beginning.

Top researchers from all fields of geosciences will present their original work during these four days. To this end, a number of prominent speakers have agreed to give keynote presentations. Moreover, we are planning workshops, a social program and field trips, where participants can take a little time out to explore the wonders of the geological sites of Tunisia.

CONFERENCE TRACKS

The scientific committee of the 3rd CAJG invites research papers on all cross-cutting themes of Earth sciences, with a main focus on the following 15 conference tracks:

- Track 1. Atmospheric Sciences, Meteorology, Climatology, Oceanography
- Track 2. Biogeochemistry, Geobiology, Geoecology, Geoagronomy
- Track 3. Earthquake Seismology and Geodesy
- Track 4. Environmental Earth Sciences
- Track 5. Exploration & Theoretical Geophysics, Seismic & Well Logging Methods, Mathematical Geosciences
- Track 6. Geo-Informatics and Remote Sensing
- Track 7. Geochemistry, Mineralogy, Petrology, Volcanology
- Track 8. Geological Engineering, Geotechnical Engineering
- Track 9. Geomorphology, Geography, Soil Science, Glaciology, Geoarchaeology, Geoheritage
- Track 10. Hydrology, Hydrogeology, Hydrochemistry
- Track 11. Marine Geosciences, Historical Geology, Paleoceanography, Paleoclimatology
- Track 12. Numerical and Analytical Methods in Mining Sciences and Geomechanics
- Track 13. Petroleum and Energy Engineering, Petroleum Geochemistry
- Track 14. Sedimentology, Stratigraphy, Paleontology, Geochronology
- Track 15. Structural Geology, Tectonics and Geodynamics, Petroleum Geology
- Track 16. Special Session on Petroleum Systems in North Africa by NARG

Contact

For general enquiries, please contact: contact@cajg.org
For enquiries related to your submission, please contact: submission@cajg.org
For enquiries related to publications in the proceedings and special issues, please contact: nabil.khelifi@springer.com

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

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

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

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

New Date 88th ICOLD Annual Meeting & Symposium on Sustainable Development of Dams and River Basins, 28-November to 3-December 2020, New Delhi, India, https://www.icold2020.org

New Date 8-10 December 2020 ASIA 2020 Eighth International Conference and Exhibition on Water Resources and Renewable Energy Development in Asia, 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

New Date on 2021 ARMS11 11th Asian Rock Mechanics Symposium, Challenges and Opportunities in Rock Mechanics, Beijing, China, www.arms11.com

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

New Date on 2021 ARMS11 11th Asian Rock Mechanics Symposium, Challenges and Opportunities in Rock Mechanics, Beijing, China, www.arms11.com

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

New Date 18-20 January 2021 Nordic Geotechnical Meeting Urban Geotechnics, Helsinki, Finland, www.ril.fi/en/events/ngm-2020.html

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

GeoAsia 2021

7th Asian Regional Conference on Geosynthetics
March 1-4, 2021, Taipei, Taiwan

Water Storage and Hydropower Development for Africa

13-15 April 2021, Lake Victoria, Uganda
www.hydropower-dams.com/africa-2021

AFRICA 2021 will take place at the Speke Resort Munyonyo beside Lake Victoria, Uganda. The fourth in the AFRICA regional conference series, previous events have been held in Ethiopia, Morocco and Namibia.

AFRICA 2021 will bring together delegates from around the world to focus on the most relevant topics facing the continent today. This website will be updated regularly as further details of the conference are confirmed.

Conference Themes

Future plans for water resources and hydro development

- Potential and planned developments
- Adapting design and construction methods to suit Africa
- The role of hydro in regional development
- Regional cooperation on transboundary rivers
- The roles and challenges for river basin authorities and power pools
- The 'Belt and Road initiative' and how it affects hydropower in Africa
- The Programme for Infrastructure Development (PIDA)
- Building and maintaining transmission systems
- Hydro in synergy with other renewables
- Innovations in hydrogen technology and opportunities for hydro projects

Hydropower, large and small: the role, benefits and technology

- Hydro machinery (research, design and operational issues)
- Innovations in powerplant design
- Opportunities for expansion and refurbishment of existing schemes
- Small hydro
- Rural electrification
- Physical and cyber security
- Innovative low-cost technology
- Pumped storage
- Operation and maintenance
- Best maintenance practice in an African context

Civil engineering: innovation and challenges

- Innovations in dam engineering

- Surveillance of key structures
- Safety of dams, spillways, gates and powerplants
- Hydro-mechanical equipment
- Design of flood discharge works
- Hydrological monitoring of rainfall and runoff
- Sedimentation of reservoirs and irrigation canals
- Upgrading of dams and associated structures
- Complicated construction and challenging sites
- Materials for dams
- Dealing with AAR and ASR

Addressing risk and project financing

- Covid-19: Lessons in risk and resiliency at water infrastructure projects and operating schemes
- Adaptive project management and business continuity
- Risk and insurance
- Regulatory and policy frameworks
- Innovative financing and contractual issues at all project stages
- Sovereign debt and macro development economics in Africa
- Financial sustainability

Multipurpose schemes

- Multipurpose dams and reservoirs
- Water resources management including irrigation
- Planning for combined hydro and irrigation schemes
- Reservoir operation and cascade developments
- Small dams for irrigation and community water supply
- Hydropower and tourism

Climate, environment and social aspects

- Climate change: resilience, adaptation and mitigation
- Environmental and social aspects
- Dealing with weeds and water hyacinth
- Resettlement and livelihood improvement
- Capacity building
- Changing management and transformational leadership
- Developing local talent in the sector
- Post-ante and ex-post measurement of project success

Contact Us

If you have questions about attending AFRICA 2021 as an exhibitor, speaker or delegate, get in touch with us using the details below. You'll also find some quick answers to the most frequently asked questions.

Director Alison Bartle, ab@hydropower-dams.com / +44 20 8773 7240

Programme & speaker enquiries Margaret Bourke, africa2021@hydropower-dams.com / +44 20 8773 7244

WTC2021
16 - 19 MAY 2021 Copenhagen

World Tunnel Congress 2021
Underground solutions for a world in change
www.wtc2021.dk

The World Tunnel Conference 2021 and associated events will be held between the 14th and 20th of May 2021 at the Bella Congress Center Copenhagen. Denmark and Scandinavia will present some of the mega projects in the world. It's a great opportunity to learn and visit the project in our part of the world. In Denmark, existing and new projects are well under construction and site visits will be arranged. New Metro lines (Cityringen, Nordhavn and Sydhavn) are well under way. There is a great deal to learn from the Great Belt Link and the Øresund Link has been used for getting the Femern Fixed Link created. In Scandinavia: Norway, Sweden and Finland the construction of many other new mega infrastructure projects will start. The E39 crossings in Norway will be well underway and lessons learned from all the projects will be shared at the conference.

Themes

The overall theme for the conference will be Underground Solutions for a World in Change with the following priority themes:

- Climate resilience
- Innovative solutions for a sustainable society
- Subsurface planning
- Sustainable underground structures

The technical topics will include all well-known tunnel topics:

- Conventional Tunneling
- Mechanized Tunnelling
- Immersed Tunnels
- Shafts
- Cut & Cover, Ramps
- Mechanical and Electrical Installations
- Building Information Modelling
- Operation and Maintenance
- Planning
- Operational Safety of Underground Structures
- Understanding the Geological and Geotechnical Conditions
- Contractual Practices
- Ground Water Control
- Instrumentation and Monitoring
- Occupational Health and Safety (OHS)

Contacts

PROFESSIONAL CONGRESS ORGANISER
DIS Congress Service A/S
Lautruphøj 1-3
2750 Ballerup, Denmark
Phone: +45 4492 4492

GENERAL INFORMATION
Helle Klestrup wtc2021@discongress.com

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

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

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

The Second International Conference on Press-in Engineering (ICPE) 2021, Kochi

19 (Sat) ~ 21 (Mon) June 2021 | Kochi, Japan

https://icpe-ipa.org/

International Press-in Association (**IPA**) organizes the International Conference on Press-in Engineering (ICPE 2021) to be held in Kochi, June 19-21, 2021, successively to ICPE 2018 that was chaired by Dr. Osamu Kusakabe. We will warmly welcome all engineers, researchers, students and machine operators related to piling industry to the city of Kochi where the Press-in method was invented. The conference main theme is "**Evolution and Social Contribution of Press-in Engineering for Infrastructure Development, and Disaster Prevention and Mitigation**". Through the two-day conference and one-day technical tour with two invited keynote lectures by Prof. Yozo Fujino and Prof. Mark Randolph, three State-of-the-Art Reports as well as several technical sessions, the participants will certainly obtain the updated technical information on various aspects of piling engineering field as well as to create and expand personal new networks, in particular, among Press-in community, internationally.

Theme

Evolution and Social Contribution of Press-in Engineering for Infrastructure Development, and Disaster Prevention and Mitigation

1. Disaster prevention and mitigation, such as countermeasure against tsunami, erosion control, slope protections and others
2. Renovation or development of infrastructure, such as road, railway, adjacent construction, underground construction, rural area development and others
3. Improvement of productivity and environmental issues, such as development of devices, construction managements, logistics, noise, vibration and others
4. Methods or case studies of project evaluation
5. Performance assessment of structures, such as pressed-in piles/sheet piles, and retaining walls/deep foundations constructed by pressed-in piles/sheet piles and others
6. Education
7. Other

Contact us

ICPE 2021 Organizing Committee/ International Press-in Association

5F, Sanwa Konan Bldg, 2-4-3 Konan,
Minato-ku, Tokyo 108-0075, Japan
Email: icpe2021@gmail.com
Tel. +81-3-5461-1191
Fax +81-3-5461-1192

EUROCK TORINO 2021 - ISRM European Rock Mechanics Symposium Rock Mechanics and Rock Engineering from theory to practice, 21-25 June 2021, Torino, Italy, http://eurock2021.com

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

ICONHIC2021

3rd International Conference on
Natural Hazards & Infrastructure

ATHENS, GREECE | JUNE, 2021

ICONHIC2021 is coming to Athens

We are proud to announce that the 3rd International Conference on Natural Hazards & Infrastructure will take place in June 2021 in Athens, Greece.

2021 marks the 200 years of the Independence of the Greek State and the country's capital is preparing to commemorate this historic anniversary with iconic events throughout the year.

At ICONHIC2021, we proudly endorse these events and invite our delegates to jointly create a major conference, set to define a new era of progress, cooperation and new ideas.

New Date 5-6 July 2021 IS-Cambridge 2020 10th International Symposium on Geotechnical Aspects of Underground Construction in Soft Ground, Cambridge, United Kingdom, www.is-cambridge2020.eng.cam.ac.uk

New Date 12-15 July 2021 7th ICRAGEE International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, 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

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

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

5th International Workshop on Rock Mechanics and Engineering Geology in Volcanic Fields
9÷11 September 2021, Fukuoka, Japan

Contact Person: Prof. Takatoshi Ito
E-mail: jsrm-office@rocknet-japan.org

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

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

New Date October/December 2021 4th International Conference on Rock Dynamics and Applications (RocDyn-4), Melbourne, Australia, https://rocdyn.org

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

LARMS 2022
IX Latin American Congress on Rock Mechanics, Rock Testing and Site Characterization
15-18 May 2022, Asuncion, Paraguay

Symposium Themes

- Site characterization,
- Rock mass properties,
- Rock mass classification,
- Foundations,
- Slopes,
- Tunnels,
- Soft Rock,
- Shotcrete

Contact Person: Jose Pavon Mendoza
Address: Espana 959, casi Washington
Telephone: +595 971 909165
E-mail: jose.pavonm@gmail.com

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
Hightlighting 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 "Hightlighting 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.

Contact Information

- Contact person: Dr. Rallis Kourkoulis
- Email: rallisko@grid-engineers.com

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

12 ICG

12th International Conference on Geosynthetics
September 18 – 22, 2022, Rome, Italy

15th ISRM

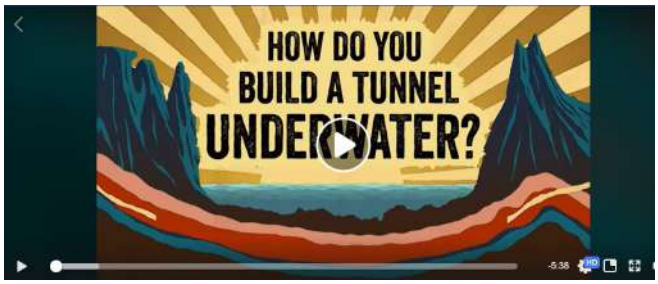
International Congress in Rock Mechanics
9÷14 October 2023, Salzburg, Austria

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

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

How the world's longest underwater tunnel was built

Flanked by two powerful nations, the English Channel has long been one of the world's most important maritime passages. Yet for most of its history, crossing was a dangerous prospect.



https://www.facebook.com/TEDEducation/videos/263296698010710/

TED-Ed

(αλιεύθηκε από τον συνάδελφο Γιάννη Μεταξά)

This Abandoned Tunnel In South Carolina Is The Secret Ingredient To A Famous Blue Cheese

The south is full of historic locations that have amazing tales. For many, discovering abandoned tunnels excites their inner adventurer. There's actually one tunnel in South Carolina that currently houses blue cheese and, yes, the cheese is edible.

The Stumphouse Tunnel, under Stumphouse Mountain in Walhalla, South Carolina, was planned to be one of the most used tunnels in the state.

It was originally created in the 1800s as a railroad tunnel to get around the Blue Ridge Mountains, making a more direct path to the Ohio River Valley.

However, due to the financial strain of the project, the state cut the funding and ended construction completely.

This left the tunnel abandoned for years, until Clemson University bought the tunnel in 1941 to make their blue cheese. To this day, this is still how the university cures their Clemson Blue Cheese.

The tunnel is 25 feet high, 17 feet wide, and stretches back 1,600 feet. The tunnel remains at a cool 50 degrees at all times and has a consistent "wetness" in the air, making it perfect to cure the famed tunnel blue cheese.

It's free to visit the tunnel; however, visitors must be careful in the darkness. Bats have made this tunnel their home and can be dangerous if frightened. So while this is a unique spot to visit, caution is highly advised.

The tunnel is also extremely dark all the way through, as lights were not installed during its original usage and haven't been added since.

With the bats most likely covering the ceiling of the tunnel, it may be best to not shine a flashlight directly above you. This way, you can avoid startling the bats.

The Stumphouse Tunnel Address: Stumphouse Tunnel Rd., Walhalla, SC

(Moná Thomas / NARCITY, April 13 2020, https://www.narcity.com/travel/us/sc/tunnel-in-south-carolina-is-1600-feet-long-and-is-full-of-blue-cheese)

BBT - Brenner Base Tunnel Info Film 2019

The Brenner Base Tunnel (BBT) is a straight, flat railway tun-

nel connecting two countries. It runs for 55 km between Innsbruck (in Austria) and Fortezza (in Italy).

In May 1994, a railway bypass was opened south of Innsbruck, known as the Inn valley tunnel. This 12.7 km tunnel links to the Brenner Base Tunnel. Passenger and freight trains along this stretch will therefore not only travel through the Brenner Base Tunnel, but for a few kilometres, through the Inn valley tunnel as well. This line, totalling 64 kilometres, will become the longest underground railway connection in the world.

https://www.youtube.com/watch?v=AQMP2eIsBtM

Big Data: Innovative Technology to make TBM Tunneling more Efficient

If you missed the Robbins webinar, No need to worry, you can watch an on-demand recording of their event on Big Data: Technology for Efficient TBM Tunneling please click here for further information.

Duration: 48 minutes Available On Demand

Summary

Modern TBMs are data-driven systems, from ground investigation tools ahead of the machine to touch-screen technology in operator's cabins, to integration with programs on the surface. Today's TBMs, paired with cutting-edge data collection and monitoring, can efficiently bore in even the most demanding circumstances.

In this complimentary 40-minute webinar, Robbins VP of Operations Steve Chorley and Aaron McClellan, Tunnel Superintendent III for Kiewit Underground, will explore the latest and greatest innovations in technology for TBMs. Nearly all the parameters of a TBM can be monitored today, and this data can be transmitted via radiating coaxial cables to offices on the surface or even mobile phones. Simple observations, such as cutterhead RPM and penetration rate in a given geology, can result in altered operational parameters and reduced thrust that can speed up advance and increase cutter life. All that is required is proactive analysis by management and engineers, and good communication with the TBM operator.

Relevant case studies from recent and ongoing projects will also be discussed. Submit your questions in advance to webinars@robbinstbm.com to get a thoughtful, well-researched answer during the Q&A session.

Speakers

Steve Chorley
Vice President – Operations / The Robbins Company

After serving as the Director of Operations for a number of years, Steve Chorley is now Vice President - Operations at the Robbins Company in Solon, Ohio. Steve holds a Bachelor's degree in Electrical Engineering and has over 35 years of extensive practical experience on large construction projects including the Channel Tunnel in the UK, the first phase of the Lesotho Highlands project in Africa and more recently on projects in Brazil, Chile, India & Italy. A native of Liverpool in the UK but currently residing and based in the USA, Steve is involved with all day-to-day operations and maintenance of all types of tunnel boring machines and associated equipment.

Aaron McClellan
Tunnel Superintendent / Kiewit Underground

Aaron McClellan has been Tunnel Superintendent for Kiewit Underground for the last 10 years. After graduating with a degree in Geological Engineering from the University of Nevada, Reno, McClellan began his work by primarily focusing on soft ground tunneling. He has worked on metro, water supply, and wastewater tunnels in North America, Europe, and Brazil, and has utilized all types of TBMs, from EPB to Slurry, Hard Rock, and Hybrid type machines. He has worked extensively on estimating and pursuing tunnel projects in the US and Canada in addition to his engineering, planning, and executing work as a superintendent.

For further information on Robbins please visit their website https://www.therobbinscompany.com

https://tunnelbuilder.com/News/Robbins-webinar-2.aspx

Spectacular Time Lapse Dam "Removal"

The Condit dam in Washington state was breached, allowing the reservoir behind it, Northwestern Lake, to drain into the White Salmon River as the nearly 100-year-old dam was disabled with explosives (October 28,2011). The reservoir draining took about 2 hours.

https://www.youtube.com/watch?v=J9cudp1eCdc

9 of the world's greatest tunnels

This year (σ.σ. 2014) marks the 20th anniversary of the opening of the Channel Tunnel linking France with the United Kingdom, and the 50th anniversary of the deal which led to its creation.

To mark the occasion, we're taking a look at some of the world's greatest tunnels.

1. Channel Tunnel (UK and France)

Connecting the United Kingdom with continental Europe (it has entrances/exits in Folkestone, Kent, and Pas-de-Calais in northern France), the tunnel has the world's longest undersea section -- 37.9 kilometers (23.5 miles).

Though a marvel of the modern age, it wasn't a new idea when it was built.

French engineer Albert Mathieu proposed a tunnel under the English Channel in 1802, although his plans included an artificial island mid-channel where horse-drawn carriages could make maintenance stops.

"This tunnel defined the term 'mega project,'" says Matt Sykes, tunnel expert and director at engineering company Arup.

"It fundamentally changed the geography of Europe and helped to reinforce high speed rail as a viable alternative to short-haul flights."

Length: 50 kilometers (31 miles)

Fast fact: Though both the English and French put in work to build the Channel Tunnel, the English side tunneled a greater distance.

More info: Euro Tunnel

2. Laerdal Tunnel (Aurland, Norway)

The Laerdal Tunnel in West Norway is the world's longest road tunnel and cost $153 million to build, which works out at $6,250 per meter.

The length of the tunnel prompted engineers to include various features designed to alleviate claustrophobia and tiredness.

"The sheer length of tunnel -- which takes 20 minutes to drive through -- led to innovation in the use of behavioral science and driver psychology in the design to reduce driver fatigue and improve safety," says Sykes.

"This resulted in large, colorfully lit caverns every six kilometers, providing points of interest and a unique driver experience."

Length: 24.5 kilometers (15.2 miles)

Fast fact: Engineers separated the tunnel into different sections to give the illusion that drivers are traveling through a number of smaller tunnels.

In these smaller sections drivers can take breaks, or even have a wedding ceremony, as one adventurous couple has previously done.

More info: The Fjords

3. Tokyo Bay Aqua-Line (Tokyo)

It's easy to mistake this tunnel for a bridge because part of the structure comprises a 4.4-kilometer span as well as a 9.6-kilometer subsea conduit.

The Aqua Line crosses Tokyo Bay and connects the cities of Kawasaki and Kisarazu.

It reduced the journey time between the two from 90 to 15 minutes.

"This project required the world's largest undersea tunnel boring machines and set the precedent for constructing two-lane road tunnels," points out Matt Sykes at Arup.

"The resilience of the construction was demonstrated during the 2011 Tohoku-Pacific Ocean earthquake, which caused severe damage to Tokyo Bay."

Length: 14 kilometers total (8.7 miles)

Fast fact: Constructed atop the Tokyo Bay Aqua Line is an island that functions as a rest area and mall.

The man-made island, called Umi-Hotaru, is a popular scenic point with an observation deck that gives a great view of Tokyo Bay.

More info: Nippon Civil Consulting Engineers

4. Eisenhower Tunnel (Colorado)

Colorado's Eisenhower road tunnel is one of the world's highest, located 3,401 meters (11,158 feet) above sea level, at the highest point on the U.S. interstate highway system.

It played a significant role in the women's rights movement when Janet Bonnema was hired as a construction worker in 1972.

Her supervisor misread her name as James, but realized his mistake and reassigned her to administrative duties after workers -- many of whom were former miners -- cited the common superstition that a woman's presence can bring bad luck to a mine.

Bonnema sued and was allowed to return to the tunnel.

A new equal rights law was subsequently passed.

Length: 2.72 kilometers (1.7 miles)

Fast fact: Prior to the tunnel's official opening in 1972, a drunk driver believed he should be the first person to take a vehicle through and was arrested for trespassing.

Charges were subsequently dropped because the signs prohibiting traffic were considered inadequate.

More info: Colorado Department of Transportation

5. Spiralen Tunnel (Drammen, Norway)

The dramatic Spiralen road tunnel, built in 1961 and comprising six spirals covering 1,649 meters (5,413 feet), leads to one of the most spectacular viewpoints in the industrial town of Drammen.

"Despite being an expensive country, Norway builds some of the cheapest tunnels," says Alun Thomas, head of tunnels at engineering consultancy Ramboll.

"This is because the engineers strip the design down to the bare essentials required for the flow of traffic in the tunnels. Maximum benefit for minimum effort -- that's good engineering."

Length: 1.65 kilometers (1.02 miles)

Fast fact: The tunnel opens out to a dramatic view of Drammen Valley and has a beer garden, restaurants and open-air museum.

6. Guoliang Tunnel (Henan Province, China)

Before the construction of this impressive tunnel, the only way to access the village of Guoliang was via a narrow path carved into the side of the Taihang Mountains.

In 1972, a group of 13 villagers decided to construct a tunnel, which they dug by hand.

Three died during the construction process but the tunnel transformed the village and became a tourist attraction in its own right.

"This tunnel is beautiful and a tribute the tenacity of the villagers who built it," says Thomas at Ramboll.

"For me it emphasizes how tunnel construction can enhance the environment as well as bringing huge benefits for society. At the same time, one should remember the cost and the fact that several villagers were killed during construction."

Length: 1.2 kilometers (0.74 miles)

Fast fact: The tunnel was built jagged and steep due to the village's primitive tools, earning it the nickname: "The road that does not tolerate any mistakes."

7. SMART (Kuala Lumpur, Malaysia)

"SMART is a combined road and flood relief tunnel," explains Thomas at Ramboll.

"It can be completely flooded to get rid of storm water and turned back into a road in a few hours."

The tunnel, the longest in Malaysia, was built to solve the problem of flash flooding in Kuala Lumpur.

SMART can operate in three ways.

When there's no flooding, it serves purely as a road tunnel.

When there are floods, rainwater can be diverted into a lower channel, and the upper level will remain open to traffic.

When exceptionally heavy floods occur, the tunnel closes to all traffic and watertight gates open to allow floodwater to flow through.

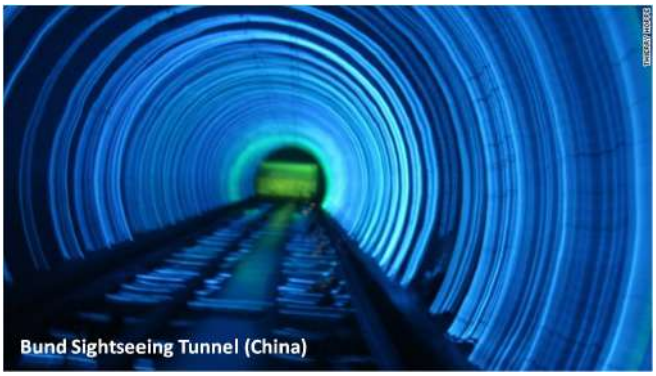
Length: 9.7 kilometers (6.02 miles)

Fast fact: The tunnel is expected to prevent billions of dollars of possible flood damage and costs from traffic congestion.

Since it opened in 2007, flood-prone areas such as Masjid Jamek, Dataran Merdeka, Leboh Ampang and Jalan Melaka have been spared inundation.

More info: SMART Motorway Tunnel

8. Bund Sightseeing Tunnel (Shanghai)



This underwater Chinese tunnel is short and sweet, but spectacular and slightly strange.

It spans the Huangpu River and connects Shanghai's Bund to Lujiazui, location of the Pearl TV tower.

Passengers were originally going to be ferried from one side to the other on a moving walkway, but automated cars were installed instead.

Length: 646.7 meters (2,122 feet)

Fast fact: A company that had worked with Disney was originally supposed to help design the tunnel, but was deemed too expensive.

Instead a Shanghai-based company created the tunnel's psychedelic lights and trippy audio-visual effects.

The ride is apparently meant to represent a journey to the core of the earth, and the tunnel currently ranks as one of Shanghai's top five tourist attractions.

9. Seikan Tunnel (Japan)

The Seikan is a railway tunnel in Japan, but what makes it unique is the fact that a 23-kilometer (14.2 miles) stretch of the tunnel is 140 meters (460 feet) below sea level.

It's the longest and deepest rail tunnel in the world, and spans the Tsugaru Strait, connecting Aomori Prefecture on the island of Honshu to the island of Hokkaido.

Work on the tunnel started in 1964 and was completed in 1988.

Length: 53 kilometers (32.9 miles)

Fast fact: In 1976, construction workers hit a patch of soft rock and water gushed into the tunnel at a rate of 80 tons per minute. The leak took two months to fix.

More info: JR-Hokkaido Hakadote Branch

(Tamara Hinson / CNN, 11th July 2014, http://edition.cnn.com/travel/article/great-tunnels/index.html)

(Οι φωτογραφίες προέρχονται από την σχετική αναδημοσίευση στο http://www.geoengineer.org/news-center/news/item/907-photo-gallery-9-of-the-world-s-greatest-tunnels?utm_source=GeoNewsletter+%23113%2C+July+2014&utm_campaign=Geo+News+July+2014&utm_medium=email, Monday, 14 July 2014)

12 of the World's Most Fascinating Dams

There are many jaw-dropping structural feats around the world that have their own interesting engineering designs.

But the one type of structure that would always leave us in great awe are dams.

Their sheer dimension and immense capacity have this humbling effect on anyone that would come across this structure. It's literally like standing in front of a calm, reassuring giant staring at you in all its glory. And it goes without saying, dams are one of the most intricately designed structures in the world.

Here, you will discover some of the largest and groundbreaking dams around the globe, which have become producers of sustainable energy.

1. Contra Dam (Switzerland)

First on the list of fascinating dams would have to be the Contra Dam or most commonly known as the Verzasca Dam in Ticino, Switzerland. It is perhaps most famous for its 1995 epic appearance in the opening scene of the James Bond movie GoldenEye.

Contra Dam is a slender concrete arch dam standing at a height of **220 m** with a crest length of **380 m**. Because of the dam's slender design, the volume of concrete required to construct it was reduced and consequently cutting down the cost of the infrastructure.

The dam's base is **28 m** in width and gradually tapers up to **7 m** at the crest. Two spillways were incorporated at each side of the structure, which has a maximum discharge capacity of **1,300 cubic meters** per second. Contra Dam also produces power through its **105 MW** power station with **3x35 MW** Francis turbines that generates an average of **234 GWh** per year.

Lago di Vogorno is a reservoir that was created and now impounded by the dam when it was constructed between 1961-1965. This reservoir has a maximum capacity of **105,000,000 cubic meters** of water and a surface area of **400 acres**.

2. Gordon Dam (Australia)

Located in southwest Tasmania in Australia, Gordon Dam is a double curvature concrete arch dam. One of the dam's amazing feature is that it's curved both in the vertical and horizontal directions to resist large hydraulic pressures coming from the **12,359,040 megaliters** of water in Lake Gordon, the largest lake in Australia.

The immense volume of water is diverted **183 m** to the underground power station, where three hydro turbines can generate up to **432 MW** of power. Approximately **13%** of Tasmania's electricity demand is provided by the Gordon Power Station.

Out of the **48 arch** dams that have been built in Australia, Gordon Dam is one of the only nine that is designed to be a double curving dam.

3. Monticello Dam (USA)

This **93 m** concrete arch dam in California, USA is one of the coolest dams in the world because of its mesmerizing spillway called the Glory Hole. The spillway is an uncontrolled morning glory type with a tip diameter of **22 m** and sits within the perimeters of Lake Berryessa, the seventh largest man-made lake in California.

It can drain **48,400 cubic feet** per second of water during the lake's peak level that occurs when the lake rises to **4.7 m** above the spillway's lip. The exit end of the spillway is also famous as a full pipe for skateboarders.

Lake Berryessa and the Glory Hole during and after drought

https://www.youtube.com/watch?v=EPJar2kh5zQ&feature=emb_logo

Monticello dam impounds the Putah Creek that can generate **56,806,000 kWh** of power annually using **2x5 MW** and **1x1.5 MW** turbines.

4. Hoover Dam (USA)

Hoover Dam is one of the most iconic dams around the world stretching between the American states of Nevada and Arizona. Originally called the Boulder dam, this colossal structure stands at a height of **221.4 m**, with a base width of **200 m** and a crest width of **14 m**.

It's a concrete gravity-arch dam that was constructed with the purpose to control flood, provide irrigation water, produce hydroelectric power, store water, and for recreation. The hydropower station houses various types of turbines like a **1x61.5 MW** Francis turbine and **2x2.4 MW** Pelton turbine, which produce an annual electrical output of **4.2 TWh.**

One of the biggest preparations done for the construction of Hoover Dam was the diversion of the Colorado River away from the site. To make this happen, four diversion tunnels were bored through the canyon walls - two on the Nevada side and two on the Arizona side.

On the 1st of February, 1935, a few years after the Colorado

River was diverted, a steel gate was lowered down to allow the water to take its natural course again. That was the first time in history when the Colorado River was under the control of man.

The dam impounds the Colorado River which consequently forms Lake Mead, the largest reservoir by volume (when full) in the United States.

5. Three Gorges Dam (China)

Known as the world's largest hydropower dam, the Three Gorges Dam stretches out **2.3 km** to span and impounds the Yangtze river in the Hubei province in China.

Capable of producing **87 TWh** of electricity per annum, this hydropower dam uses **32x700 MW** and **2x50 MW** of Francis turbines. Its structural profile is designed with a large base width of **115 m** and tapers to **40 m** at the crest.

Intended not only to produce electricity, the three Gorges Dam was also constructed to increase the shipping capacity of the Yangtze river and mitigate the chances of flooding downstream by providing large water storage space.

The most mind blowing fact about this dam is that it's capable of slowing the Earth's rotation by shifting immense volume of water.

6. Tarbela Dam (Pakistan)

Considered as the largest earth-filled dam in the world, the Tarbela Dam in Pakistan impounds the Indus river to serve

as irrigation supply, flood control, and to produce hydroelectric power.

In order to properly divert the Indus river, the dam's construction had to be done in three stages where large tunnels had to be constructed to act as diversion channels. The dam's main wall was built with earth and rock fill that spans **2,743.2 m** from the island to the right-hand side of the river. Two concrete auxiliary dams span the river from the island to the left-hand-side.

Equipped with **10x175 MW** and **4x432 MW** of turbines, Tarbela Dam is capable of producing **14.959 billion kWh** of electricity per annum.

7. Almendra Dam (Spain)

One of Spain's tallest structures, the Almendra Dam, literally translates to almond, is located in the country's province of Salamanca.

Impounding the Tormes river, this concrete gravity arch dam is part of the hydroelectric system known as the Duero Drops. The Duero Drops system is composed of five dams from Spain and three other dams nearby Portugal.

The spillway seen from the photo below can disperse water at a rate of **3,039 cubic meters** per second.

8. Itaipu Dam (Brazil)

This fascinating hydroelectric dam stretches **7, 919 m** from Brazil to Paraguay impounding the Parana river.

It beats the Three Gorges Dam in terms of power output at an average of **89.5 TWh** per annum by using **20x700 MW** Francis turbines. Ten of the turbines generate power for Paraguay, while the other ten brings power to Brazil.

Itaipu dam is, in fact, a series of four dams: a concrete wing dam, a main concrete dam, a rock-fill dam, and an earth-fill dam.

Impressively, the immense volume of concrete used in constructing the dam was properly cured using large refrigeration units equivalent to **50,000** deep freezers.

Another mind-blowing fact about this dam is that the Guaira Falls, once known as the world's most amazing water feature, was submerged under water when the Itaipu reservoir was filled. The Guaira Falls stood twice the height of Niagara falls and surged twice as much water.

9. Atatürk Dam (Turkey)

Located on the Euphrates river, the Atatürk Dam is the largest in Turkey and ranks sixth from the largest earth-and-rock filled embankment dams in the world. It is the centerpiece of the 22 dams that exist on the Euphrates and the Tigris, which comprise the integrated sectors of the Southeastern Anatolia Project, or GAP in Turkish (*Güney Doğu Anadolu Projesi*).

The Atatürk reservoir has a capacity of **48.7 cubic kilometers** of water and equipped with **8x300 MW** Francis turbines, which generate **8,900 GWh** of electrical power per annum. The construction of the dam wiped out many important historical sites like the birthplace of the Ancient Greek poet Lucian.

10. Kariba Dam (Zimbabwe)

One of the largest in Africa, the Kariba Dam supplies **1,626 MW** of power to the Copperbelt parts of both Zambia and Zimbabwe.

Impounding the Zambezi river, Kariba dam is outfitted with 10 types of Francis turbines capable of outputting an average of **6,400 GWh** of electrical power per year.

The dam was designed as a double curvature concrete arch-dam to effectively resist the **180 cubic kilometres** of water

pressing against it.

Because of the immense volume of water from the created Kariba reservoir, over 6,000 animals had to be rescued by Operation Noah as the Kariba Gorge was flooded.

11. Kerr Dam (USA)

Designed for producing hydroelectricity, the Kerr Dam also serves as wildlife resources, forest conservation, and public recreational uses.

By impounding the Flathead River, the dam is capable of producing **426 GWh** of electricity per annum.

It is one of the two PPL Montana dams located west of the Continental Divide where the Flathead river cascadingly empties into the Clark Fork River, which subsequently empties into the Columbia River.

Finally, the Columbia River empties right into the Pacific ocean.

12. Gariep Dam (South Africa)

The Gariep Dam was designed to be a hybrid gravity-arch dam as the gorge is too wide for a full arch.

Gravity abutments are formed using flank walls then the design gradually arches at the center of the dam. It impounds the Orange river and creates the Gariep reservoir with a maximum capacity of **5,340,00 megaliters**. **899 GWh** of electrical power is produced by the dam annually using **4x90 MW** turbines.

The Gariep Dam bridge is also visible from the photo below, where the Orange and Caledon rivers flow through as well the Brakspruit, Broekspruit, Oudagspruit, and Slykspruit streams.

(Kathleen Villaluz / INTERESTING ENGINEERING, April 26, 2020, https://interestingengineering.com/12-of-the-worlds-most-fascinating-dams)

NMSU engineer's earthworm-inspired devices may lead to soils exploration in space

New Mexico State University associate professor Douglas Cortes, left, and his research assistants, Russell Buehling, bottom, a senior in electrical engineering; Cyrena Ridgeway, right, a master's student in civil engineering; and Salvador Ibarra, top, a senior in electrical engineering, gather around to test a flow sensor using an Arduino microcontroller.

LAS CRUCES - New Mexico State University civil engineering associate professor Douglas Cortes is investigating the amazing burrowing abilities of the common earthworm, found in soil the world over, to study the characteristics of soils on Mars and Earth's moon and identify life-sustaining substances.

Cortes and his research team received funding from NASA and the New Mexico Space Grant Consortium to develop facilities from which to deploy a new generation of earthworm-inspired self-excavating subsurface characterization tools that are both light and small, so they could easily be transported to the moon and Mars.

The subsurface of Mars and the moon comprise a wealth of resources, from those that support basic human necessities, such as water, in the form of ice, to propellants such as methane, in the form of hydrates.

"Subsurface excavation on Earth is somewhat simple. However, one of the challenges of geotechnical engineering is that extracting information from the ground requires large and heavy equipment to provide the force necessary to drive probes into the ground," explained Cortes. "NASA is not likely to put heavy equipment on the Space Shuttle."

Earthworms, however, use the soil itself to gain the resistance force necessary to drive forward thrust, expanding and contracting as they penetrate deeper.

Cortes began his research on earthworm-inspired soil penetration as part of the National Science Foundation Center for Bio-Mediated and Bio-Inspired Geotechnics launched in 2015

to develop and implement nature-inspired sustainable solutions to geotechnical engineering and infrastructure problems. NMSU was named one of four universities in the consortium for the $18.5 million NSF award.

New Mexico State University associate professor Douglas Cortes, left, and Russell Buehling, undergraduate research assistant and electrical engineering senior, prepare a bio-inspired self-excavating probe for testing in dry sand.

Cortes and his team developed a series of earthworm-inspired soil penetration devices that have provided insight into the mechanical advantages of earthworm penetration in sands. The group devised a very simple tool that emulates the earthworm: a tube connected to a balloon that can inflate and deflate as it moves through soil.

Control tests that mimicked conventional soil penetration and the bio-inspired soil penetration show promise: "We have conducted tests on dry and partially saturated loose and dense sands. In all cases, we find a significant reduction in penetration resistance when using the earthworm's burrowing strategy. Seems logical that an animal that has lived underground for over 300 million years may have an edge over our soil penetration devices," Cortes said.

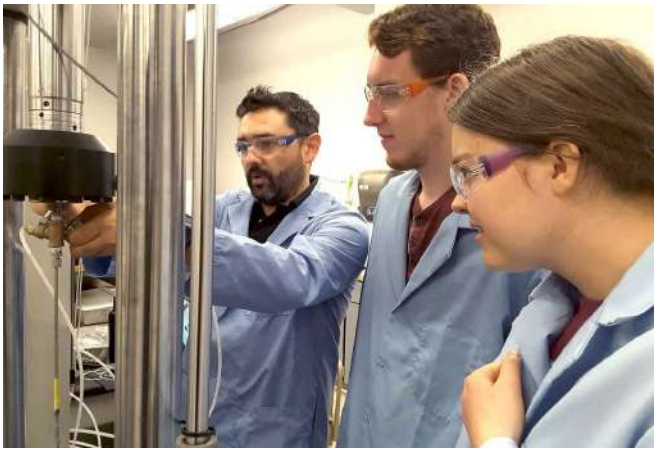
The results of this research led Cortes to believe that an earthworm-inspired self-excavating geoprobe could be used to conduct Martian and lunar subsurface sampling and testing and to gain other information about underground resource deposits. However, testing the devices in ground that is similar to that found in extraterrestrial environments is as important as the development of the self-excavating devices themselves.

With the new NASA funding, Cortes will develop an instrumented regolith subsurface exploration testbed to monitor the performance of his earthworm-inspired devices under controlled laboratory conditions. Regolith is a layer of loose deposits covering solid rock that includes dust, soil, broken rock and other related materials.

"We have information on lunar regolith from the Apollo missions," Cortes said. A mixture mimicking the lunar material is available commercially and will be used in a 55-gallon testbed, capable of accommodating probes up to four inches in diameter. The testbed will be equipped with acoustic sensors and other electronics, which will detect and record sound waves emitted from movement in the ground and how it responds to the activity of the probes. The probes will be equipped with a variety of sensors that will measure things like force and temperature. Further, the probes could be tethered to draw power from a rover.

Additionally, this project aims to enhance and expand the testbed capabilities. Cortes has also secured additional funds to purchase a modular loading frame for the 55-gallon testbed and to double the current testing depth range. Upon completion of this project, a new regolith subsurface exploration testbed will be available to meet the needs of researchers working toward the development of extraterrestrial subsurface exploration tools.

This research aligns with NASA's goal to secure resources that would enable sustaining human life on both the moon and Mars. Cortes' team plans to continue working with NASA on the development of landed subsurface exploration, production of water and methane from underground ice and hydrate deposits, and the development of basic infrastructure to support scientific and commercial capabilities on Mars and on the moon.



New Mexico State University civil engineering associate professor Douglas Cortes, left, and his students, Lane Yutzy, center, and Luisa Bannister conduct an earthworm-inspired soil penetration test. Yutzy is a National Science Foundation Research Experiences for Undergraduates student and biology senior at Shippensburg University in Pennsylvania, and Bannister graduated with a Bachelor of Science in civil engineering from NMSU in May 2019.

"It is a small grant but we have big ideas," said Cortes. "It will be good for NMSU and for New Mexico to have a facility to support new research efforts in the field of self-excavating robots for terrestrial and extraterrestrial subsurface exploration. Our vision is to develop a platform in New Mexico from which to launch a new generation of devices that will help make the dream of an extraterrestrial human settlement a reality."

"Eye on Research" is provided by New Mexico State University. This week's feature was written by Linda Fresques of the College of Engineering. Fresques can be reached at 575-646-7416 or lfresque@nmsu.edu.

(Linda Fresques │New Mexico State University / Las Cruces Sun News, Apr. 25, 2020, https://eu.lcsun-news.com/story/news/local/community/2020/04/25/nmsu-engineers-earthworm-inspired-devices-may-lead-soils-exploration-space/3027165001/)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ

Coronavirus lockdowns have changed the way Earth moves

A reduction in seismic noise because of changes in human activity is a boon for geoscientists.

Residents of Brussels have been told to stay at home, leaving the city's streets empty.

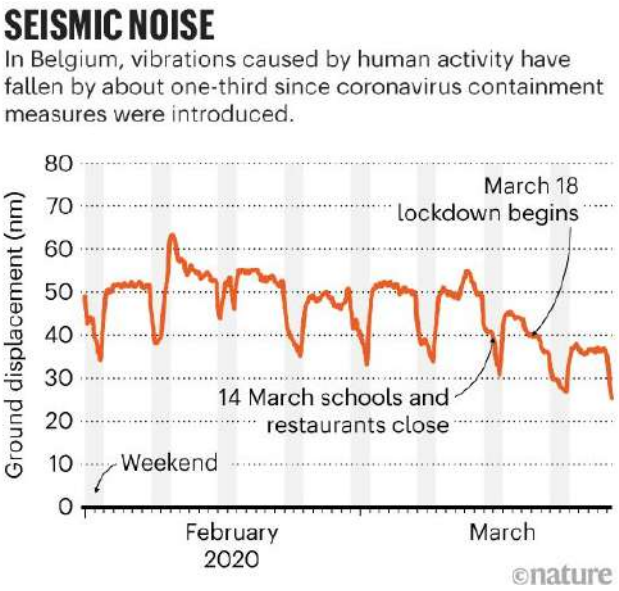
The coronavirus pandemic has brought chaos to lives and economies around the world. But efforts to curb the spread of the virus might mean that the planet itself is moving a little less. Researchers who study Earth's movement are reporting a drop in seismic noise — the hum of vibrations in the planet's crust — that could be the result of transport networks and other human activities being shut down. They say this could allow detectors to spot smaller earthquakes and boost efforts to monitor volcanic activity and other seismic events.

A noise reduction of this magnitude is usually only experienced briefly around Christmas, says Thomas Lecocq, a seismologist the Royal Observatory of Belgium in Brussels, where the drop has been observed.

Just as natural events such as earthquakes cause Earth's crust to move, so do vibrations caused by moving vehicles and industrial machinery. And although the effects from individual sources might be small, together they produce background noise, which reduces seismologists' ability to detect other signals occurring at the same frequency.

Data from a seismometer at the observatory show that measures to curb the spread of COVID-19 in Brussels caused human-induced seismic noise to fall by about one-third, says Lecocq. The measures included closing schools, restaurants and other public venues from 14 March, and banning all non-essential travel from 18 March (see 'Seismic noise').

The current drop has boosted the sensitivity of the observatory's equipment, improving its ability to detect waves in the same high frequency range as the noise. The facility's surface seismometer is now almost as sensitive to small quakes and quarry blasts as a counterpart detector buried in a 100-metre borehole, he adds. "This is really getting quiet now in Belgium."



Information boost

If lockdowns continue in the coming months, city-based detectors around the world might be better than usual at detecting the locations of earthquake aftershocks, says Andy Frassetto, a seismologist at the Incorporated Research Institutions for Seismology in Washington DC. "You'll get a signal with less noise on top, allowing you to squeeze a little more information out of those events," he says.

The fall in noise could also benefit seismologists who use naturally occurring background vibrations, such as those from crashing ocean waves, to probe Earth's crust. Because volcanic activity and changing water tables affect how fast these natural waves travel, scientists can study these events by monitoring how long it takes a wave to reach a given detector. A fall in human-induced noise could boost the sensitivity of detectors to natural waves at similar frequencies, says Lecocq, whose team plans to begin testing this. "There's a big chance indeed it could lead to better measurements," he says.

Belgian seismologists are not the only ones to notice the effects of lockdown. Celeste Labedz, a graduate student in geophysics at the California Institute of Technology in Pasadena, tweeted that a similar fall in noise had been picked up by a station in Los Angeles. "The drop is seriously wild," she said.

However, not all seismic monitoring stations will see an effect as pronounced as the one observed in Brussels, says Emily Wolin, a geologist at the US Geological Survey in Albuquerque, New Mexico. Many stations are purposefully located in remote areas or deep boreholes to avoid human noise. These should see a smaller decrease, or no change at all, in the level of high-frequency noise they record, she says.

doi: 10.1038/d41586-020-00965-x

(Elizabeth Gibney / nature, 31 March 2020, https://www.nature.com/articles/d41586-020-00965-x)

Sediments May Control Location, Magnitude of Megaquakes

The world's most powerful earthquakes strike at subduction zones, areas where enormous amounts of stress build up as one tectonic plate dives beneath another. When suddenly released, this stress can cause devastating "megaquakes" like the 2011 Mw 9.0 Tohoku event, which killed nearly 16,000 people and crippled Japan's Fukushima Dai-ichi Nuclear Power Plant. Now a study published in *Geology* suggests that sediments atop the downgoing slab can play a key role in determining the magnitude and location of these catastrophic events.

In this newly published study, a team led by Gou Fujie, a senior scientist at the Japan Agency for Marine-Earth Science and Technology, used a trio of geophysical methods to image the subducting sediments in the northeastern Japan arc, where the Tohoku event occurred. The findings suggest that variations caused by volcanic rocks intruded into these sediments can substantially influence the nature of subduction zone earthquakes.

"Our imaging shows that the enormous amount of slip that occurred during the 2011 Tohoku earthquake stopped in an area of thin sediments that are just starting to subduct," says Fujie. "These results indicate that by disturbing local sediment layers, volcanic activity that occurred prior to subduction can affect the size and the distribution of interplate earthquakes after the layers have been subducted."

Researchers first began to suspect that variations in subducting sediments could influence megaquakes after the 2011 Tohoku event, when international drilling in the northeastern Japan arc showed that giant amounts of slip during the earthquake occurred in a slippery, clay-rich layer located within the subducting sediments. To better understand the nature of the downgoing slab in this region, Fujie's team combined several imaging techniques to paint a clearer picture of the subseafloor structure.

The researchers discovered there are what Fujie calls "remarkable regional variations" in the sediments atop the downgoing plate, even where the seafloor topography seems to be flat. There are places, he says, where the sediment layer appears to be extremely thin due to the presence of an ancient lava flow or other volcanic rocks. These volcanic intrusions have heavily disturbed, and in places thermally metamorphosed, the clay layer in which much of the seismic slip occurred.

Because the type of volcanism that caused sediment thinning in the northeastern Japan arc has also been found in many areas, says Fujie, the research suggests such thinning is ubiquitous—and that this type of volcanic activity has also affected other seismic events. "Regional variations in sediments atop descending oceanic plates appear to strongly influence devastating subduction zone earthquakes," he concludes.

Featured Article

Spatial variations of incoming sediments at the northeastern Japan arc and their implications for megathrust earthquakes

Gou Fujie et al., fujie@jamstec.go.jp. URL: https://pubs.geoscienceworld.org/gsa/geology/article/doi/10.1130/G46757.1/583388/Spatial-variations-of-incoming-sediments-at-the

(Kea Giles / GEOLOGICAL SOCIETY OF AMERICA, 31 March 2020, https://www.geosociety.org/GSA/News/pr/2020/20-11.aspx)

Spatial variations of incoming sediments at the northeastern Japan arc and their implications for megathrust earthquakes

Gou Fujie, Shuichi Kodaira, Yasuyuki Nakamura, Jason P. Morgan, Anke Dannowski, Martin Thorwart, Ingo Grevemeyer, Seiichi Miura

The nature of incoming sediments is a key controlling factor for the occurrence of megathrust earthquakes in subduction zones. In the 2011 M_w 9 Tohoku earthquake (offshore Japan), smectite-rich clay minerals transported by the subducting oceanic plate played a critical role in the development of giant interplate coseismic slip near the trench. Recently, we conducted intensive controlled-source seismic surveys at the northwestern part of the Pacific plate to investigate the nature of the incoming oceanic plate. Our seismic reflection data reveal that the thickness of the sediment layer between the seafloor and the acoustic basement is a few hundred meters in most areas, but there are a few areas where the sediments appear to be extremely thin. Our wide-angle seismic data suggest that the acoustic basement in these thin-sediment areas is not the top of the oceanic crust, but instead a magmatic intrusion within the sediments associated with recent volcanic activity. This means that the lower part of the sediments, including the smectite-rich pelagic red-brown clay layer, has been heavily disturbed and thermally metamorphosed in these places. The giant coseismic slip of the 2011 Tohoku earthquake stopped in the vicinity of a thin-sediment area that is just beginning to subduct. Based on these observations, we propose that post-spreading volcanic activity on the oceanic plate prior to subduction is a factor that can shape the size and distribution of interplate earthquakes after subduction through its disturbance and thermal metamorphism of the local sediment layer.

https://pubs.geoscienceworld.org/gsa/geology/article/doi/10.1130/G46757.1/583388/Spatial-variations-of-incoming-sediments-at-the

Large earthquakes follow 'Devil's Staircase' mathematical pattern

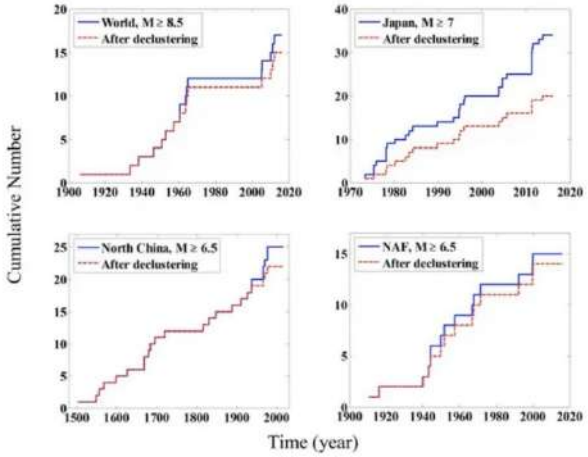
According to a new study published in the Bulletin of the Seismological Society of America, the occurrence of large shallow earthquakes worldwide follows a mathematical pattern called the Devil's Staircase, wherein clusters of seismic events are separated by long but irregular intervals of seismic quiet. The result in this study is different from the pattern predicted by classical models.

The Devil's Staircase pattern, sometimes called a Cantor function, is a fractal demonstrated by nonlinear dynamic systems, wherein a change in any portion could impact the behavior of the whole system. In nature, the pattern can be

seen in sedimentation sequences, changes in uplift and erosion rates and reversal in the magnetic field of the Earth, for instance.

This pattern is evident in huge earthquakes in the Great Basin, spanning Nevada, most of Oregon and Utah, and portions of California, Idaho, and Wyoming.

The same pattern is also found in Australia, on the Africa-Eurasia plate boundary off western Algeria coast, along the Dead Sea Transform Fault, and likely in the New Madrid seismic zone of central U.S., according to researcher Dr. Mian Liu.



The result in this study is different from the pattern predicted by classical models that suggest cycles of build-up and release of tectonic stress would make tremors occur periodically.

Yuxuan Chen, the study's lead author, said periodic large earthquake sequences are relatively unusual. Liu, also Chen's Ph.D. supervisor, learned of the Devil's Staircase pattern in an unprecedented way-- by reading a study of the temporal pattern of a serial killer from the former Soviet Union.

"I stumbled into this topic a few years ago when I read about two UCLA researchers' study of the temporal pattern of a notorious serial killer, Andrei Chikatilo, who killed at least 52 people from 1979 to 1990 in the former Soviet Union," Liu explained.

"The time pattern of his killings is a Devil's staircase. The researchers were trying to understand how the criminal's mind worked, how neurons stimulate each other in the brain. I was intrigued because I realized that earthquakes work in a similar way, that a fault rupture could stimulate activity on other faults by stress transfer."

Liu added, "Conceptually, we also know that many large earthquakes, which involve rupture of multiple and variable fault segments in each rupture, violate the basic assumption of the periodic earthquakes model, which is based on repeated accumulation and release of energy on a given fault plane."

Researcher and co-author Gang Luo of Wuhan University said the factors controlling the clustered events are complex and may involve the stress that triggers an earthquake, changes in frictional properties, and stress transfer between faults or fault segments in the event of a rupture, among other factors. He also remarked that the intervals appear to be inversely related to the background tectonic strain rate for a region.

Reference

"Complex Temporal Patterns of Large Earthquakes: Devil's Staircases" - Chen, Y. et al. - Bulletin of the Seismological Society of America - DOI: 10.1785/0120190148

(Julie Celestial / THE WATCHERS, April 19, 2020, https://watchers.news/2020/04/19/large-earthquakes-follow-devil-s-staircase-mathematical-pattern)

Complex Temporal Patterns of Large Earthquakes: Devil's Staircases

Yuxuan Chen, Mian Liu & Gang Luo

Abstract

Periodic or quasiperiodic earthquake recurrence on individual faults, as predicted by the elastic rebound model, is not common in nature. Instead, most earthquake sequences are complex and variable, and often show clusters of events separated by long but irregular intervals of quiescence. Such temporal patterns are especially common for large earthquakes in complex fault zones or regional and global fault networks. Mathematically described as the Devil's Staircase, such temporal patterns are a fractal property of nonlinear complex systems, in which a change of any part (e.g., rupture of a fault or fault segment) could affect the behavior of the whole system. We found that the lengths of the quiescent intervals between clusters are inversely related to tectonic-loading rates, whereas earthquake clustering can be attributed to many factors, including earthquake-induced viscoelastic relaxation and fault interaction. Whereas the underlying causes of the characteristics of earthquake sequences are not fully known, we attempted to statistically characterize these sequences. We found that most earthquake sequences are burstier than the Poisson model commonly used in probabilistic seismic hazard analysis, implying a higher probability of repeating events soon after a large earthquake.

(Bulletin of the Seismological Society of America (2020), https://doi.org/10.1785/0120190148, https://pubs.geoscienceworld.org/ssa/bssa/article-abstract/doi/10.1785/0120190148/583503/Complex-Temporal-Patterns-of-Large-Earthquakes?redirectedFrom=fulltext)

Study shows ground may start 'wobbling' months prior to a giant earthquake

A new study by an international team of geoscientists shows that a strange reversal of ground motion occurred prior to two of the biggest earthquakes in history-- the M8.8 great Maule quake in 2010 and the M9 Tohoku-Oki quake in 2011, which triggered a catastrophic tsunami and the Fukushima nuclear meltdown. The researchers hope that these movements they call "wobbles" could alert seismologists in the future, and give countries enough time to prepare for a disaster.

The 2011 earthquake in Japan was the strongest in the country's recorded history-- the landmasses yanked from east to west, and then east again months before the devastating event that killed more than 15 500 people.

These movements or wobbles occur when one of the Earth's tectonic plates slip under another, which jams up the planet until it is broken, resulting in an earthquake.

"What happened in Japan was an enormous but very slow wobble - something never observed before," said co-author Michael Bevis, a professor of earth sciences at Ohio State University.

"But are all giant earthquakes preceded by wobbles of this kind? We don't know because we don't have enough data. This is one more thing to watch for when assessing seismic risk in subduction zones like those in Japan, Sumatra, the Andes, and Alaska."

2011 Tohoku-Oki earthquake.

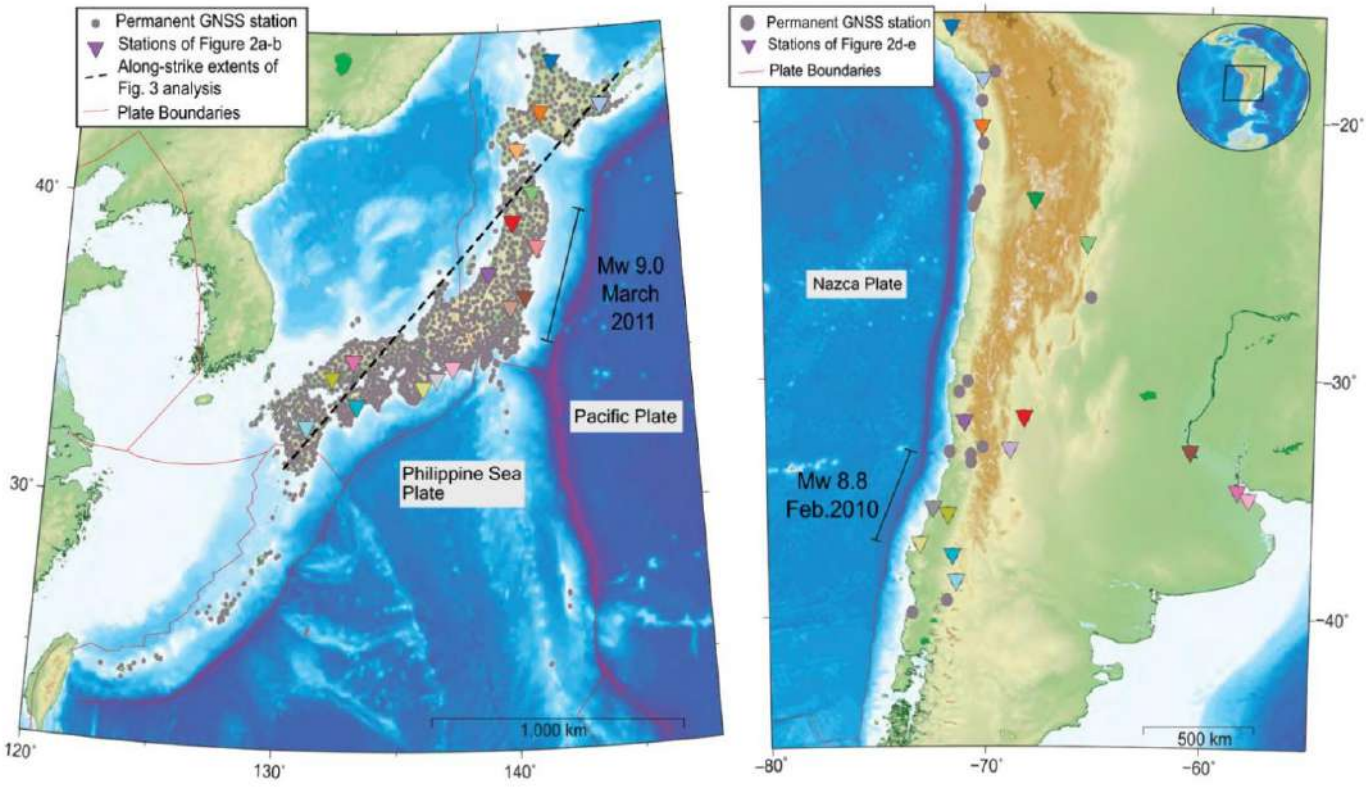
Bevis added that although people standing on the island would not have been able to detect or notice the wobble as the movement is just a few millimeters per month over a period of five to seven months, the movement was evident in data recorded by more than 1 000 GPS stations throughout Japan.

2010 Maule earthquake.

Geoscientists from Germany, Chile, and the U.S. analyzed the data and found a reversing shift about 4 to 8 mm (0.2 to 0.3 inches) east, then to the west, and to the east again. The team explained that those movements were markedly different from the steady shifts that the landmasses continuously generate.

"The world is broken up into plates that are always moving in one way or another. Movement is not unusual. It's this style of movement that's unusual," said Bevis.

The professor noted that the wobble could indicate that in the months before the tremor, the plate under the Philippine Sea had a "slow slip event", a gentle underthrusting of two adjoining oceanic plates under Japan, which eventually triggered a huge westward and downward sway. This drove the Pacific plate and slab beneath Japan, producing powerful seismic waves that pounded the entire country.



GNSS stations in Japan and Chile

The event inflicted widespread damage throughout Japan, also causing large parts of Honshu island to be permanently shifted a few meters to the east. It triggered a tsunami that reached more than 40 m (131 feet), and more than 450 000 were left homeless. Several nuclear reactors at the Fukushima Daiichi power plant sent a stream of toxic and radioactive materials into the atmosphere as it melted. Overall, it was the worst nuclear disaster since Chernobyl.

Scientists who study seismic activities and plate tectonics try to identify the approximate magnitude of the next massive earthquake and forecast where and when they may take place. However, lead author Jonathan Bedford, also a researcher at the GFZ, explained that GPS systems are needed in some subduction zones around the world in order to use the findings of the study to predict quakes.

Japan had one of the largest GPS monitoring systems in the world in 2011, which provided the country with sufficient data and allowed the researchers to analyze the landmass' swinging movements months before the event.

Chile and Sumatra were also hit by catastrophic earthquakes and tsunamis in 2010 and 2004, respectively, but they had less-comprehensive systems during those times.

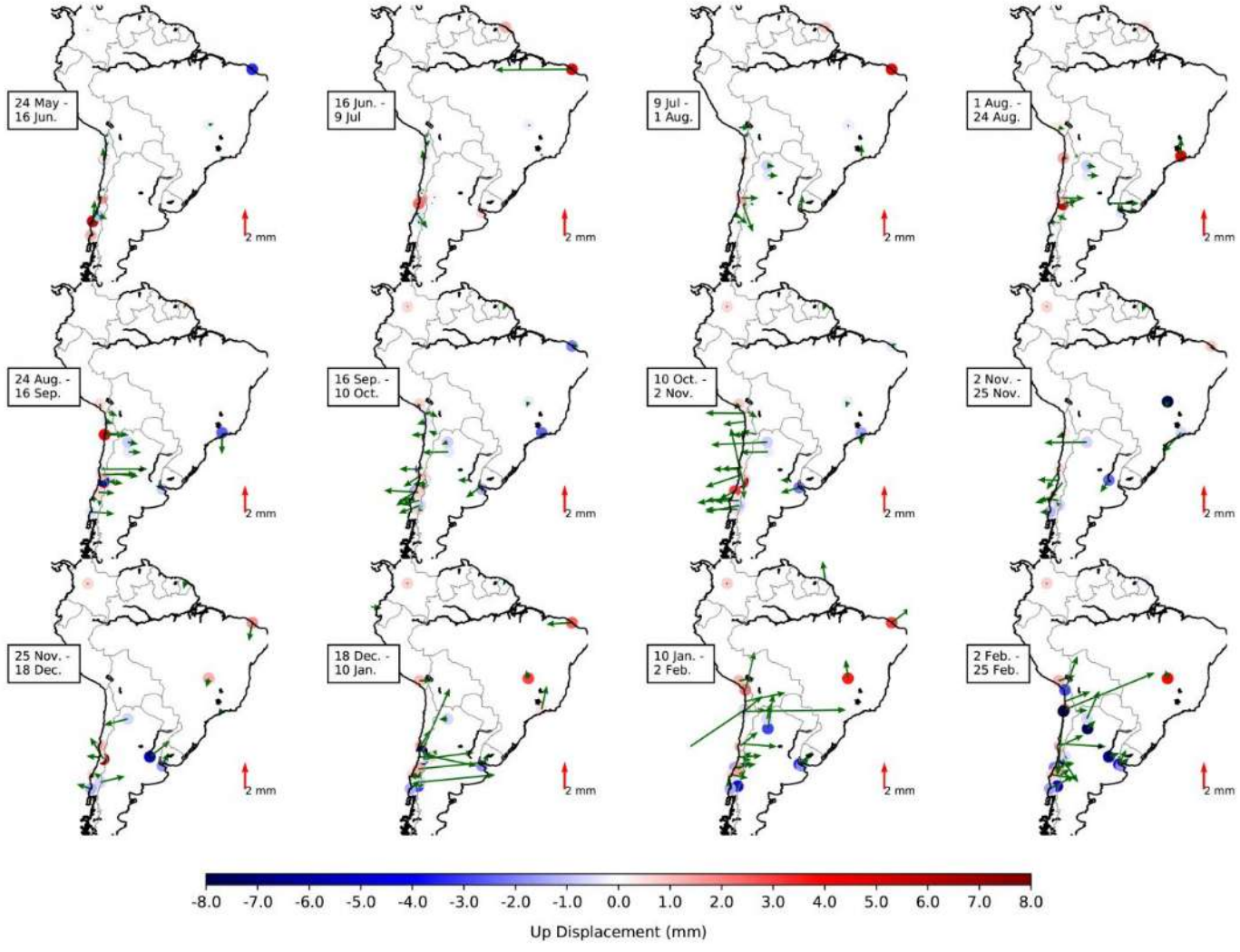
The team studied similar data from the 2010 Maule quake in Chile. The network is not as dense, but still tracked much of the deforming continental plate.

The stations on land normally move away slightly from the subduction trench as the continental crust is mashed and shortened. However, by analyzing the time sequences of GNSS signals, the researchers found evidence of a wobble--stations suddenly shifted towards the subduction trench and reversed their direction again, back to the normal movement.

Shortly after the second reversal, the underground tore, followed by the massive quakes. Bedford explained that it was "only just good enough to capture the signal."

The team hopes that by tracking wobbles, nations at risk will be alerted and given more time to prepare for an upcoming disaster, and a sensor network is necessary for this.

"We really need to be monitoring all major subduction zones with high-density GPS networks as soon as possible."



Motion of tectonic plates changed in direction and speed months before the massive earthquake.

References

"Months-Long thousand-kilometer-scale wobbling before great subduction earthquakes" - Bedford, J. et al. - Nature - https://doi.org/10.1038/s41586-020-2212-1

Abstract

Megathrust earthquakes are responsible for some of the most devastating natural disasters1. To better understand the physical mechanisms of earthquake generation, subduction

zones worldwide are continuously monitored with geophysical instrumentation. One key strategy is to install stations that record signals from Global Navigation Satellite Systems2,3 (GNSS), enabling us to track the non-steady surface motion of the subducting and overriding plates before, during and after the largest events4,5,6. Here we use a recently developed trajectory modeling approach7 that is designed to isolate secular tectonic motions from the daily GNSS time series to show that the 2010 Maule, Chile (moment magnitude 8.8) and 2011 Tohoku-oki, Japan (moment magnitude 9.0) earthquakes were preceded by reversals of 4–8 millimeters in surface displacement that lasted several months and spanned thousands of kilometers. Modeling of the surface displacement reversal that occurred before the Tohoku-oki earthquake suggests an initial slow slip followed by a sudden pulldown of the Philippine Sea slab so rapid that it caused a viscoelastic rebound across the whole of Japan. Therefore, to understand better when large earthquakes are imminent, we must consider not only the evolution of plate interface frictional processes but also the dynamic boundary conditions from deeper subduction processes, such as sudden densification of the metastable slab.

(Julie Celestial / THE WATCHERS, April 30, 2020, https://watchers.news/2020/04/30/study-shows-ground-may-start-wobbling-months-prior-to-a-giant-earthquake)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΓΕΩΛΟΓΙΑ

Γύρω στο 1560 π.Χ. η έκρηξη του ηφαιστείου της Θήρας

Σύμφωνα με νέα εκτίμηση Αμερικανών επιστημόνων

Ακρωτήρι Θήρας. Η Ξεστή 3 από τα ανατολικά

Αμερικανοί ερευνητές, οι οποίοι βασίστηκαν σε μια βελτιωμένη τεχνική δενδροχρονολόγησης, ανακοίνωσαν περίπου το 1560 π.Χ. ως την πιθανότερη ημερομηνία για την ισχυρή «μινωική» έκρηξη του ηφαιστείου της Θήρας (Σαντορίνης).

Η χρονολόγηση της έκρηξης, μιας από τις ισχυρότερες που έχουν ποτέ συμβεί στη Γη, αποτελεί σημαντική πρόκληση και πολλοί ξένοι και Έλληνες επιστήμονες ασχολούνται κατά καιρούς με το ζήτημα. Η νέα μελέτη, με επικεφαλής την επίκουρη καθηγήτρια δενδροχρονολόγησης και ανθρωπολογίας, Σάρλοτ Πίρσον, επικεφαλής του Εργαστηρίου Έρευνας Δακτυλίων Δέντρων του Πανεπιστημίου της Αριζόνα, δημοσιεύθηκε στο περιοδικό της Εθνικής Ακαδημίας Επιστημών των ΗΠΑ (PNAS)

Πριν από μόλις μία εβδομάδα, μία άλλη ομάδα Αμερικανών και Ευρωπαίων επιστημόνων, με επικεφαλής τον καθηγητή κλασικής αρχαιολογίας Στουρτ Μάνινγκ του Πανεπιστημίου Κορνέλ της Νέας Υόρκης, που έκαναν τη σχετική δημοσίευση στο περιοδικό «Science Advances», είχαν ανακοινώσει ότι η έκρηξη πιθανώς έγινε μεταξύ του 1600 και του 1550 π.Χ., ενώ η προηγούμενη επιστημονική εκτίμηση ήταν ότι η έκρηξη είχε συμβεί μεταξύ του 1630 και του 1600 π.Χ.

«Η πιο παλιά δενδροχρονολόγηση που έχουμε κάνε, φτάνει έως πριν από 12.000 χρόνια. Όμως στη Μεσόγειο το πρόβλημα είναι ότι δεν έχουμε μια πλήρη και συνεχή χρονολόγηση που να φτάνει έως την εποχή της αρχαίας Θήρας. Έχουμε πολύ καλά στοιχεία για τα τελευταία 2.000 χρόνια, όμως πιο πίσω υπάρχει ένα κενό. Έχουμε δακτυλίους δέντρων από πιο πρώιμες περιόδους, όμως δεν γνωρίζουμε ακριβώς σε ποιες χρονολογίες αντιστοιχούν», δήλωσε η Πίρσον.

Αυτή τη φορά πάντως, οι Αμερικανοί ερευνητές πιστεύουν ότι έφτασαν πιο κοντά στην πραγματική χρονολόγηση της λεγόμενης «μινωικής» έκρηξης. Τόσο η νέα εκτίμηση όσο και εκείνη πριν λίγες μέρες παραπέμπουν σε μια ελαφρώς πιο πρόσφατη έκρηξη, κάτι που συμβαδίζει καλύτερα με τα έως τώρα αρχαιολογικά και ιστορικά δεδομένα.

Για την επιστημονική δημοσίευση πατήστε εδώ.

(Archaeology Newsroom / 01 Απρ 2020, https://www.archaiologia.gr/blog/2020/04/01/γύρω-στο-1560-π-χ-η-έκρηξη-του-ηφαιστείου-τη)

Securing timelines in the ancient Mediterranean using multiproxy annual tree-ring data

Charlotte Pearson, Matthew Salzer, Lukas Wacker, Peter Brewer, Adam Sookdeo, and Peter Kuniholm

Significance

This study demonstrates how different lines of evidence from tree rings in widely spread growth locations can combine to fix an approximately dated tree-ring record from the East Mediterranean Bronze–Iron Age to an exact calendar-dated range. This tree-ring record is of high importance for regional chronology and spans the time period in which the major volcanic eruption of Thera (Santorini) occurred. Exact dating of this eruption is important because it provides a prominent marker horizon through which ancient timelines of the East Mediterranean, Egypt, and the Levant can be synchronized. Chemical analysis of the dated tree-ring sequence identifies a chemical change in their growth environment around 1560 BC, which while requiring further substantiation, may be evidence of the Thera eruption.

Abstract

Calendar-dated tree-ring sequences offer an unparalleled resource for high-resolution paleoenvironmental reconstruction. Where such records exist for a few limited geographic regions over the last 8,000 to 12,000 years, they have proved invaluable for creating precise and accurate timelines for past human and environmental interactions. To expand such records across new geographic territory or extend data for certain regions further backward in time, new applications must be developed to secure "floating" (not yet absolutely dated) tree-ring sequences, which cannot be assigned single-calendar year dates by standard dendrochronological techniques. This study develops two approaches to this problem for a critical floating tree-ring chronology from the East Mediterranean Bronze–Iron Age. The chronology is more closely fixed in time using annually resolved patterns of ^{14}C, modulated by cosmic radiation, between 1700 and 1480 BC. This placement is then tested using an anticorrelation between calendar-dated tree-ring growth responses to climatically effective volcanism in North American bristlecone pine and the Mediterranean trees. Examination of the newly dated Mediterranean tree-ring sequence between 1630 and 1500 BC using X-ray fluorescence revealed an unusual calcium anomaly around 1560 BC. While requiring further replication and analysis, this anomaly merits exploration as a potential marker for the eruption of Thera.

(Proceedings of the National Academy of Sciences of the United States of America, https://www.pnas.org/content/early/2020/03/24/1917445117)

Νέα ανατρεπτική μελέτη για την έκρηξη στο ηφαίστειο της Σαντορίνης

Το τρομερό ξύπνημα του ηφαιστείου κατέστρεψε ολοσχερώς τη Σαντορίνη και τα γύρω νησιά και άφησε ανε-

ξίτηλο αποτύπωμα στο πώς οι άνθρωποι θα αντίκριζαν εφεξής τον κόσμο. Τι απέγιναν όμως οι αρχαίοι κάτοικοι της Θήρας...;

Ήταν άνοιξη - κι αυτό αποδεικνύεται από τα γεωλογικά ευρήματα - περίπου του 1613 π.Χ., όταν η ανθρωπότητα ζούσε τη μεγαλύτερη ηφαιστειακή έκρηξη στην ιστορία της. Ήταν σαν να έπεφταν πολλές ατομικές βόμβες ταυτόχρονα στο Αιγαίο. Τα πρώτα εικοσιτετράωρα της έκρηξης, σύμφωνα με τους επιστήμονες, σταμάτησε κάθε είδος ζωής σε ακτίνα 100 χιλιομέτρων ενώ στη συνέχεια άρχισαν τα τσουνάμι.

Το τρομερό ξύπνημα του ηφαιστείου κατέστρεψε ολοσχερώς τη Σαντορίνη και τα γύρω νησιά και άφησε ανεξίτηλο αποτύπωμα στο πώς οι άνθρωποι θα αντίκριζαν εφεξής τον κόσμο. Τι απέγιναν όμως οι αρχαίοι κάτοικοι της Θήρας...;

Στις ανασκαφές που έχουν πραγματοποιηθεί μέχρι σήμερα στην περιοχή του Ακρωτηρίου δεν βρέθηκαν σκελετοί όπως συνέβη στην Πομπηία. Βρέθηκαν μόνο ίχνη μιας καθημερινότητας που εγκαταλείφθηκε άρον άρον: εργαστήρια με μισοτελειωμένες δουλειές, νοικοκυριά παρατημένα στη μέση.

Νέα θεωρία

Σήμερα, περισσότερα από 3.600 χρόνια μετά, μια νέα μελέτη έγκριτων ηφαιστειολόγων από το Πανεπιστήμιο της Χαβάης έρχεται να ανατρέψει αρκετά από όσα γνωρίζαμε: ενάντια στην κρατούσα άποψη που ήθελε τους κατοίκους της Θήρας να έχουν εγκαταλείψει το νησί με τα πλοιάριά τους και να έχουν βρει καταφύγιο σε γειτονικά κυκλαδονήσια με την έναρξη των πρόδρομων φαινομένων - ισχυρών σεισμών και μικρότερων εκρήξεων -, οι ηφαιστειολόγοι K.J. Evans και F.W. McCoy υποστηρίζουν πως οι κάτοικοι, ενώ έπλεαν στη θάλασσα, χτυπήθηκαν από πυροκλαστικές ροές, δηλαδή υπέρθερμες μάζες ηφαιστειακών υλικών, οι οποίες τους σκόρπισαν στο νερό. Μόνο λίγοι εικάζεται ότι έφτασαν στον προορισμό τους...

Η θεωρία των επιστημόνων, που βασίζεται σε συγκεκριμένες μετρήσεις, δείχνει να επιβεβαιώνεται από τα αρχαιολογικά ευρήματα. Σύμφωνα με όσα έχουν γίνει γνωστά, δεν υπάρχουν ενδείξεις μαζικής κατοίκησης και ανάπτυξης νέων «προσφυγικών» καταυλισμών στα γειτονικά νησιά. «Οι επιστήμονες του Πανεπιστημίου της Χαβάης υποστηρίζουν ότι αυτή η μαζική κατοίκηση δεν έγινε ποτέ», λέει στα «ΝΕΑ» ο δρ σεισμολόγος Γεράσιμος Παπαδόπουλος, επιστημονικός συνεργάτης της Ευρωπαϊκής Ένωσης και της UNESCO, ο οποίος είχε ασχοληθεί με τα πρόδρομα φαινόμενα της ηφαιστειακής έκρηξης ως επισκέπτης ερευνητής στο εργαστήριο σεισμολογίας του MIT στη Βοστώνη.

«Εξάγουν αυτό το συμπέρασμα λαμβάνοντας υπόψη ότι οι πυροκλαστικές ροές, τεράστιες μάζες τέφρας και αερίων, που αναπτύσσουν θερμοκρασία ακόμη και 800 βαθμών Κελσίου, σχηματίζονται με την έκρηξη και κατεβαίνουν από την πλαγιά του ηφαιστειακού κώνου με τεράστια ταχύτητα, έως και 500 μέτρων το δευτερόλεπτο, κατακαίοντας τα πάντα. Όπως έχει αποδειχθεί και από πρόσφατες εκρήξεις, οι μάζες αυτές μπορούν να εισέλθουν στη θάλασσα και να ταξιδεύουν πάνω στο νερό - καθώς είναι ελαφρύτερες από αυτό - με ορμή ακόμη και για απόσταση 30 ή 40 χιλιομέτρων», συνεχίζει.

Πολιτισμός

Είναι γνωστό ότι οι κάτοικοι της Θήρας είχαν συστήσει έναν εμπορικό πολιτισμό, με στενές σχέσεις με την Κρήτη, ενώ στις περίφημες τοιχογραφίες του Ακρωτηρίου απεικονίζονται τα σκάφη της εποχής τους - πλοιάρια στα οποία κωπηλατούσαν με αστερέωτα κουπιά, όπως γίνεται στα κανό. «Οι ερευνητές του Πανεπιστημίου της Χαβάης έλαβαν υπόψη τους την ποσότητα της ηφαιστειακής μάζας που εκλύθηκε και την ταχύτητα που θα μπορούσαν να αναπτύξουν οι κάτοικοι της Θήρας με τα πλοιάριά τους.

Βασίστηκαν σε άλλους συγγραφείς και υπολόγισαν ότι θα μπορούσαν να ταξιδεύουν περίπου 50-60 χιλιόμετρα την ημέρα, όμως τις ώρες εκείνες είναι πολύ πιθανό ένα μεγάλο μέρος του Νότιου Αιγαίου να είχε γεμίσει με ελαφρόπετρα από τις πυροκλαστικές ροές των εκρήξεων που προηγήθηκαν, άρα θα είχαν να αντιμετωπίσουν ένα ακόμη εμπόδιο στο ταξίδι τους. Μάλιστα, αυτές οι πυροκλαστικές ροές, καθώς εφορμούν στη θάλασσα, μπορεί να αποτελέσουν και πηγή μεγάλου τσουνάμι, καθώς οι τεράστιες μάζες που μπαίνουν με ορμή στη θάλασσα εξωθούν το νερό. Καταλήγουν έτσι στο συμπέρασμα πως η πλειονότητα των κατοίκων, θορυβημένη από τα πρόδρομα φαινόμενα, δραπέτευσε μεν, δεν πρόλαβε όμως να φτάσει στον προορισμό της, καθώς καταπλακώθηκε από τις ροές και έγινε τέφρα που σκορπίστηκε στη θάλασσα», λέει ο Παπαδόπουλος.

Όπως προκύπτει από τις επιστημονικές έρευνες και τα ηφαιστειακά στρώματα που έχουν βρεθεί στο νησί, η κύρια έκρηξη του ηφαιστείου της Θήρας πραγματοποιήθηκε σε τέσσερις φάσεις οι οποίες διήρκεσαν συνολικά 18 ώρες. Είχε προηγηθεί μια μικρότερη έκρηξη, η οποία επίσης εκτυλίχθηκε σε διάφορες φάσεις. Επιπλέον είχαν εκδηλωθεί ισχυροί σεισμοί, ως πρόδρομα φαινόμενα της έκρηξης, αρκετό χρονικό διάστημα πριν από την εκδήλωσή της. «Σύμφωνα με ένα μοντέλο που είχα καταρτίσει παλαιότερα, των μεγάλων ηφαιστειακών εκρήξεων προηγούνται ισχυροί σεισμοί, που προετοιμάζουν το μάγμα και που μπορεί να εκδηλώνονται ακόμη και ένα ή δύο έτη πριν από την έκρηξη του ηφαιστείου. Μετά τους σεισμούς ακολουθεί μια πρόδρομη έκρηξη σχετικά μικρού μεγέθους και στο τελείωμα αυτής της πρόδρομης έκρηξης ξεκινά η κύρια έκρηξη ίσως με μερικές ώρες διαφορά», λέει ο Γεράσιμος Παπαδόπουλος. «Προειδοποιημένοι από όλα αυτά, οι κάτοικοι της Θήρας πρόλαβαν να φύγουν, όμως, σύμφωνα με τους ερευνητές του Πανεπιστημίου της Χαβάης, δεν πρόλαβαν να σωθούν...».

(Κατερίνα Ροββά, 11 Απριλίου 2020,
https://www.tanea.gr/2020/04/11/science-technology/nea-anatreptiki-meleti-gia-tin-ekriksi-sto-ifaisteio-tis-santorinis/

Precursory eruptive activity and implied cultural responses to the Late Bronze Age (LBA) eruption of Thera (Santorini, Greece)

K.J.Evans & F.W.McCoy

Highlights

- Precursor activity good indicator of pending volcanic eruptions
- Theran people reacted to precursory eruptive activity at Santorini.
- Group of Therans returned to only evacuate again during main eruption.

- Fleeing Therans evacuated in paddled boats.
- Therans overwhelmed at sea by pyroclastic density currents.

Abstract

The Late Bronze Age (LBA) eruption (ca. 1650 BCE) of Thera (Santorini) was one of the largest known in history, burying and destroying a thriving Theran (Cycladian) culture that occupied the island and surrounding islands. The consequent thick tephra deposit provides detailed information on the eruptive sequence and vent mechanics – it also provides details on that culture through burial of towns, farmsteads, and landscapes, the most prominent being the town of Akrotiri on the south coast of Thera. Here stratigraphic relationships between volcanic and archaeological deposits/constructions clearly indicate this eruption was signaled by seismic and minor eruptive events precursory to the main Plinian eruption. Because no casualties have yet been found beneath the tephra, inhabitants had advance notice of the impending disaster by a precursory eruption whose deposits are well preserved both within the archaeological site and in geological exposures throughout southern Thera island – and escaped by boat. Yet archaeological sites on nearby islands rarely record an influx of new arrivals at this time. Accordingly, it is suggested here that those escaping were incinerated at sea by pyroclastic density currents that swept across the ocean surface during the second phase of the Plinian eruption.

https://doi.org/10.1016/j.jvolgeores.2020.106868

https://www.sciencedirect.com/science/article/abs/pii/S0377027319306286

Επτάστομο: Ο νοτιότερος παγετώνας στην Ευρώπη

Ποιος θα μπορούσε να φανταστεί ότι ο νοτιότερος παγετώνας της Ευρώπης βρίσκεται στον Παρνασσό!

Το εντυπωσιακό βάραθρο Επτάστομο το συναντάμε στον δυτικό Παρνασσό κοντά στην θέση Καλάνια σε υψόμετρο 1300μ. Στο σπήλαιο με τα επτά στόμια, το χιόνι δεν λιώνει ποτέ αφού η θερμοκρασία στο εσωτερικό του δεν ξεπερνά τους 0°C.

Η κατάβαση στο βάραθρο είναι πολύ επικίνδυνη και γίνεται μόνο από καλά εκπαιδευμένα άτομα ή σπηλαιολόγους. Όσοι καταφέρουν να κατέβουν θα έχουν την τύχη να θαυμάσουν, καταπληκτικούς καταρράκτες, σταλακτίτες και σταλαγμίτες από πάγο, αλλά και μια λιμνούλα με κρυστάλλινα νερά.

Ο απόκοσμος ήχος που ακούγεται μέσα στο βάραθρο δεν είναι παρά ένα παιχνίδι του αέρα καθώς περνάει μέσα από τα 7 στόμια.

Πρόσβαση

Από Αράχωβα:

Στο 17ο χλμ. Αράχωβας - Επταλόφου, περίπου 3 χλμ. μετά την διασταύρωση για το Χιονοδρομικό Κέντρο Παρνασσού, συναντάμε πινακίδα προς Επτάστομο και Καλάνια.

Από Επτάλοφο (Αγόριανη):

Στο 7ο χλμ. από Επτάλοφο προς Αράχωβα, στη θέση Δόκανο, περίπου 3 χλμ. πριν την διασταύρωση για το Χιονοδρομικό Κέντρο Παρνασσού, συναντάμε πινακίδα προς Επτάστομο και Καλάνια.

https://onparnassos.gr/el/places/eptastomo-o-notioteros-pagetonas-stin-europi

Ένα σπάνιο φυσικό θέαμα: η έρημος που γίνεται θάλασσα

Η ιστορία 200 εκατομμυρίων ετών και οι ισχυροί σεισμοί που άλλαξαν την τοπογραφία

Για το μεγαλύτερο διάστημα του χρόνου, μία από τις μεγαλύτερες σε έκταση αλυκές του κόσμου είναι μία τεράστια λευκή έρημος. Και το υπόλοιπο διάστημα εξαφανίζεται τελείως.

Σε απόσταση περίπου εκατό χιλιομέτρων από την Αραβική Θάλασσα, στο κρατίδιο Γκουτζαράτ, στα δυτικά της Ινδίας, μία τεράστια έκταση με νιφάδες αλατιού, που μοιάζουν με χιονονιφάδες, συνθέτουν το εξωπραγματικό τοπίο της εντυπωσιακής αλυκής που φτάνει βόρεια μέχρι τα σύνορα της Ινδίας με το Πακιστάν. Γνωστή ως Rann of Kutch, η περιοχή αυτή χωρίζεται σε δύο μέρη: το Great Rann, που καλύπτει 19.000 τετραγωνικά μέτρα, και το Little Rann, το οποίο αποτελείται από περίπου 5.000 τετραγωνικά χιλιόμετρα.

Μαζί αυτές οι δύο εκτάσεις σχηματίζουν μία από τις μεγαλύτερες αλμυρές ερήμους στον κόσμο και παρέχουν το 75% της συνολικής ποσότητας αλατιού που παράγεται στην Ινδία.

Ωστόσο, για πολλούς μήνες, κάθε καλοκαίρι, καθώς η περιοχή πλημμυρίζει από τις βροχές των μουσώνων, η αλμυρή γη εξαφανίζεται και μεταμορφώνεται σε μια λαμπερή περίκλειστη θάλασσα, που λάμπει εκθαμβωτικά κάτω από τον καυτό ήλιο.

Ο κύκλος του αλατιού

Τα δύο Rann βρίσκονται ανάμεσα στον Κόλπο του Kutch, στο δυτικό σύνορο της Ινδίας και στο δέλτα του Ινδού ποταμού στο νότιο Πακιστάν. Το Great Rann, που βρίσκεται 100 χιλιόμετρα βορειοανατολικά της πόλης Bhuj, αναφέρεται συχνά ως η ατελείωτη «λευκή έρημος» της Ινδίας και έχει πολύ περιορισμένη ζωή. Το Little Rann, που βρίσκεται νοτιοανατολικά του Great Rann, με το οποίο συνδέεται, έχει γίνει καταφύγιο για μεταναστευτικά πουλιά και είδη της άγριας ζωής. Κι όμως, αυτές οι δύο εκτάσεις μοιράζονται πολλά κοινά.

Προς το τέλος του Ιουνίου, οι βροχές των μουσώνων πέφτουν στα δύο Rann, πλημμυρίζοντας την περιοχή μέχρι τον Οκτώβριο, οπότε το νερό σταδιακά αρχίζει να εξατμίζεται. Καθώς τα νερά υποχωρούν, οι εποχικοί εργάτες του αλατιού στήνουν τα «εργαστήριά» τους, για να συλλέξουν τους κρυστάλλους του αλατιού που αφήνει πίσω του το νερό που γίνεται ατμός. Από τον χειμώνα μέχρι τον επόμενο Ιούνιο, που οι βροχές επιστρέφουν, οι εργάτες συλλέγουν όσο περισσότερο αλάτι μπορούν.

«Η λευκή έρημος είναι τόσο επίπεδη που βλέπεις τον ορίζοντα, όπως όταν βλέπεις τη θάλασσα, χωρίς το νερό και τα κύ-

ματα όμως» περιγράφει τοπικός ξεναγός.

Οι ρίζες

Οι γεωλογικές ρίζες του Rann of Kutch φτάνουν περισσότερα από 200 εκατομμύρια χρόνια πίσω, στην προ-ιουρασική και την ιουρασική περίοδο. Μέχρι πριν από λίγες εκατοντάδες χρόνια, η περιοχή ήταν ναυτική οδός από την οποία περνούσαν τα πλοία που έμπαιναν στον Κόλπο του Kutch και έπλεαν βόρεια μέσα στον Ινδό ποταμό. Ο πολιτισμός της Κοιλάδας του Ινδού, ένας από τους πρώτους μεγάλους στον κόσμο, άνθησε στην περιοχή αυτή από το 3300 έως το 1300 π.Χ. Ωστόσο οι τεράστια σεισμοί που καταγράφηκαν στο σημείο αυτό άλλαξαν την τοπογραφία της περιοχής. Οι δονήσεις έκαναν το έδαφος να υψωθεί, δημιουργώντας έτσι και πολλά ρήγματα που γέμισαν με θαλασσινό νερό και σχημάτισαν μια «κορυφογραμμή» μήκους 90 χιλιομέτρων και ύψους τριών μέτρων, που απέκλεισε αυτή την κάποτε χρήσιμη στη ναυσιπλοΐα οδό από την Αραβική Θάλασσα. Τα γεγονότα αυτά προκάλεσαν τον εγκλωβισμό του αλμυρού νερού στην έρημο και δημιούργησαν τη μοναδική τοπογραφία του Rann.

«Βρήκαμε το κουφάρι ενός πλοίου μέσα στην έρημο, το οποίο ήταν απομονωμένο στη διάρκεια των σεισμών και αποκλείστηκε εκεί, μην μπορώντας να φτάσει στη θάλασσα. Ήταν μια τόσο καταπληκτική εικόνα: ένα ξύλινο κουφάρι στη μέση του πουθενά» περιγράφει ο Δρ MG Thakkar, γεωλόγος στο Πανεπιστήμιο Krantiguru Shyamji Krishna Verma Kachchh.

Η συλλογή του αλατιού

Στο διάστημα των τελευταίων 200 ετών, η συλλογή αλατιού αναδείχθηκε σε τεράστια βιομηχανία στο Ranns. Πολλοί από τους εποχικούς εργάτες που βρίσκονται στην περιοχή αυτή τον Οκτώβριο έρχονται από την παρακείμενη Surendranagar ή ανήκουν στις εθνοτικές κοινότητες Kohli και Agyariya. Η συλλογή αλατιού στο Ranns συνεχίζεται ασταμάτητα έως τον Ιούνιο και οι εργάτες δουλεύουν σε σκληρές συνθήκες και σε πολύ υψηλές θερμοκρασίες- από τις υψηλότερες που καταγράφονται στη χώρα.

Καθώς οι βροχές υποχωρούν τον Οκτώβριο και τον Νοέμβριο, οι εργάτες αρχίζουν τη διαδικασία της συγκομιδής, σκάβοντας το έδαφος και αντλώντας το υπόγειο αλμυρό νερό. Το νερό «μοιράζεται» σε αυτοσχέδια τετράγωνα «εργαστήρια», ανάλογα με το επιθυμητό ποσοστό αλατότητας. Μπορεί να χρειαστεί έως και δύο μήνες για να εξατμιστεί το νερό και τότε οι εργάτες οργώνουν το έδαφος δέκα με δώδεκα φορές την ημέρα, με το χέρι, ώστε να απομείνει μόνο αγνό ανεπεξέργαστο αλάτι.

«Είμαστε η 5η γενιά της οικογένειας που ασχολούμαστε με τη συγκομιδή αλατιού. Κάθε χρόνο, για εννέα μήνες, φέρνουμε όλη μας την οικογένεια εδώ και επιστρέφουμε σπίτι την εποχή των βροχών» λέει ο εργάτης Rasikbhai Kalubhai.

Μοναδικές κατασκευές

Εκτός από το αλλόκοσμο τοπίο του Rann, η έρημος φιλοξενεί και μοναδικής μορφής αρχιτεκτονικές δημιουργίες, τα λεγόμενα σπίτια bunga. Επί αιώνες, πολλές από τις νομαδικές κοινότητες και τις φυλές που ζούσαν στην περιοχή, έμειναν σε αυτές τις κυλινδρικές καλύβες από λάσπη με τις κωνικές στέγες. Παρότι η εξωτερική πλευρά είναι συχνά διακοσμημένη με σχέδια, αυτά τα θαύματα της μηχανικής, όπως αναφέρει το BBC, είναι σχεδιασμένα να αντέχουν στους θυελλώδεις ανέμους, τους συχνούς σεισμούς που εξακολουθούν να συνταράσσουν την περιοχή και τις ακραίες θερμοκρασίες- που αγγίζουν τους 45 βαθμούς το καλοκαίρι και πλησιάζουν τον παγετό τον χειμώνα.

Η έρημος

Τα τελευταία χρόνια, τα Rann έχουν αναδειχθεί σε μεγάλη τουριστική ατραξιόν. Άνθρωποι από όλο τον κόσμο συρρέουν εδώ για να δουν τις αλμυρές ερήμους της Ινδίας. Συνήθως φτάνουν στη διάρκεια των ξηρών ολόλευκων χειμώνων, με καμήλες ή με τζιπ σαφάρι. Μία από τις κύριες ατραξιόν είναι η ανατολή και η δύση του ηλίου, σε αυτό το εξωπραγματικό τοπίο. Άλλοι επισκέπτες προγραμματίζουν τις επισκέψεις τους εδώ στη διάρκεια της πανσελήνου, απολαμβάνοντας την αχανή έρημο κάτω από τον φεγγαροφώτιστο ουρανό.

Η κουλτούρα της υφαντουργίας

Σε μία προσπάθεια να ενισχυθεί ο τουρισμός, το κρατίδιο του Γκουτζαράτ χρηματοδοτεί τοπικές μικρής κλίμακας οικιακές επιχειρήσεις υφαντουργίας. Οι δημιουργίες των πολλών νομαδικών κοινοτήτων που ζουν στην περιοχή Kutch γνωρίζουν αναγνώριση σε όλη τη χώρα. Πολλά είδη υφασμάτων που παράγονται στα Rann είναι είδη που δεν φτιάχνονται πια αλλού. Η τοπική κυβέρνηση παρουσιάζει αυτές τις δημιουργίες στο ετήσιο Rann Festival, το οποίο περιλαμβάνει μουσική, χορό, χειροτεχνίες και τοπική κουλτούρα.

Οι εποχικοί «κάτοικοι»

Οι ακραίες βροχές, η ζέστη και πλημμύρες στα Rann έχουν δημιουργήσει ένα μοναδικό οικοσύστημα, κατάλληλο για πολλά είδη χλωρίδας και πανίδας. Τους χειμερινούς μήνες, από τον Οκτώβριο έως τον Μάρτιο, σμήνη μεταναστευτικών πουλιών κάνουν το Little Rann σπίτι τους. Αετοί, πελαργοί, γερανοί και ασφαλώς οι πιο φημισμένοι φτερωτοί «κάτοικοι», τα φλαμίνγκο.

Το Little Rann είναι επίσης ένα από τα τελευταία καταφύγια του ασιατικού άγριου γαϊδάρου, που αποτελεί απειλούμενο είδος. Στην περιοχή απαντώνται επίσης αλεπούδες της ερήμου, ινδικοί μπλε ταύροι και ινδικές γαζέλες, οι chinkara.

Ένα θαύμα γεννιέται

Με τα αβάσταχτα κύματα ζέστης, τις πλημμύρες από τα νερά της βροχής και τους ατελείωτους παγωμένους χειμώνες, τα Rann παραμένουν ένα γεωλογικό θαύμα εν τη γενέσει του.

Η περιοχή προσελκύει οικολόγους και γεωλόγους που θέλουν να μελετήσουν πώς ένα τέτοιο ακραία και φαινομενικά αφιλόξενο έδαφος μπορεί να προσελκύει τόση ζωή και να βγάζει τόσο αλάτι από μία τόση άγονη γη. Όπως οι βροχές επιστρέφουν και τα πουλιά αλλά και οι άνθρωποι, που εξακολουθούν να γυρίζουν σε αυτόν τον εκθαμβωτικό καμβά της φύσης, που συνδυάζει την ολόλευκη εικόνα του με τον αχανή ορίζοντα συνθέτοντας αυτό το σπάνιο φυσικό θαύμα.

(newsbeast, 21/12/2019, https://www.newsbeast.gr/weekend/arthro/5430060/ena-spanio-fysiko-theama-i-erimos-poy-ginetai-thalassa)

Trovants
«Ζωντανά» βράχια μεγαλώνουν με τη βροχή και... περπατάνε!

Τα «trovants» είναι ότι πιο περίεργο υπάρχει στη γη, καθώς χαρακτηρίζονται ως «ζωντανά» βράχια!

Πρόκειται για **παράξενους βράχους** σε διάφορα μεγέθη που αναπτύσσονται όταν έρθουν σε επαφή με το νερό και σε μερικές περιπτώσεις μετακινούνται μόνοι τους από το ένα σημείο στο άλλο.

Τα βράχια αυτά βρίσκονται σε ένα μικρό ρουμανικό χωριό, το Costesti και η λέξη trovant σημαίνει «τσιμέντο και άμμος».

Έχουν σφαιρικό σχήμα, αποτελούνται από έναν πέτρινο πυρήνα με εξωτερικό κέλυφος άμμου και αν κοπούν στο εσωτερικό τους διακρίνονται δαχτυλίδια σαν αυτά που υπάρχουν στους κορμούς των δέντρων. Η δημιουργία τους χρονολογείται **6 εκατομμύρια χρόνια πριν**, ως αποτέλεσμα σεισμικής δραστηριότητας στην περιοχή.

Υπάρχουν πολλές θεωρίες, φανταστικές και επιστημονικές, που επεξηγούν την προέλευση και την παράξενη συμπεριφορά των trovants.

Οι επιστήμονες πιστεύουν ότι κάτω από το κέλυφος, υπάρχει

υψηλή περιεκτικότητα σε ανόργανα άλατα και όταν η επιφάνεια έρχεται σε επαφή με το νερό τα ορυκτά εξαπλώνονται και κάνουν την άμμο να επεκταθεί.

Κάπως έτσι επεξηγείται η αύξηση των πετρών. Ωστόσο, **πέρα από κάθε επεξήγηση του φαινομένου**, η περιοχή αποτελεί σπουδαίο τουριστικό αξιοθέατο της Ρουμανίας, ενώ τα trovants από το 2004 προστατεύονται από την UNESCO.

(Ευαγγελία Αναστασάκη / Perierga.gr, 4 Ιανουάριος 2014, https://perierga.gr/2014/01/vrachi-megalonoun-ke-perpatane)

Trovants: The Growing Stones of Romania

You might have raised an eyebrow after reading the title, but nature is happy to confirm this fact and guarantees to give you the weirdest things in life as always. Trovants are extraordinary rocks that grow and multiply and you can witness these rocks in Romania.

The growing stones of Romania, Trovants, aren't just unique because of their ability to multiply. These rocks are composed mainly by a hard stone core and the rest is made up of sand which forms around the core as its shell.

Trovants can only be made by highly-porous sand accumulations and sandstone deposits that are cemented by waters rich in calcium carbonate. The name "Trovant" (trovanti) was made and introduced by the naturalist Gh. M. Murgoci in his work "The Tertiary in Oltenia".

Heading straight to the question: What makes these rocks multiply? As you've read before, any form of water rich in calcium carbonate is essential in forming a Trovant, and that is also the key to make the rock grow in the presence of rain-water.

After every heavy rain shower, Trovants absorb the rain's minerals. The minerals are combined with the chemicals already present in the stone that later creates a reaction and pressure inside. The pressure spontaneously makes the rock grow from the center to its margins and multiply, with a deposition rate of about 4-5 cm in 1000 years.

Trovants usually appear with smooth and edgeless shapes. Cylindrical, nodular, and spherical; Trovants develop these inconsistent shapes as they grow and multiply due to irregular cement secretion. You can see these formations grow from a few millimeters, or to as large as 10 meters.

Trovants aren't only strange due to their structure and ability to grow and multiply. They can also move from one place to another. Other than that, they also have root-like extensions and age rings visible when you cut the stone, but scientists have yet to find out an explanation of these unique features.

These rocks came into existence because of the earthquakes which occurred six million years ago. The sand reservoir was created after the successive sedimentation of the detritic material transported by the rivers.

If you want to see these rocks up-close then head right away to Romania's Valcea County. You can either go to a sand quarry nearby Costeşti village or along a river in Gresarea Brook nearby Oteşani village, approximately 15 km from Horezu. You can also see Trovants at the "Trovants Museum" Natural Reserve run by the Kogayon association which aims to raise awareness about protecting the environment. This museum located inside Costeşti village is protected by the UNESCO.

With combined characteristics of a plant and a rock, it's confusing if these Trovants should be categorized as a living or a non-living creature. But whether it's alive or not, these growing stones are surely interesting to see, touch and use. Besides its popular use as a building material for tombstones, locals also use these in making souvenirs.

Not only in Romania, but you can also see the growing stones in Russia, the steppes of Kazakhstan, the Czech Republic, and other places.

(Hailey Brotze / WHEN ON EARTH, https://whenonearth.net/trovants-growing-stones-romania)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Το "πολεμικό σκηνικό" αντιμετώπισης του κορωνοϊού θα δώσει μια άνευ προηγουμένου ώθηση στις ψηφιακές εφαρμογές στον κατασκευαστικό τομέα

Αν μπορέσουμε να περάσουμε αυτή την κρίση θα επέλθουν μακροπρόθεσμες αλλαγές, λέει ο Richard Saxon[1]. Η παραγωγικότητα θα έχει βελτιωθεί, η ευέλικτη εργασία θα έχει γίνει κανόνας, η αντίληψη για τον κύκλο ζωής των δραστηριοτήτων και των πάσης φύσεως έργων θα έχει εξελιχθεί.

Η κρίση του Covid-19 μοιάζει πολύ με ένα σκηνικό πολέμου. Ο Πρόεδρος Τραμπ έχει ήδη χαρακτηρίσει τον εαυτό του ως "Πρόεδρο Πολέμου" (War President) και υποσχέθηκε "πλήρη νίκη" (total victory).

Ταυτόχρονα, επιχειρήσεις δραστηριοποιούμενες σε ποικίλους τομείς, προβαίνουν σε δηλώσεις για το πως θα μπορέσουν να παραμείνουν ενεργές με το προσωπικό τους εργαζόμενο κατ' οίκον. Το σύνθημα είναι "μένετε ψύχραιμοι και συνεχίστε".

Η τεχνολογία γνώριζε πάντοτε ταχεία ανάπτυξη κατά τις πολεμικές περιόδους. Ο Β' 'Παγκόσμιος Πόλεμος έφερε τους υπολογιστές, τα ραντάρ, τα αεριωθούμενα αεροσκάφη και την πυρηνική ενέργεια. Ο Ψυχρός Πόλεμος έφερε το τσιπ πυριτίου, τα λέιζερ και το διαστημικό πρόγραμμα. Η ρομποτική αναδύθηκε στα πεδία μάχης της Μέσης Ανατολής.

Σήμερα η βιομηχανία σχεδιασμού και κατασκευών βρίσκεται υπό ασφυκτικό περιορισμό λόγω του ιού (lockdown) και ως εκ τούτου έχει αρχίσει να βασίζεται σε "εργαλεία" και τεχνικές που μόνον μερικές από τις εταιρείες του χώρου είχαν ήδη θέσει σε εφαρμογή. Οι αποκεντρωμένες Εταιρείες Συμβούλων με πολλαπλά υποκαταστήματα και αυτές που αναλαμβάνουν έργα στο εξωτερικό έχουν από καιρό εξασφαλίσει την δυνατότητα διαδικτυακής συνεργασίας των στελεχών τους και των συνεργαζομένων με αυτές εταιρειών. Οι εφαρμογές ομαδικής εργασίας που βασίζονται στο υπολογιστικό νέφος (cloud computing επιτρέπουν πλέον στο προσωπικό να εργάζεται από το σπίτι ή εν κινήσει, με πλήρη πρόσβαση στο κοινό περιβάλλον δεδομένων της επιχείρησης.

Οι πρωτοπόροι δείχνουν τον δρόμο μετά από προσομοιώσεις ακραίων καταστάσεων (stress-testing) διαδικασιών τηλε-εργασίας.

Οι υπόλοιποι θα ακολουθήσουν ταχύτερα από ότι διαφορετικά θα είχαν, ωθώντας την υιοθέτηση τεχνολογιών σε ολόκληρη την εφοδιαστική αλυσίδα. Η πίεση για την ανάπτυξη υπερταχέων ευρυζωνικών δικτύων και δικτύων 5G θα είναι τεράστια.

Αλλά και οι ανάγκες ανθρώπινης επικοινωνίας μπορούν να καλυφθούν. Οι εφαρμογές μέσων κοινωνικής δικτύωσης μέσων επιτρέπουν την εικονική συνεργασία, έτσι ώστε να μπορούν οι συνεργάτες να βλέπουν ο ένας τον άλλων, αλλά με σίγαση κατά το διάστημα εργασίας που θα διακόπτεται μόνον στα διαλείμματα! Οι τηλεδιασκέψεις αποτελούν πλέον διαδικασίες ρουτίνας και σύντομα οι εικονικές επισκέψεις στα εργοτάξια θα γίνουν κανόνας.

Μετά την κορύφωση των ελέγχων διάδοσης του ιού, η επάνοδος στους χώρους εργασίας θα πρέπει να συνδυαστεί με τήρηση της τήρησης των αποστάσεων μεταξύ των ατόμων που υπαγορεύονται από τους όρους υγείας και ασφάλειας. Οι κάσκες επιβοηθούμενης πραγματικότητας (augmented reality) και τα συστήματα BIM CAVE (computer-aided virtual environment, εικονικό περιβάλλον επιβοηθούμενο από υπολογιστή) θα υποστηρίξουν την καλύτερη ενημέρωση και την άνευ σφαλμάτων εκτέλεση.

Οι κατασκευαστικές δραστηριότητες εκτός εργοταξίου θα διευρυνθούν, δοθέντος ότι με τον τρόπο αυτό προσφέρονται ασφαλέστερες συνθήκες εργασίας.

Οι υπεύθυνοι διαχείρισης εγκαταστάσεων θα αρχίσουν να δείχνουν ενδιαφέρον για τις τεχνολογίες ψηφιακού "αντιτύπου" της παραγωγικής διαδικασίας (digital twin), που τους επιτρέπει να διευθύνουν ένα κτίριο εξ αποστάσεως και να βελτιστοποιούν τη χρήση του.

Το χρονικό διάστημα μέχρι να γίνει ευρέως διαθέσιμο κάποιο κατάλληλο εμβόλιο, θα είναι μια περίοδος αναγκαστικής προώθησης της τεχνολογίας. Οι ειδήσεις για το τι κάνουν άλλοι θα διαδίδονται μέσω δικτύων και δικτυακών σεμιναρίων (webinars). Η κατάσταση δεν φαίνεται ότι θα επανέλθει στην προ Covid-19 εποχή. Η παραγωγικότητα θα έχει βελτιωθεί, η ευέλικτη εργασία θα έχει γίνει κανόνας, η αντίληψη για τον κύκλο ζωής των δραστηριοτήτων και των πάσης φύσεως έργων θα έχει εξελιχθεί.

Και η ζήτηση για κτίρια θα έχει μετατοπιστεί, με μεγαλύτερη έμφαση στην επαρκή στέγαση και λιγότερη σε γραφεία και εμπορικούς χώρους.

Θα είναι υπέροχο να βγούμε ξανά έξω για φαγητό, αλλά προς το παρόν οι επιλογές είναι φαγητό σε πακέτο, μαγείρεμα στο σπίτι και Αγώνας για την Νίκη!

[1] Ο Richard Saxon (έτος γέννησης 1942) είναι ο "πρεσβευτής" του Ηνωμένου Βασιλείου για την ανάπτυξη των συστημάτων BIM (Building Information Modeling, Μοντελοποίηση Κατασκευαστικών Πληροφοριών). Είναι Αρχιτέκτων και Πιστοποιημένος Εμπειρογνώμων, ο οποίος με την παροχή υπηρεσιών συμβούλου για το δομημένο περιβάλλον. Συνεργάσθηκε επί σειρά ετών με την Βρετανική Εταιρεία Μελετών BDP (Building Design Partnership), της οποίας διατέλεσε Πρόεδρος (CEO) κατά την περίοδο 1996-2002. Είναι μέλος της συντονιστικής επιτροπής της Βρετανικής ομάδας εργασίας BIM και μέλος της εκτελεστικής επιτροπής για τις Επιχειρήσεις Συλλογικής Ωφέλειας (CIC, UK Community Interest Companies) που επιδιώκουν καινοτομίες. Διατέλεσε Πρόεδρος του Βρετανικού Φορέα Αρχιτεκτόνων (RIBA) κατά την περίοδο 2007-2008. Το 2001 του απονεμήθηκε ο τίτλος CBE (Commander of the Order of the British Empire, Διοικητής του Ανωτάτου Τάγματος της Βρετανικής Αυτοκρατορίας) για τις υπηρεσίες του στην Αρχιτεκτονική και την Κατασκευή.

(ΑΡΧΙΜΗΔΗΣ, https://www.e-archimedes.gr/latest/item/7522)

Έτσι θα είναι το νέο κτήριο της Γενικής Γραμματείας Υποδομών

Λίγο πιο κοντά στη γραμμή εκκίνησης βρίσκεται η υλοποίηση του νέου κτηρίου της Γενικής Γραμματείας Υποδομών του υπουργείου Υποδομών στην οδό Πειραιώς 166 στην Αθήνα, ύστερα από την πρόσφατη ολοκλήρωση του αρχιτεκτονικού διαγωνισμού του έργου, που έχει προϋπολογισμό 161,2 εκατ. ευρώ. Το πρώτο βραβείο του έργου, ύψους 45.000 ευρώ, απέσπασε το αρχιτεκτονικό γραφείο ARSIS Architects, με το Economix.gr να παρουσιάζει σήμερα ορισμένες από τις μακέτες του έργου.

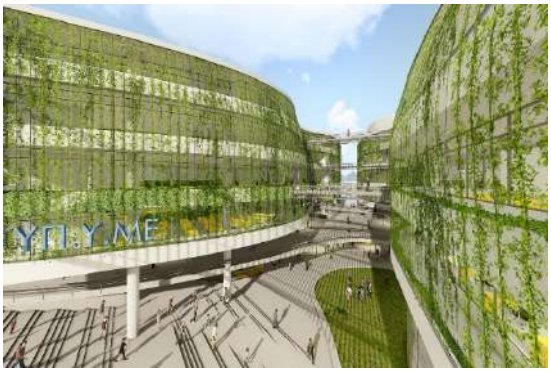
Το κτήριο

Η ιδέα της υλοποίησης του εν λόγω κτιριακού συγκροτήματος απορρέει από την ανάγκη συγκέντρωσης όλων των υπηρεσιών της Γενικής Γραμματείας Υποδομών του Υπουργείου Υποδομών και Μεταφορών, προκειμένου να επιτευχθεί αφενός η εύρυθμη λειτουργία των υπηρεσιών, με την άμεση συνεργασία των οργανικών μονάδων και του προσωπικού και αφετέρου η εξοικονόμηση πόρων και χρόνου.

Σκοπός του διαγωνισμού είναι η ανέγερση ενός λειτουργικού, σύγχρονου κτιριακού συγκροτήματος που θα στεγάσει τις υπηρεσίες της Γενικής Γραμματείας Υποδομών του Υπουργείου Υποδομών και Μεταφορών. Σήμερα, οι υπηρεσίες της Γενικής Γραμματείας Υποδομών, του Υπουργείου Υποδομών και Μεταφορών στεγάζονται διάσπαρτες στην Αθήνα, σε ενοικιαζόμενα κτίρια με προβληματική κτιριολογική διαρρύθμιση, τα οποία δεν πληρούν τις προδιαγραφές που θέτει η πολιτεία για εργασιακούς χώρους. Επιπλέον, το κόστος του ενοικίου, το κόστος συντήρησης και γενικά οι λειτουργικές δαπάνες των κτιρίων αυτών, επιβαρύνουν τον προϋπολογισμό του Υπουργείου και περαιτέρω τον κρατικό προϋπολογισμό.

Η μετεγκατάσταση των υπηρεσιών της Γενικής Γραμματείας Υποδομών του Υπουργείου Υποδομών και Μεταφορών σε ένα νέο κτίριο, που θα πληροί τις προδιαγραφές ενός σύγχρονου εργασιακού χώρου σχεδιασμένου με άξονα τη μέγιστη ενεργειακή απόδοση και τη μικρότερη δυνατή συντήρηση, θα συμβάλει σημαντικά στη μείωση των λειτουργικών εξόδων, στην απαλλαγή εξόδων για μισθώσεις κτιρίων, στην αναβάθμιση του εργασιακού περιβάλλοντος, στη πρόσβαση ΑΜΕΑ, στην εξασφάλιση της υγιεινής και ασφάλειας των εργαζομένων, και στις Ευρωπαϊκές και Εθνικές στρατηγικές για την εξοικονόμηση ενέργειας και μείωσης των εκπομπών CO2 με την χρήση των Μ.Μ.Μ., δεδομένης της γειτνίασης του χώρου με το σταθμό μετρό «Κεραμεικός», με το σταθμό ηλεκτρικού «Κάτω Πετράλωνα», με το σταθμό προαστιακού «Ρουφ» και τις οδικές συγκοινωνίες της οδού Πειραιώς.

Το κτήριο θα αποτελείται από χώρους διοίκησης- γραφεία, αμφιθέατρο, αίθουσα πολλαπλών χρήσεων, συνεδριακό κέντρο, αίθουσες συσκέψεων, βιβλιοθήκη, μουσείο τεχνολογίας, εστιατόριο, κυλικεία, παιδικό σταθμό, ιατρείο, χώρους αρχείων, αποθηκευτικούς χώρους, χώρους Η/Μ εγκαταστάσεων και υπόγειους χώρους στάθμευσης.



Το οικόπεδο είναι εμβαδού 8.770,23 τ.μ., βρίσκεται εντός των ορίων του Δήμου Ταύρου-Μοσχάτου, στο Ο.Τ. 59Α, επί της οδού Πειραιώς 166 και είναι ιδιοκτησίας του Ελληνικού Δημοσίου. Σήμερα στο χώρο στεγάζεται το Κεντρικό Εργαστήριο Δημοσίων Έργων, που αποτελεί υπηρεσία της Γενικής Γραμματείας Υποδομών, του οποίου οι δραστηριότητες έχουν επεκταθεί σε όλο το οικόπεδο.

Σύμφωνα με το κτιριολογικό πρόγραμμα που έχει συνταχθεί από τη Διεύθυνση Κτηριακών Υποδομών, το συνολικό μεικτό εμβαδόν των χώρων που θα πρέπει να χωροθετηθούν στην ανωδομή είναι 19.815 τ.μ. και το σύνολο των υπόγειων χρήσεων- εκτός των χώρων στάθμευσης- είναι 6.015 τ.μ.

Συνολικά, το κτίριο θα εξυπηρετεί τους εργαζόμενους της Γενικής Γραμματείας Υποδομών και θα δέχεται και έναν σημαντικό αριθμό πολιτών, τόσο για τις υπηρεσίες της Γενικής Γραμματείας Υποδομών, όσο και για τις υπόλοιπες χρήσεις.

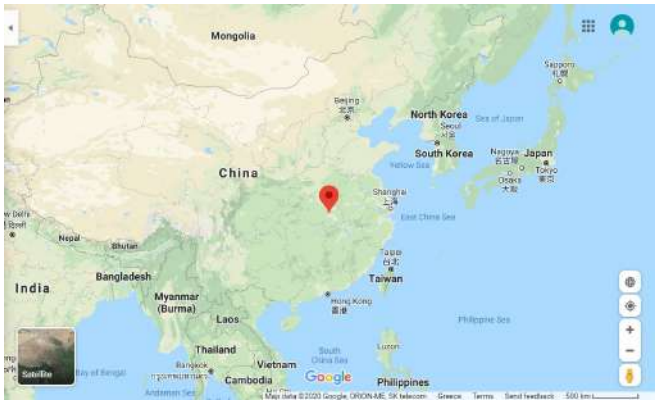
Το έργο θα υλοποιηθεί με Σύμπραξη Δημοσίου και Ιδιωτικού Τομέα (ΣΔΙΤ) και ο Ιδιωτικός Φορέας Σύμπραξης (ΙΦΣ) που θα επιλεγεί θα αναλάβει τη μελέτη, χρηματοδότηση, κατασκευή, συντήρηση και διαχείριση (φύλαξη, ασφάλιση) των κτιριακών εγκαταστάσεων, για μια ορισμένη χρονική περίοδο, όπως θα ορίσει η Αναθέτουσα Αρχή. Με την ολοκλήρωση της διαγωνιστικής διαδικασίας για την επιλογή ΙΦΣ, η Διεύθυνση Κτηριακών Υποδομών της Γενικής Διεύθυνσης Υδραυλικών, Λιμενικών και Κτηριακών Υποδομών θα συνάψει Σύμβαση Σύμπραξης με Ανώνυμη Εταιρεία Ειδικού Σκοπού (ΑΕΕΣ), η οποία θα συσταθεί από τον ΙΦΣ με αποκλειστικό σκοπό την υλοποίηση του έργου.

(Δημήτρης Δανός, 8 Απριλίου 2020, https://www.economix.gr/2020/04/08/etsi-tha-ine-to-neo-ktirio-tis-genikis-grammatias-ypodomon)

Wuhan, China

Αυτή η σχεδόν διαστημική πόλη είναι η Wuhan, που από εκεί ξεκίνησαν όλα. Δείτε το βίντεο για να καταλάβετε την ανάπτυξη που έχει η Κίνα και πόσο πίσω έχει αφήσει οικονομικά την Αμερική και την Ευρώπη.

Wuhan, the sprawling capital of Central China's Hubei province, is a commercial center divided by the Yangtze and Han rivers. The city contains many lakes and parks, including expansive, picturesque East Lake. Nearby, the Hubei Provincial Museum displays relics from the Warring States period, including the Marquis Yi of Zeng's coffin and bronze musical bells from his 5th-century B.C. tomb.



https://www.facebook.com/george.vorreas/videos/10157935652174277/

How can cities become more resilient?

Mike Woolgar, Water Strategy Director of WSP asks, does our emphasis on efficiency in cities result in unintended reduced resilience?

Does our emphasis on efficiency in cities result in unintended reduced resilience?

When I set out to write this blog, the world was a different place. That was only four weeks ago but so much has happened since then. My original theme was to address how the resilience and excellence of cities might be defined and how former US Army General, Omar Bradley, gives us some insight into weaknesses in the armour. Now, I see the need to discuss the difference between efficiency and resilience.

The OECD defines resilient cities as the result of four different drivers: economy, governance, society, and environment. Given that history has shown an apparently unstoppable change from predominantly rural living to predominantly urban - as shown by UN data – we need to consider how resilience can be achieved.

Of course, the many reasons why this has happened have been researched and reported on almost since the beginnings of the ancient Greek city state, but I will simplify this into 'economic opportunity'. People without title to land have tended to migrate to the cities to earn money, seek their fortune, take a bite from the 'big apple'.

And while only a very few get rich, undoubtedly urban living has been one of the main drivers of economic growth since the Industrial Revolution. Access to jobs, services, markets, the growth of utilities and health services, housing and physical and financial trade are all concentrated at city nodes.

Cities have been likened to 'engines of growth' and like engines, they need fuel and other inputs, whilst also having wastes which need dealing with and require maintenance. Cities also have inefficiencies in conversion of 'fuel' to 'value'.

Making cities more efficient

In the recent past, work has begun on making the engine more efficient – to improve output – and on reducing the impacts of wastes – to reduce environmental, health and social damage. Most cities have grown so fast that they are effectively unplanned and so efforts have been made to impose some order often after constructing a particular type of infrastructure. Examples of this include improving internal transport links, strengthening waste management, increasing communications and IT connectivity, all of which are essentially efficiency improvements.

But to what extent does efficiency translate to resilience? The 'fuels' that are needed for the city engine are multiple and complex; human capital, raw and manufactured materials,

energy sources, food, water and sewerage services, intellectual capital, education and health systems, physical and cyber security to name just a few.

Unforeseen lack of 'system slack'

The provision of these fuels, and the management of wastes, maintenance of systems, and improved efficiencies, are delivered by a range of service providers from public and private bodies with a range of objectives. While these organisations generally plan well at an individual level, there is obviously potential for a mismatch of levels of service reliability; a difference of view as to what is critical and what is vulnerable, and different time horizons for investment in maintenance or capacity. All of this of which can lead to an unforeseen lack of 'system slack', or headroom, in a city's function.

Since there is no one entity co-ordinating all of this and ensuring that weaknesses in supply chains, services, financial and trade flows and utilities are operating both efficiently and effectively within the context of emerging vulnerabilities, this leaves real operating resilience somewhat in the wind. Efficiency can support resilience, but it can also be the enemy in certain circumstances. The logistics of running large and growing cities are complex and apparently largely outsourced to 'others'. One solution could be to build in a mechanism for oversight, perhaps learning from the 'war gaming' approach used by the Army and some sectors – to assess how events might unfold and how well the city system responds.

As General Omar Bradley is reported to have said: "Amateurs talk strategy and tactics, professionals talk logistics". Are our logistical failings damaging our ability to manage our resilience?

(Mike Woolgar /Water Strategy Director, WSP, 14 April, 2020, https://www.ice.org.uk/news-and-insight/the-civil-engineer/april-2020/how-can-cities-become-more-resilient)

Epic Engineering: Building the Brooklyn Bridge

It took 14 years, the modern equivalent of over $400 million, nearly 6,000 kilometers of wire, and the life's work of three members of the Roebling family to complete.

https://www.facebook.com/TEDEducation/videos/525613901676639/UzpfSTEw-MDAwMzY3NzY4MTqzNTpWSzoyMDc5NjMwNzg1NTE2MzQ2/?multi_permalinks=2079630785516346&notif_id=1587537540151651&notif_t=group_activity

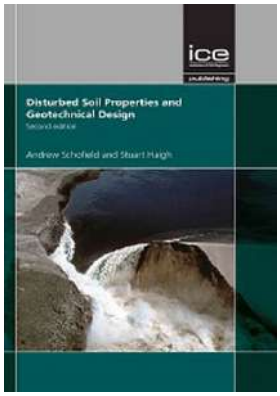
15,000-tonne bridge in NE China rotates to position

A 15,000-tonne cable-stayed bridge successfully rotated to its position in Shenyang, northeast China, on Tuesday night. The 262.8-meter-long and 31-meter-wide main bridge rotated 45 degrees counterclockwise to its targeted position in about 80 minutes. Sitting over 10 railway lines, the bridge has totally six lanes on two directions, connecting a main road of Shenyang with a national highway.

http://www.xinhuanet.com/english/2020-04/29/c_139017835.htm

(huaxia / XINHUANET, 2020-04-29, http://www.xinhuanet.com/english/2020-04/29/c_139017835.htm)

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



Disturbed Soil Properties and Geotechnical Design, Second Edition

Andrew Schofield and Stuart Haigh

Disturbed Soil Properties and Geotechnical Design, Second edition describes the developments leading to the Original Cam Clay model, focusing on fundamentals of the shearing of soil. The first edition explained and illustrated fallacies in past work of engineering geologists, and laid groundwork for the understanding that should form the basis of modern geotechnical design.

With the changing environment, and the increasing size of construction projects, engineers now need a better understanding of ground behaviour to prevent future catastrophes such as the 1976 Teton Dam failure shown on the cover. The further additions in this book will help geotechnical engineers acquire this knowledge.

Disturbed Soil Properties and Geotechnical Design, Second edition:

- provides an outline of the energy-based Cam-clay approach that can predict geotechnical deformations
- illustrates further fallacies in commonly used c-φ Coulomb soil mechanics
- describes the use of centrifuge modelling in geotechnical design, based on examples from the last four decades

Once armed with the simple concepts of wet/weepy and dry/thirsty sides of the critical state line, readers will better understand if soil will tend to contract or dilate in drained shearing, and if pore pressures caused by undrained shearing will be positive or negative.

Full of technical and personal insights, this is a rewarding book that forces the rethinking of modern geotechnical engineering. Much like the first edition, this book remains an invitation for the unconverted to re-examine the basic understanding of soil behaviour, and for the converted to ensure that the teaching, vocabulary and nomenclature used in describing strength models for soil, accurately reflect the underlying concepts.

Book Review

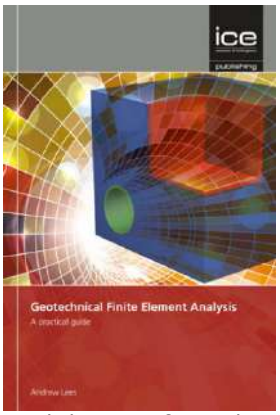
"This 182-page book is a useful reference for anyone interested in or gaining knowledge of the development of critical-state soil mechanics, a theory of plasticity which was initially jointly developed by Schofield in the 1950s.

Topics covered range from simple planar sliding of soil to plastic design in geotechnical engineering. Historical coverage starts with Coulomb's theory of strength, through Taylor's recognition that interlocking between grains provides a component of strength, to Schofield's work on the Cam clay soil model and critical state concepts.

Many other seminal geotechnical engineering contributions are discussed, critically reviewed and in some cases refuted. Limitations of the Cam clay model with regard to anisotropy, soil sensitivity and cyclic loading are acknowledged. The establishment and development of geotechnical centrifuge model testing in the UK is included together with mobilisable strength design, where calculations of the deformation of geotechnical systems are based on energy dissipation."

Colin Rawlings Jacobs/High Speed Two, UK

(ICE Publishing, 22 November 2017)



Geotechnical Finite Element Analysis

Andrew Lees

Geotechnical Finite Element Analysis provides the latest practical guidance and comprehensive explanations of applying finite element analysis (FEA) in geotechnical design – from planning and analysis, determining how the FEA relates to the design process and explaining the decisions that need to be made at each stage through to validation of results and reporting.

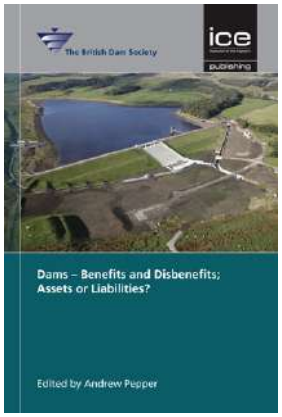
This highly illustrated guide expands on the practical benefits of FEA, such as the analysis of complex problems, overall increased productivity and revenue, and explains the complex theory behind the decisions that need to be made at each stage of a project.

Geotechnical Finite Element Analysis:

- features as the first practical and internationally applicable guidebook in this subject area
- includes detailed guidance on using FEA together with international design codes
- clarifies the factors to consider when selecting from the various constitutive models
- attests as a training aid, facilitated by complete worked examples
- covers 160 competence statements from the COGAN Competency Tracker maintained by NAFEMS.

Geotechnical Finite Element Analysis aims to combine essential learning material in one place. As a practical guide, textbook, reference and training tool, it is aimed at practising civil, structural and geotechnical engineers, and those undergoing training in geotechnical FEA and performing geotechnical FEA in design.

(ICE Publishing, 11 October 2016)



Dams - Benefits and Disbenefits; Assets or Liabilities?

Edited by Andrew Pepper

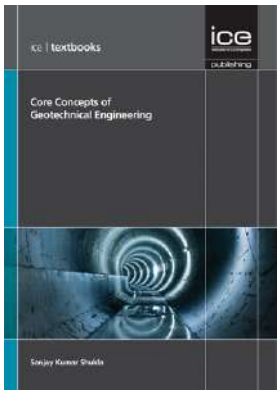
This book contains the proceedings of the 19th Biennial Conference of the British Dam Society, *Dams – Benefits or Disbenefits; Assets or Liabilities?*

Work to reservoirs and dams today covers far more than engineering, and the papers in this book show how engineers integrate their work with other disciplines to minimise the adverse impacts of schemes that are essential to ensure the safety of the public, while maximising other potential benefits to society.

Anyone with a professional interest in dams and reservoirs, such as dam owners, designers, or constructors, will find papers of direct relevance to them.

In addition to papers on dam construction and modifications, there are papers on the discontinuance of existing reservoirs, with the many engineering and environmental factors that have to be taken into account. The need to provide and exercise drawdown capability, while mitigating any adverse environmental impacts, is another area of increasing interest that is covered by several papers.

(ICE Publishing, 22 August 2016)



Core Concepts of Geotechnical Engineering

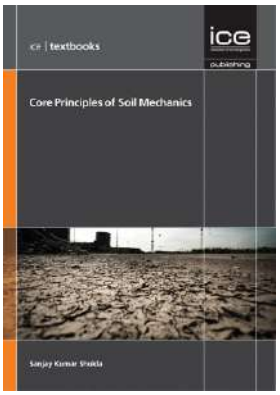
Sanjay Kumar Shukla

Core Concepts of Geotechnical Engineering is a practical introduction for students to the analysis, design, construction, maintenance and renovation of geotechnical structures. It presents the key principles of engineering geotechnical structures beginning with shallow and deep foundations and retaining structures through to slopes, embankments, earth dams, machine foundations, buried structures and tunnels. The book guides the students through the analysis of soils and rocks, site investigation and ground improvement techniques as well as exploring the geotechnical structures with geosynthetics.

Produced by the Institution of Civil Engineers, ICE Textbooks offer clear, concise and practical information on the major principles of civil and structural engineering. They are an indispensable companion to undergraduate audiences, providing students with:

- A comprehensive introduction to core engineering subjects
- Real-life case studies and worked examples
- Key learning aims, revision points and chapter summaries
- Further reading suggestions

(ICE Publishing, 11 June 2015)



Core Principles of Soil Mechanics

Sanjay Kumar Shukla

Core Principles of Soil Mechanics is a practical guide to the key concepts and latest developments in the field of soil mechanics. It explores the physical properties of soils and the behaviour of soil masses subjected to loads, as well as soil phases, classification and characteristics, stresses and fluid flow, consolidation, compressibility and compaction, shear strength, lateral earth pressure, slope stability and bearing capacity. These core principles can be applied to soil-like materials, such as coal ashes and mine tailings, and are explored using real-life scenarios and worked examples.

Produced by the Institution of Civil Engineers, ICE Textbooks offer clear, concise and practical information on the major principles of civil and structural engineering. They are an indispensable companion to undergraduate audiences, providing students with:

- A comprehensive introduction to core engineering subjects
- Real-life case studies and worked examples
- Practice questions, exercises and supplementary online solutions available at: www.icetextbooks.com
- Key learning aims, revision points and chapter summaries
- Further reading suggestions

(ICE Publishing, 22 May 2014)

ICE Specification for Piling and Embedded Retaining Walls, Third edition

Institution of Civil Engineers

The ICE Specification for Piling and Embedded Retaining Walls (SPERWall) is the UK's pre-eminent technical specification for piling and embedded walling works, either on land or near to shore.

The existence of an agreed way of executing piling works helps to reduce disputes on site and enables consultants to design more economically by having confidence in how the site works will be carried out. This edition has been updated to reflect the latest piling techniques and procurement methods used in the geotechnical sector, as well as revisions to the Eurocodes, British Standards and CIRIA guides.

This document has been designed for use with common practices, but is not intended to inhibit innovation. Novel solutions

can be used with this specification provided that additional clauses are included in the project specification which will ensure that the final product is constructed in accordance with the design requirements.

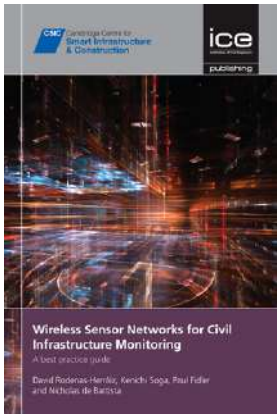
ICE Specification for Piling and Embedded Retaining Walls:

- includes new sections on micropiling and helical piling as well as guidance on the use of polymer fluids for excavation support
- ensures tolerances are better understood for the various techniques
- provides further guidance on concrete specification and testing

This edition retains the three-part approach of the second edition. Part A is an introduction to the essential concepts necessary to procure a piling or retaining wall contract. Part B is the specification and is still the only part of this document intended for incorporation in contracts. Part C provides guidance for use of the specification and essential background information for specifiers and contractors alike.

This specification has been one of the most popular of ICE's standard specifications and has been fundamental in raising piling standards in the UK, as well as where it has been applied around the world.

(ICE Publishing, 20 December 2016)



Wireless Sensor Networks for Civil Infrastructure Monitoring: A best practice guide

David Rodenas-Herráiz, Kenichi Soga, Paul Fidler and Nicholas de Battista

Wireless Sensor Networks for Civil Infrastructure Monitoring provides expert guidance on the selection and use of wireless sensor network (WSN) technology for structural monitoring of both existing infrastructure and new construction projects. The purpose of this guide is to consolidate a generic methodology for the design and implementation of WSNs for monitoring civil engineering infrastructure, coupled with best practice for data management and information valuation.

Wireless Sensor Networks for Civil Infrastructure Monitoring:

- aims to address a wide range of monitoring objectives, including monitoring undertaken in support of construction work, in response to specific problems identified during inspections, long-term monitoring over the whole life of an asset and for research purposes
- intends to assist stakeholders in the identification of the key performance criteria for a monitoring system
- includes highly illustrated real-world case studies
- contains a detailed reference list for further reading on specific topics.

Part of a series of best practice guides written by experts at the Cambridge Centre for Smart Infrastructure and Construction (CSIC), this book provides valuable information which will be useful to a range of stakeholders involved in the management of infrastructure assets.

(ICE Publishing, 22 July 2016)

Distributed Fibre Optic Strain Sensing for Monitoring Civil Infrastructure: A Practical Guide

C Kechavarzi, K Soga, N de Battista, L Pelecanos, M Elshafie, RJ Mair

Distributed Fibre Optic Strain Sensing for Monitoring Civil Infrastructure offers comprehensive guidance in the current developments of distributed optical fibre sensing applied to the field of civil engineering. The book discusses the concepts and practice of fibre optic monitoring of infrastructure and construction within the underground and geotechnical industry through real-life case studies in tunnel and pile monitoring, diaphragm-walls and slopes and embankments. Smart monitoring for performance-based design is increasingly being recognised as an essential tool for improving construction processes, delivering efficiency and reducing over-specification.

Distributed Fibre Optic Strain Sensing for Monitoring Civil Infrastructure:

- provides in-depth knowledge of Brillouin sensing, including DFOSS and BOTDR/A
- includes highly illustrated real-world case studies
- explores an innovative, economic and effective solution to performance monitoring
- discusses practical considerations such as cable types, methods of attachment, cable handling and installation planning and testing.

Written by experts at the Cambridge Centre for Smart Infrastructure and Construction (CSIC), this book highlights the main issues and offers guidance on how to correctly and efficiently determine the specifications for a distributed strain sensing system, examines fibre optic data analysis, the conversion to engineering parameters and how to interpret results.

(ICE Publishing, 06 September 2016)

Effective Site Investigation

Site Investigation Steering Group

Effective Site Investigation provides an introductory guide to accepted best practice for site investigations, both for construction professionals such as civil and structural engineers, builders and architects, and for their clients. It has been prepared by the Site Investigation

Steering Group, a multidisciplinary body representing those professional institutions, learned societies, trade organisations and government agencies involved or affected by site investigations.

The second edition represents a major revision and extension of the series with the aim of bringing together the whole site investigation industry and is intended for general application to all ground investigation work.

This is the second book published in the bestselling Site Investigation in Construction series. Also available: UK Specification for Ground Investigation.

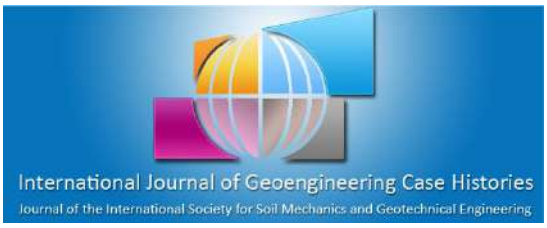
(ICE Publishing, 26 April 2013)

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

www.issmge.org/publications/issmge-bulletin/vol-14-issue-2-april-2020

Κυκλοφόρησε το Volume 14, Issue 2 του ISSMGE Bulletin (Απριλίου 2020) με τα παρακάτω περιεχόμενα:

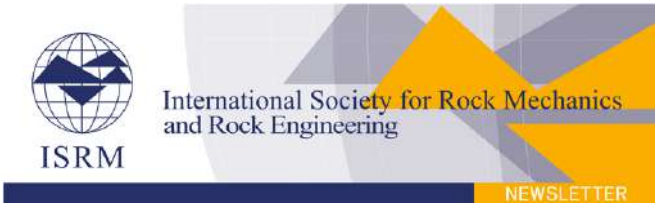
- President's message
- Research highlights
- Message from Board-level committee: Corporate Associates Presidential Group (CAPG)
- Conference reports
  - 16th Asian Conference of Soil Mechanics and Geotechnical Engineering, Taiwan
  - International Conference on Geotechnical Engineering, Iraq
- Hot News – ISSMGE Bright Spark Award
- ISSMGE Foundation reports
- Event Diary
- Corporate Associates
- Foundation Donors



An official journal of the International Society for Soil Mechanics and Geotechnical Engineering
www.geocasehistoriesjournal.org/pub/issue/view/44

Ολοκληρώθηκε το Volume 5, Issue 2, του International Journal of Geoengineering Case Histories με τα παρακάτω περιεχόμενα:

- Electrical Resistivity at Internal Erosion Locations in Levees, Stacey Tucker-Kulesza, Cassandra Rutherford, Michelle Bernhardt-Barry
- Forensic Analysis of Levee Failures: The Breitenhagen Case, Job J. Kool, Willem Kanning, Torsten Heyer, Cristina Jommi, Sebastiaan N. Jonkman
- Geotechnical Observations of Dams Failed During the 2015 Historic Flooding in South Carolina, Inthuorn Sasanakul, Sarah L. Gassman, Charles E. Pierce, William Ovalle-Villamil, Ryan Starcher, Emad Gheibi, Mostaqur Rahman
- Infiltration Study for Deep Foundations in Ephemeral Streams, Naresh C. Samtani



www.isrm.net/adm/newsletter/ver_html.php?id_newsletter=186

Κυκλοφόρησε το τεύχος 49, Μαρτίου 2020 του Newsletter της ISRM με τα παρακάτω περιεχόμενα:

- Message from the President
- EUROCK 2020 postponed to October 2020
- 29th ISRM online lecture by Prof. Francois Malan
- A tribute to Pierre Habib
- In remembrance of Ove Stephansson
- In memory of Fernando de Mello Mendes
- 11th Asian Rock Mechanics Symposium, China, postponed to 2021
- 5th Symposium of the Macedonian Association for Geotechnics postponed to October 2020
- IX Brazilian Rock Mechanics Symposium postponed to 2021
- XIII International Symposium on Landslides, Colombia, postponed to February 2021
- ISRM Sponsored Conferences

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

IGS NEWSLETTER – April 2020

Helping the world understand the appropriate value and use of geosynthetics

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

- GeoAmericas 2020 Postponed to October - A message from our President, Chungsik Yoo READ MORE
- Announcement of Candidates for IGS Council: Term 2020 to 2024 READ MORE

- IGS Launches New Publication – Chapter Chat READ MORE
- Sustainability Focus At EuroGeo 7 READ MORE
- Speaker Line-Up Announced for UK Chapter Symposium READ MORE
- Development of Geosynthetics Practice in Egypt READ MORE
- Sponsorship Packages Still Available For EuroGeo 7 READ MORE
- Engaging Young Engineers In South Africa READ MORE
- 2020 IGS Membership Renewals READ MORE
- Chapters: Don't forget to submit your 2019 Chapter Report! READ MORE
- Calendar of Events

READ MORE AT GEOSYNTHETICSSOCIETY.ORG

www.icevirtuallibrary.com/toc/jgein/27/2

Κυκλοφόρησε το Τεύχος 2 του Τόμου 27 (Απριλίου 2020) του Geosynthetics International της International Geosynthetics Society με τα παρακάτω περιεχόμενα:

Foreword

Foreword to special issue on geosynthetic-reinforced pile-supported embankments, R. J. Bathurst, J. P. Giroud, 27(2), pp. 110

Introduction

Introduction to Special Issue on Geosynthetic-reinforced pile-supported embankments, S.J.M. van Eekelen, J. Han, 27(2), pp. 111

Papers

Geosynthetic-reinforced pile-supported embankments: state of the art, S. J. M. van Eekelen, J. Han, 27(2), pp. 112–141

Long term measurements in the Woerden geosynthetic-reinforced pile-supported embankment, S. J. M. van Eekelen, A. A. M. Venmans, A. Bezuijen, A. F. van Tol, 27(2), pp. 142–156

3D modeling of geosynthetic-reinforced pile-supported embankment under cyclic loading, H. V. Pham, D. Dias, A. Dudchenko, 27(2), pp. 157–169

Centrifuge model studies on the settlement response of geosynthetic piled embankments, B. Reshma, K. Rajagopal, B. V. S. Viswanadham, 27(2), pp. 170–181

Analysis of unreinforced and reinforced shallow piled embankments under cyclic loading, K. Aqoub, M. Mohamed, T. Sheehan, 27(2), pp. 182–199

Effectiveness of geosynthetic reinforcement for load transfer in column-supported embankments, M. McGuire, J. Sloan, G. Filz, 27(2), pp. 200–218

Deformations in trapdoor tests and piled embankments, R. Rui, Y. X. Zhai, J. Han, S. J. M. van Eekelen, C. Chen, 27(2), pp. 219–235

www.sciencedirect.com/journal/geotextiles-and-geomembranes/vol/48/issue/2

Κυκλοφόρησε το Τεύχος 2 του Τόμου 48 (Φεβρουαρίου 2020) του Geotextiles and Geomembranes της International Geosynthetics Society με τα παρακάτω περιεχόμενα:

Special issue on Geosynthetics for Hydraulic and Environmental Applications

Editorial Board

Special issue "Geosynthetics for hydraulic and environmental applications", C.S. Yoo, Bumjoo Kim, Page 129

Lifetime assessment of exposed PVC-P geomembranes installed on Italian dams, D. Cazzuffi, D. Gioffrè, Pages 130-136

Geosynthetic clay liners: Perceptions and misconceptions, R. Kerry Rowe, Pages 137-156

Analyses and design of steep slope with GeoBarrier system (GBS) under heavy rainfall, Harianto Rahardjo, Yongmin Kim, Nurly Gofar, Alfrendo Satyanaga, Pages 157-169

Predicting the depletion of antioxidants in high density polyethylene (HDPE) under sunlight using the reciprocity law, Siavash Vahidi, Grace Hsuan, Adel ElSafty, Pages 170-175

Determination of geomembrane – protective geotextile friction angle: An insight into the shear rate effect, Guillaume Stoltz, Sylvie Nicaise, Guillaume Veylon, Daniel Poulain, Pages 176-189

Seismic performance and numerical simulation of earth-fill dam with geosynthetic clay liner in shaking table test, Kyungbeom Jeong, Satoru Shibuya, Toshinori Kawabata, Yutaka Sawada, Hiroshi Nakazawa, Pages 190-197

Damage to geomembrane liners from tire derived aggregate, B.A. Marcotte, I.R. Fleming, Pages 198-209

Modelling of hydraulic deterioration of geotextile filter in tunnel drainage system, Kang-Hyun Kim, No-Hyeon Park, Ho-Jong Kim, Jong-Ho Shin, Pages 210-219

ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ ΕΕΕΕΓΜ (2019 – 2022)

Πρόεδρος	:	Μιχάλης ΜΠΑΡΔΑΝΗΣ, Δρ. Πολιτικός Μηχανικός, ΕΔΑΦΟΣ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Α.Ε. mbardanis@edafos.gr, lab@edafos.gr
Α' Αντιπρόεδρος	:	Χρήστος ΤΣΑΤΣΑΝΙΦΟΣ, Δρ. Πολιτικός Μηχανικός, ΠΑΝΓΑΙΑ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Ε.Π.Ε. editor@hssmge.gr, ctsatsanifos@pangaea.gr
Β' Αντιπρόεδρος	:	Μιχάλης ΠΑΧΑΚΗΣ, Πολιτικός Μηχανικός mpax46@otenet.gr
Γενικός Γραμματέας	:	Γιώργος ΜΠΕΛΟΚΑΣ, Δρ. Πολιτικός Μηχανικός, Επίκουρος Καθηγητής ΤΕΙ Αθήνας gbelokas@teiath.gr, gbelokas@gmail.com
Ταμίας	:	Γιώργος ΝΤΟΥΛΗΣ, Πολιτικός Μηχανικός, ΕΔΑΦΟΜΗΧΑΝΙΚΗ Α.Ε.- ΓΕΩΤΕΧΝΙΚΕΣ ΜΕΛΕΤΕΣ Α.Ε. gdoulis@edafomichaniki.gr
Έφορος	:	Γεώργιος ΓΚΑΖΕΤΑΣ, Δρ. Πολιτικός Μηχανικός, Ομότιμος Καθηγητής Ε.Μ.Π. gazetas@central.ntua.gr, gazetas50@gmail.com
Μέλη	:	Ανδρέας ΑΝΑΓΝΩΣΤΟΠΟΥΛΟΣ, Δρ. Πολιτικός Μηχανικός, Ομότιμος Καθηγητής ΕΜΠ aanagn@central.ntua.gr
		Παναγιώτης ΒΕΤΤΑΣ, Πολιτικός Μηχανικός, ΟΜΙΛΟΣ ΤΕΧΝΙΚΩΝ ΜΕΛΕΤΩΝ Α.Ε. otmate@otenet.gr
		Μαρίνα ΠΑΝΤΑΖΙΔΟΥ, Δρ. Πολιτικός Μηχανικός, Αναπληρώτρια Καθηγήτρια Ε.Μ.Π. mpanta@central.ntua.gr
Αναπληρωματικά Μέλη	:	Χρήστος ΣΤΡΑΤΑΚΟΣ, Πολιτικός Μηχανανικός, ΝΑΜΑ Α.Ε. stratakos@namalab.gr
		Βάλια ΞΕΝΑΚΗ, Δρ. Πολιτικός Μηχανικός, ΕΔΑΦΟΜΗΧΑΝΙΚΗ Α.Ε. vxenaki@edafomichaniki.gr

ΕΕΕΕΓΜ

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

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

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

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