Árbol de Piedra - Bolivia

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΤΑΙΡΕΙΑ ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ & ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Τα Νέα της Ε Ε Ε Ε Γ Μ

35

Αρ. 35 – ΦΕΒΡΟΥΑΡΙΟΣ 2011

SIMSG ISSMGE

Φονικός σεισμός 6.3 βαθμών στη Νέα Ζηλανδία

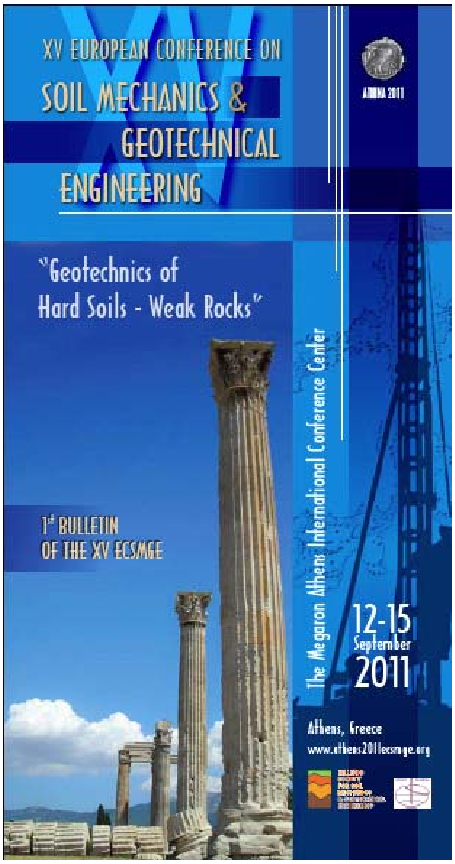
Τουλάχιστον 65 (σ.σ. 147 και 50 αγνοούμενοι την 27.02.2011) νεκροί και περίπου 200 εγκλωβισμένοι στα συντρίμμια, είναι ο μέχρι στιγμής απολογισμός από τον ισχυρό σεισμό που σημειώθηκε σήμερα στη δεύτερη μεγαλύτερη πόλη της Νέας Ζηλανδίας, το Christchurch.

«Ενδέχεται να είμαστε αντιμέτωποι με την πιο ζοφερή κατάσταση στη Νέα Ζηλανδία», δήλωσε ο πρωθυπουργός Τζον Κι μετά την έκτακτη συνεδρίαση του υπουργικού συμβουλίου.

Από τον δεύτερο σεισμό που πλήττει την πόλη μέσα σε πέντε μήνες ξέσπασαν πυρκαγιές. Ο σεισμός που είχε ένταση 6,3 βαθμούς σημειώθηκε την ώρα του μεσημεριανού γεύματος όταν οι δρόμοι και τα καταστήματα ήταν γεμάτοι, ενώ οι ερ-

(συνέχεια στην σελ. 3)

Π Ε Ρ Ι Ε Χ Ο Μ Ε Ν Α



Κυκλοφορεί εντός των ημερών το 2nd Bulletin του XV European Conference on Soil Mechanics and Geotechnical Engineering με λεπτομέρειες για την διοργάνωση του συνεδρίου, των συνεδριών, των τεχνικών επισκέψεων κ.λπ. Σημειώνεται ότι έχουν εγκριθή 380 περίπου περιλήψεις άρθρων.

Το Bulletin καθώς και το έντυπο εγγραφής στο συνέδριο είναι αναρτημένα στον ιστοχώρο του συνεδρίου www.athens2011ecsmge.org.

(συνέχεια από την πρώτη σελίδα)

γαζόμενοι βρίσκονταν στα γραφεία τους.

Ο δήμαρχος του Κράιστσερτς περιέγραψε την πόλη των σχεδόν 400.000 ως εμπόλεμη ζώνη.

«Θα υπάρχουν νεκροί, θα υπάρχουν πολλοί τραυματίες, θα υπάρξει πολύς πόνος σε αυτή την πόλη», είπε τηλεφωνικώς στην αυστραλιανή τηλεόραση ο δήμαρχος Μπομπ Πάρκερ.

Ελικόπτερα πραγματοποίησαν ρίψεις νερού για την κατάσβεση πυρκαγιάς που έχει ξεσπάσει σε ένα ψηλό κτίριο, όπου στεγάζονται γραφεία. Οι αρχές διέταξαν τα μεγάλα νοσοκομεία της χώρας να είναι σε επιφυλακή για τη μεταφορά εκεί των τραυματιών, ενώ υπάρχουν πληροφορίες ότι παρατηρείται έλλειψη σε ασθενοφόρα.

Η αστυνομία ανακοίνωσε ότι συντρίμμια των κτιρίων έχουν καταπλακώσει δύο λεωφορεία, αλλά δεν έχει γίνει γνωστό αν υπάρχουν νεκροί μεταξύ των επιβατών.

Ο σεισμός σημειώθηκε στις 12:51 μμ τοπική ώρα (23:51 GMT της Δευτέρας) σε εστιακό βάθος τεσσάρων χιλιομέτρων, σύμφωνα με το Αμερικανικό Γεωδυναμικό Ινστιτούτο.

Το επίκεντρο του σεισμού εντοπίζεται περίπου 10 χιλιόμετρα νοτιοδυτικά του Κράιστσερτς, το οποίο υπέστη σοβαρές υλικές ζημιές από τον σεισμό του Σεπτεμβρίου που είχε μέγεθος 7.1 βαθμούς, αλλά δεν προκάλεσε θανάτους.

Όπως δήλωσε ο Τζέιμς Γκοφ του τμήματος Έρευνας Φυσικών Κινδύνων του πανεπιστημίου της Νέας Νότιας Ουαλίας στην Αυστραλία, ορισμένα κτίρια που άντεξαν στον σεισμό του Σεπτεμβρίου δεν είναι σε θέση να αντέξουν ένα δεύτερο σεισμό, ειδικά με τόσο μικρό εστιακό βάθος. Στην περιοχή σημειώθηκαν αρκετοί μετασεισμοί.

Η σεισμογενής περιοχή

Η Νέα Ζηλανδία βρίσκεται ανάμεσα στην Ινδο-αυστραλιανή τεκτονική πλάκα και την τεκτονική πλάκα του Ειρηνικού, όπου καταγράφονται κατά μέσον όρο περισσότεροι από 14,000 σεισμοί ετησίως, από τους οποίους περίπου οι 20 έχουν μέγεθος 5 βαθμών.

Το υπέδαφος στο Κράιστσερτς είναι σαθρό με αποτέλεσμα, όταν σημειώνεται σεισμός, να αυξάνεται η στάθμη του νερού και αφού ανακατευθεί με την άμμο να μετατρέπεται σε βάλτο «καταπίνοντας» ουσιαστικά ολόκληρα τμήματα του οδοστρώματος και «εξαφανίζοντας» αυτοκίνητα.

Ομάδα έρευνας και διάσωσης από την Αυστραλία

Η Αυστραλία έστειλε σήμερα μία ομάδα έρευνας και διάσωσης στο Κράιστσερτς για να συνδράμει τις προσπάθειες των αρχών της Νέας Ζηλανδίας να αντιμετωπίσουν την κατάσταση που έχει διαμορφωθεί.

Η πρωθυπουργός Τζούλια Γκίλαρντ ανακοίνωσε ότι η Αυστραλία θα προσφέρει όποια βοήθεια ζητήσει η Νέα Ζηλανδία. «Ενδέχεται να χρειαστούν πολλές έρευνες κάτω από τα συντρίμμια», είπε η Γκίλαρντ προσθέτοντας ότι οι αρχές του Κράιστσερτς κάνουν λόγο για «πολλά θύματα».

Η ίδια είπε ότι οι εικόνες που έρχονται από το Κράιστσερτς είναι «πραγματικά σοκαριστικές».

«Άνθρωποι να περπατούν στους δρόμους με αίμα να τρέχει από το κεφάλι και το πρόσωπό τους. Εικόνες από κτίρια που έχουν μείνει συντρίμμια», είπε η Γκίλαρντ.

(www.kathimerini.gr με πληροφορίες από ΑΠΕ-ΜΠΕ)

Magnitude 6.3 - SOUTH ISLAND OF NEW ZEALAND
2011 February 21 23:51:43 UTC

Earthquake Details

Magnitude **6.3**

Date-Time
- **Monday, February 21, 2011 at 23:51:43 UTC**
- Tuesday, February 22, 2011 at 12:51:43 PM at epicenter

Location 43.600°S, 172.710°E

Depth 5 km (3.1 miles)

Region SOUTH ISLAND OF NEW ZEALAND

Distances
NEAR **Christchurch, New Zealand**
225 km (140 miles) SSE of **Westport, New Zealand**
305 km (190 miles) SSW of **WELLINGTON, New Zealand**
310 km (190 miles) NE of **Dunedin, New Zealand**

Tectonic Summary

The February 21, 2011 South Island, New Zealand earthquake occurred as part of the aftershock sequence of the M 7.0 September 3, 2010 Darfield, NZ earthquake. The February 21st earthquake involved oblique-thrust faulting at the easternmost limit of previous aftershocks, and like the mainshock itself is broadly associated with regional plate boundary deformation as the Pacific and Australia plates interact in the central South Island, New Zealand.

This latest shock is significantly closer to the main population center of Christchurch, NZ, than is the September 2010 mainshock, in the vicinity of several other moderate (M 4 to 5) sized aftershocks located east of the main rupture zone of the 2010 event. There is no specific structure directly linking this event to the main fault of the 2010 mainshock, although there have been numerous aftershocks along generally east-west linear trends extending east from the end of the previous rupture. The north or north-east trends to the possible fault planes and the oblique thrust faulting mechanism as seen in the focal mechanism solution may reflect an association with similarly-trending faults previously mapped in the Port Hills region, just to the south of Christchurch.

Since the September 3, 2010 mainshock, there have been approximately 6 M>=5.0 aftershocks in the Christchurch region. The February 21st earthquake represents the largest aftershock to date, more that half a magnitude unit larger than the previous largest aftershock.

EARTHQUAKE STRIKES CHRISTCHURCH, NEW ZEALAND

The Pyne Gould Guiness Building

The Christchurch Catholic Cathedral

More than 100 people, including as many as a dozen visiting Japanese students, are thought to be trapped in the rubble.

Despite darkness and drizzling rain, rescue crews with sniffer dogs fanned out across the city in search of survivors, some of whom were sending text and phone messages from beneath the rubble.

Christchurch Cathedral

Presbyterian Konx Church

Littelton town

Unusual Physical Impacts

20 million tons of ice were separated from a glacier located 120 mi from the epicentre, and Bexley, a suburb of Christchurch, was flooded.

Engineers Surprised by Damage to Modern Buildings in Christchurch

The New Zealand earthquake surprised engineers by triggering severe damage or collapse of some recently constructed buildings.

The magnitude 6.3 earthquake that struck 10 km from Christ-church, South Island, New Zealand on Feb. 22 brought down or severely damaged some contemporary structures because the quake was extremely shallow—centered only 5 km below the surface.

"New Zealand has very good loading standards and a strict regulatory environment and since the mid-70s onwards, the buildings have been designed for earthquake resistance very well," says John Wilson, chair of the Australian Earthquake Loading Standard and Deputy Dean of Engineering at Swinburne University of Technology, speaking on behalf of the Australian Science Media Centre (AusSMC).

The standard of design has been improving over the last 20 years or so, "which is why most buildings performed well, with the exception of a few buildings that were severely damaged or partially collapsed."

Engineers representing the international community are already gearing up to inspect the damaged contemporary buildings to determine why they failed.

A team from Miyamoto International Inc., led by Amir Gilani, left for New Zealand Feb. 23. There the team will meet up with a New Zealand civil engineer. A team from Canada plans to go to Christchurch soon.

"The New Zealand construction code is one of the most stringent in the world for new buildings and it partially inspired our own Canadian Code," says Dr René Tinawi, manager of the Canadian Seismic Research Network and Professor Emeritus at the Ecole Polytechnique de Montreal.

"This is why Canadian experts would like to inspect first-hand how newer buildings fared during this second Christchurch earthquake, as soon as the situation allows."

To help with rescue and recovery, and at the request of the New Zealand government, the U.S. is deploying a U.S. Agency for International Development (USAID) Disaster Assistance Response Team (DART). The team will include the Los Angeles County Fire Dept.'S Urban Search and Rescue team (USAR) to assist with the search and rescue efforts.

The USAR component of the DART will be what is called a "heavy team," bringing more than 70 specialized personnel and all necessary equipment to make live rescues in even the most precarious situations, according to USAID.

Engineers are not surprised there is damage, especially to the older, unreinforced masonry buildings, considering their masonry is heavy, brittle and vulnerable to earthquake shaking.

"This quake was pretty much a bullseye – it was quite a large Magnitude 6.3 event and so close to Christchurch that we weren't surprised to see significant damage; at that close range, the level of shaking is quite severe," says Wilson.

The New Zealand Building Code can be viewed on-line. In particular, clause B1-Structure covers seismic resistance, says the AusSMC. The loading code from 1976 to 2004 was in various editions of NZS 4203, and since then NZS 1170.5.

Limit state design methods have supplanted working stress methods for habitable buildings during this period. All of the loading codes define seismic hazard zones on maps that have changed over the years.

Apart from the zone factor, the designer must include soil type, building natural period, importance level, and working life in determining the earthquake loads to be used in design.

An Aftershock of Earlier Quake

"New Zealand is a first-world country, and the reason the damage is so much greater is that it's an aftershock of the larger 7.1 magnitude earthquake that happened last September near Christchurch," says Melissa Giovanni, a professor of geology at the University of Calgary, Alberta, Canada.

Giovanni speculates that buildings were already weakened by the Sept. 4 quake so much that magnitude 6.3 temblor would be much more devastating.

"Another reason this earthquake was more damaging is that it was closer to the surface, and so the movement would be more intense than in a deeper quake where the earth can dissipate some of the energy," says Giovanni.

In New Zealand, the North Island is located where two plates are converging - the Australian Plate and the Pacific Plate. On the South Island, the plates are sliding past each other in what is called a strike-slip fault, called the Alpine Fault. It's similar to the San Andreas Fault in California, says Giovanni.

"These plates are always in motion," she adds.

The plates grinding and scraping past each other breaks rocks and causes earthquakes.

The crust is still trying to regain its equilibrium since the Sept. 4 quake, says Giovanni.

She calls the fault that broke an oblique thrust, which means there was some horizontal movement and some vertical movement.

"So the initial movement probably felt like a lift as the earth moved vertically, and then later you would feel vertical and horizontal movement," says Giovanni.

The Feb. 23 quake is part of a series of aftershocks from the September event, say engineers. Aftershocks have been common since September, with several reaching magnitudes larger than 5.0.

"We can expect aftershocks to continue for days, weeks, and months," says Giovanni.

(Nadine M. Post, Engineering News-Record, February 23-24, 2011)

Mona Vale

Εντυπωσιακά φαινόμενα ρευστοποίησης και εδαφικών αστοχιών

Christchurch suburb of Linwood

Ferry Road, Christchurch

People walk across buckled road in Christchurch

Cracks in Bridge Rodd, South Brighton

Road between Lyttelton and Sumner

Sumner Road, Lyttelton

Cass Bay, Lyttelton: Ίχνος πτώσης βραχοτεμάχους

Rock falls at Redcliffs

Rock falls at Sumner

Βραχοπτώσεις στην περιοχή του Sumner

Instability from Soil Liquefaction Remains a Danger, Says Engineer

An engineer on the ground in Christchurch says that New Zealand's seismic retrofit code and/or construction methods should be strengthened based on the damage to recently upgraded buildings.

Many other Christchurch buildings, damaged in many cases as a result of soil liquefaction, were rendered uninhabitable and also still pose a public threat because they might collapse, says the engineer, Amir Gilani.

Several recently seismically retrofitted buildings collapsed, including the Christchurch Cathedral, says Gilani. "Clearly, the retrofit criteria or methods failed," says Gilani.

The magnitude-6.3 earthquake, the second to hit Christchurch since September, struck on Feb. 22 and Gilani, an engineer with Los Angeles-based Miyamoto International Inc., left for New Zealand the next day.

The official death toll has risen to 102, with 228 people missing. Insurance losses are estimated at $12 billion compared to the $3.8 billion in September's quake, according to sources.

"In addition to the rising death toll and the human suffering, the damage to the downtown buildings caused by widespread soil liquefaction is extensive and a continuing danger to the inhabitants," says Gilani.

In some areas, more than 20% of the buildings have collapsed. "We have visited many industrial buildings where our team witnessed the total collapse of the structures, wiping out equipment and inventory," he adds.

"Many office buildings have fared no better, resulting in a complete shutdown of the central business district," Gilani continues.

This is in contrast to what happened in September 2010 during a magnitude-7.1 earthquake, he says. "Some buildings that withstood that quake are no longer standing today," he adds.

Structural engineers the world over are somewhat surprised that several contemporary buildings collapsed even though the quake was extremely shallow. Centered 10 km from Christchurch, on South Island, the quake's depth was only 5 km below the surface.

Engineers are not surprised the temblor caused extensive damage to the older, unreinforced masonry buildings—

among them several churches. Their masonry is heavy, brittle and vulnerable to earthquake shaking.

But the collapse of several newer buildings, including the Pyne Gould Guiness Building, is much more curious.

"This quake was pretty much a bullseye–it was quite a large magnitude-6.3 event and so close to Christchurch that we weren't surprised to see significant damage; at that close range, the level of shaking is quite severe," says John Wilson, chair of the Australian Earthquake Loading Standard and deputy dean of engineering at Swinburne University of Technology, speaking on behalf of the Australian Science Media Centre (AusSMC). "In general the contemporary buildings performed well, although a few contemporary buildings have collapsed, which did surprise us."

New Zealand building codes are comparable to those in the U.S. and Japan, explains Gilani. "Based on what we have seen," he says, "it will take many months, even years to repair the damage and rebuild to a much higher standard.

"And because the New Zealand islands straddle a geologically unstable area, known as the Ring of Fire, serious aftershocks and future events cannot be ruled out," adds Gilani.

H. Kit Miyamoto, Miyamoto's chief executive, is in Haiti and he compared the Haiti and New Zealand quakes in statements released by his firm.

"In Haiti, where Miyamoto teams have been working for the last year to assess the damage and restore and rebuild housing, we have seen the worst of what earthquakes can cause," he says. "But the collapse ratio in some of areas of New Zealand is reaching a similar percentage as in Haiti."

"We have also learned from our experience in responding to earthquake events around the world about what should be done to prevent this kind of devastation. We hope to lend our expertise to the city of Christchurch to build in a manner that will prevent this loss of human life and extensive economic dislocation in the future," Miyamoto says.

The New Zealand Building Code can be viewed on-line. In particular clause B1 Structure covers seismic resistance, says the AusSMC. Limit state design methods have supplanted working stress methods for habitable buildings. All of the loading codes define seismic hazard zones on maps that have changed over the years.

Since the mid-70s, buildings have been well-designed for earthquake resistance, says Wilson.

Most Buildings Fared Well

"What's more, the standard of design has still been improving over the last 20 years or so, which is why most buildings performed well, with the exception of a few buildings that were severely damaged or partially collapsed," he adds.

Melissa Giovanni, a professor of geology at the University of Calgary, Alberta, Canada, has her own theories about the damage. She blames much of it on the Sept. 4 quake.

"New Zealand is a first-world country, and the reason the damage is so much greater is that it's an aftershock of the larger magnitude-7.1 earthquake that happened," she says.

Giovanni speculates that many buildings were already weakened by the Sept. 4 event, so much that the magnitude-6.3 temblor would be much more devastating. "Another reason this earthquake was more damaging is that it was closer to the surface, and so the movement would be more intense than in a deeper quake where the earth can dissipate some of the energy," says Giovanni.

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The fault is similar to the San Andreas Fault in California, says Giovanni. "These plates are always in motion," she adds.

The grinding and scraping of the plates against each other breaks rocks and causes earthquakes. The crust is still trying to regain its equilibrium since the Sept. 4 quake, says Giovanni.

She calls the fault that broke an oblique thrust, which means there was some horizontal movement and some vertical movement. "So the initial movement probably felt like a lift as the earth moved vertically, and then later you would feel vertical and horizontal movement," says Giovanni.

Aftershocks have been common since September, with several having magnitudes larger than 5.0. "We can expect aftershocks to continue for days, weeks and months," says Giovanni.

To help with rescue and recovery, at the request of the New Zealand government, the U.S. is deploying a U.S. Agency for International Development (USAID) Disaster Assistance Response Team (DART). The team will include the Los Angeles County Fire Dept.'s Urban Search and Rescue team (USAR) to assist with the search and rescue efforts.

The USAR component of the DART will be what is called a "heavy team," bringing more than 70 specialized personnel and all necessary equipment to make live rescues in even the most precarious situations, according to USAID.

(Nadine M. Post, Engineering News-Record, February 23-24, 2011)

Christchurch's Pico Wholefood building

Why Was New Zealand's Latest Earthquake So Deadly?

Christchurch copes with a tragedy it did not see coming

New Zealanders living in the nation's second-largest city, Christchurch (population approximately 377,000) on the South Island's Canterbury Plains were hit hard Tuesday by magnitude 6.3 earthquake, an aftershock from September's magnitude 7.1 tremor. Prior to these two seismic events, Canterbury Plains likely had not experienced an earthquake in thousands of years. In fact, scientists did not even know there was a geologic fault there until it ruptured last year.

The latest Christchurch tremors were not as strong as the original earthquake, but they have caused considerably more damage and claimed dozens of lives. (No one died during the September quake). The Christchurch epicenter was only 10 kilometers outside of the city, whereas the 2010 event took place about 40 kilometers to the west, in an area that is mostly farmland. Adding to Christchurch's misfortune, the aftershock struck only about four kilometers in depth below the city, whereas September's temblor originated about 10 kilometers deep. Compounding these problems, Tuesday's quake hit during lunchtime when the city was buzzing with activity, whereas the earlier disaster occurred during early morning hours.

Scientific American spoke with Robert Yeats, a professor emeritus of geology at Oregon State University in Corvallis, about why earthquakes are so difficult to predict and what is being done to lessen the odds of surprise temblors.

[*An edited transcript of the interview follows.*]

The 7.1-magnitude earthquake in September caught the locals completely off guard. Why was that earthquake as well as Tuesday's aftershock such a surprise?

The earthquakes struck an area of New Zealand's South Island where sediments are deposited from the Southern Alps and from the nearby rivers. The sediment deposits reach all the way to the east coast on what is called the Canterbury Plains. The fault that ruptured in September had not done so in thousands of years, during which sediments had been deposited on top. I've been out there, and it's like driving anyplace where it's all flat. There are farms, but there's nothing that says, "Here's a fault." So, when the earthquake struck in September they were totally surprised. On the South Island, the Hope Fault and Marlborough Fault System are better known—there had been an earthquake in 1888 along the Hope Fault. Much less was known about faulting on the Canterbury Plains because no earthquake had happened in their historical record.

What defines an "aftershock" as opposed to an earthquake? Does a certain amount of time have to elapse for a seismic event to be considered an earthquake?

It takes many years before seismic activity can be considered an earthquake rather than an aftershock of a previous earthquake. That's a point of debate among seismologists. If you look at a map of southern California, you'll see quite a few little earthquakes south of Bakersfield in the San Joaquin Valley. Some people regard those as still aftershocks from the earthquake of 1952, which measured 7.3. That's not the consensus but it indicates that these aftershocks go on for decades. It takes quite a long time for everything to become quiet again. Now the San Andreas, on the other hand, had a large earthquake in 1857, just west of San Joaquin Valley, and it's quiet as could be. Same with the area of the 1906 San Francisco earthquake along the San Andreas. You can't paint all aftershock series with the same brush.

You mentioned that the aftershock was "shallow". What is the difference between an earthquake that takes place four kilometers below ground and one that takes place 10 kilometers below the surface, as the September earthquake did?

It's like how close you are to a bomb going off. If you're within a couple of kilometers, you're likely to get injured. If you're three or four times that distance, you not likely to. The waves are attenuating, or propagating, toward the surface. Christchurch was a very shallow earthquake, and that's a reason why the damage was much worse than the earlier one.

What do you look for when you investigate seismic activity in a particular area?

If I study a particular fault, I like to know its slip rate, how fast it's moving, whether it's a millimeter per year or a centimeter per year. As plates move, they're building up strain, and I estimate how much strain can build up before there is a rupture. New Zealanders have been good about trenching faults (digging trenches along fault lines to study previous seismic activity). The problem with this fault was that they didn't even know it was there. That tells me it's a pretty slow-moving fault but, nonetheless, when it builds up toward an earthquake of magnitude 7, then that's going to continue to produce aftershocks for a long time. It's not an exact science.

I'm working with the New Zealand Institute of Geological and Nuclear Sciences on a project funded by the Global Earthquake Model to map all of the active faults on Earth. This Global Faulted Earth project will include a global active fault and seismic source database, along with a book I'm writing. At some point in the not too distant future, if you hear about an earthquake in a place like Christchurch, you will be able to click on this database to find out what is known about it.

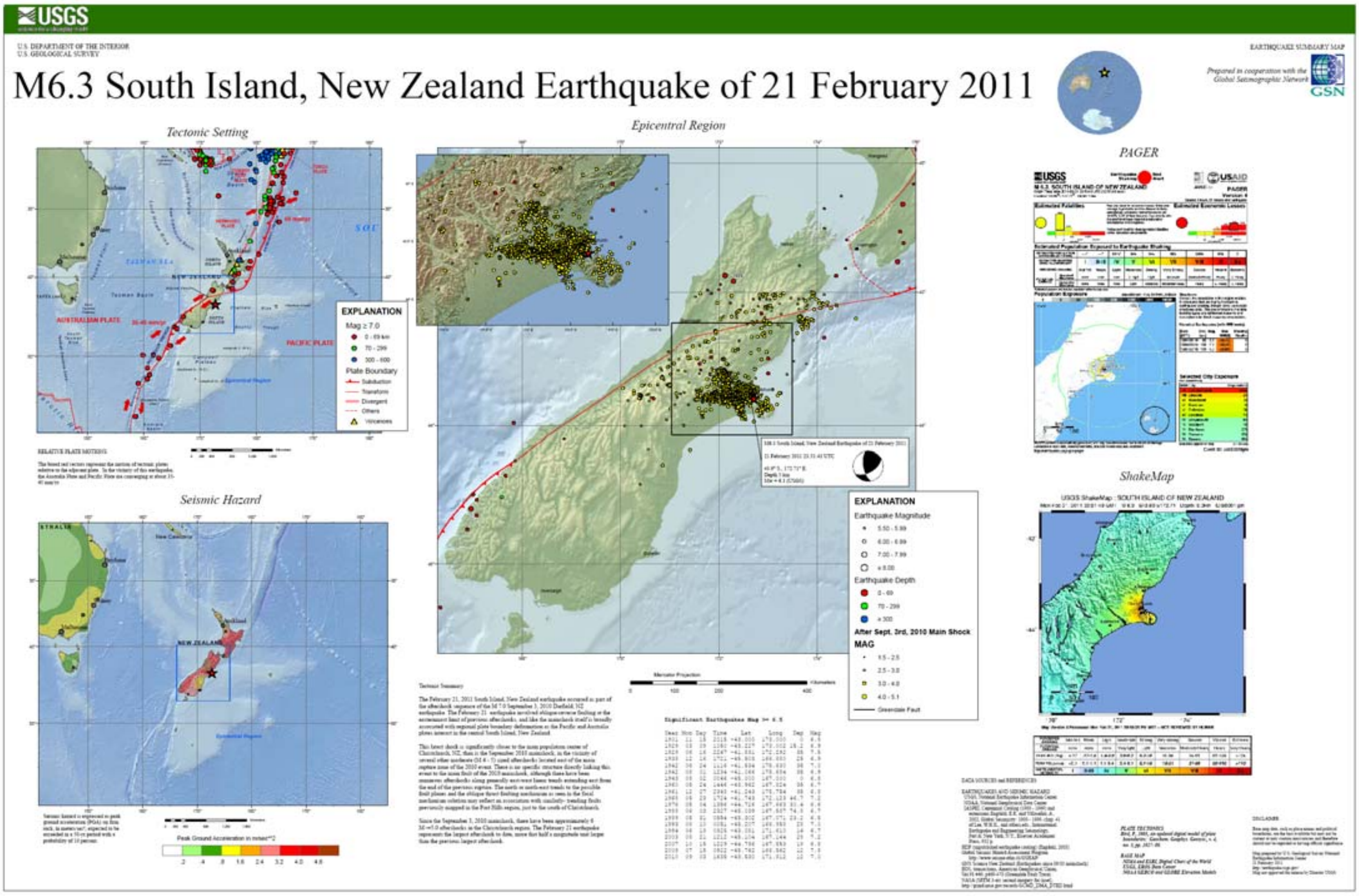
What can be learned from this week's aftershock in New Zealand?

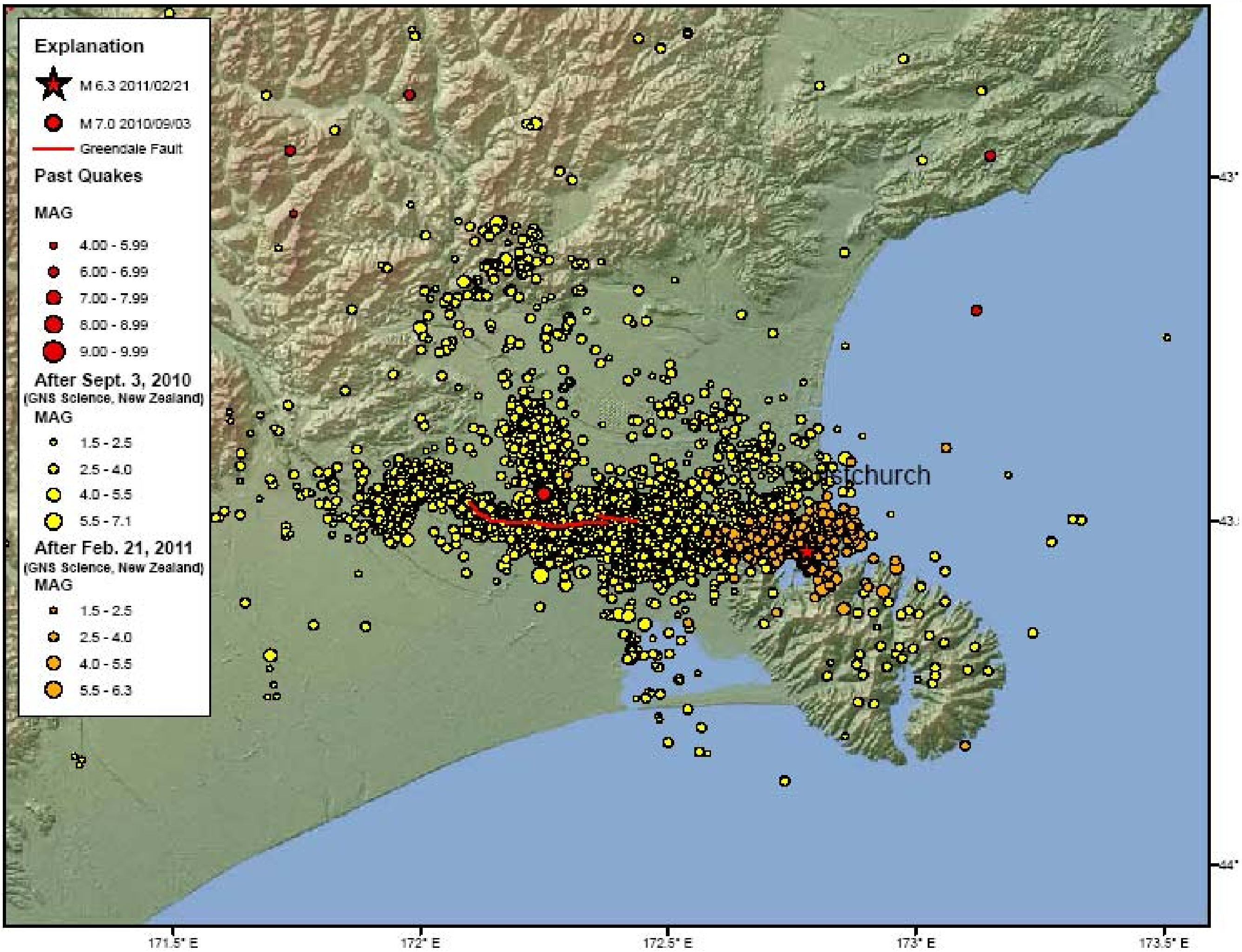
We can map faults, and that's what we do, and we can use what we learn about those faults to establish some probability of an earthquake happening—but you can't map all faults. In the case of Christchurch, I'm not sure what they could have done differently. They could have said, let's do a seismic survey of the whole Christchurch metropolitan area just to be sure there's nothing going on underneath the city. But it was unlikely for the faults to extend as far south from the original Darfield earthquake site at as they did, so I can't fault them for not doing that.

You have to realize that New Zealand has some of the strongest building codes in the world, and those building codes are respected. That means you have loss of life, but it's in the dozens or maybe 100 or 200. If the same earthquake were to happen under a city of that size in a developing country, the number of deaths would be in the thousands, if not tens of thousands. Turkey, for example, had great building codes but that didn't keep tens of thousands of people from getting killed in the 1999 Izmit 7.6-magnitude earthquake because they weren't paying attention to those codes.

(Larry Greenemeier, Scientific American, February 22, 2011 στο ASCE SmartBrief, 23 February 2011)

Πριν και Μετά τον σεισμό


USGS
M6.3 South Island, New Zealand Earthquake of 21 February 2011
Tectonic Setting
Epicentral Region
PAGER
Seismic Hazard
ShakeMap
EXPLANATION


Explanation
M 6.3 2011/02/21
M 7.0 2010/09/03
Greendale Fault
Past Quakes
MAG
4.00 - 5.99
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After Sept. 3, 2010
(GNS Science, New Zealand)
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After Feb. 21, 2011
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Christchurch
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173.5° E

ΑΡΘΡΑ

Corruption kills

Nicholas Ambraseys and Roger Bilham

On the anniversary of Haiti's devastating quake, Nicholas Ambraseys and Roger Bilham calculate that 83% of all deaths from building collapse in earthquakes over the past 30 years occurred in countries that are anomalously corrupt.

Port-au-Prince, Haiti, 2010.

The six-digit death toll from last year's Haiti earthquake compared with the absence of any fatalities in New Zealand's identical magnitude (7) earthquake was a stark reminder that poor building practices are largely to blame for turning moderate earthquakes into major disasters. Earthquake-resistant construction depends on responsible governance, but its implementation can be undermined by corruption[1–5] or by poverty, through the use of substandard materials and assembly methods, or through the inappropriate siting of buildings[6,7].

The effects of these forces are difficult to tease apart, because the poorest nations are often also the most corrupt. To try to isolate these influences, we quantified a global relationship between national corruption[8] and a nation's per capita income[9]. It showed that some nations are more corrupt than anticipated. It is in these countries that about 83% of all deaths from earthquakes in the past three decades have occurred.

The construction industry — currently worth US$7.5 trillion annually and expected to more than double in the next decade — is recognized as being the most corrupt segment of the global economy[10]. Corruption takes the form of bribes to subvert inspection and licensing processes, and of covert activities that reduce costs and thereby compromise the quality of structures. The assembly of a building, from the pouring of foundations to the final coat of paint, is a process of concealment, a circumstance ideally suited to the omission or dilution of expensive but essential structural components. Reports of the spontaneous collapse of new buildings testify to a lack of construction oversight (for example, Shanghai, 27 June 2009; Delhi, 15 November 2010). During earthquakes, the consequences of decades of shoddy construction are revealed on a catastrophic scale[1,2,4,11].

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The analysis we present here is a sequel to a report on the mitigation of earthquake losses that one of us (N.A.) wrote in 1976 for the United Nations Educational, Scientific and Cultural Organization. The section of that report discussing the causes and effects of a lack of transparency on engineering failures was never published[5]. Following more recent earthquakes in China, Pakistan and Haiti, we felt it was imperative to update and air that discussion.

GROUND RULES

The number of deaths continues to climb despite advances in earthquake-resistant design in the past century (Fig. 1). Averaged over the past decade, the fatality rate is 60,000 a year. This average is dominated by the earthquakes in Indonesia in 2004, Kashmir in 2005, Iran in 2005, China in 2008 and Haiti in 2010. It includes fatalities from building collapse and from secondary causes such as tsunami, landslides and fire.

Since 1980, fatalities from dwelling collapses, for which an absence of earthquake engineering may be held responsible, average 18,300 a year.

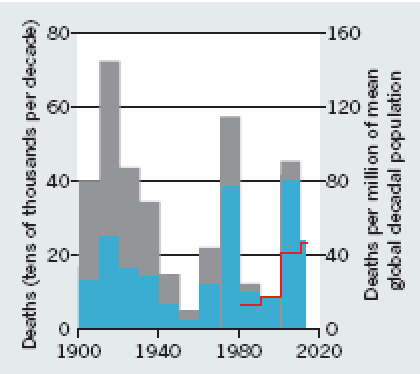

Figure 1. Earthquake deaths. Despite advances in earthquake engineering, the number of people killed by earthquakes each decade has surged (blue), and the number of deaths as a proportion of global population has not dropped much (dark grey). Many of these deaths can be attributed to building collapse (red).

The recent increase in earthquake fatality rates might be supposed to arise from population growth, urbanization or industrial development. Indeed, when adjusted for population growth, deaths from earthquakes are loosely linked with average global populations (Fig. 1). So has the application of earthquake-resistant design and construction of dwellings had any effect in reducing fatalities from earthquakes? Yes: significant nation-to-nation variations in the cumulative death toll indicate that the application of resistant engineering clearly benefits earthquakeprone countries that have the wealth and willpower to mandate its use.

Corruption is by nature covert and difficult to quantify. Yet business people or foreign visitors are frequently willing to disclose its presence on the condition of anonymity. The degree to which corruption is perceived to exist in different countries has been ranked annually[8] since 1995 by Transparency International, a global civil society organization headquartered in Berlin, using a Corruption Perceptions Index (CPI). The score is determined from an aggregate of 13 polls averaged over 2 years from 10 institutions alert to the frequency and extent of bribes paid within various countries. A CPI score of 0 indicates a highly corrupt nation with zero transparency; a score of 10 indicates an absence of perceived corruption with total transparency. The CPI is less reliable for countries with fewer sources of information[12]. We used an average CPI derived from our investigation of long-term fluctuations (Fig. S1), and its standard deviation (Fig. S2).

Relative wealth is the most obvious parameter that influences a country's corruption. Wealth is frequently attended by a stable constitution conducive to the rule of law. A standard measure that allows comparison of wealth between countries or across economies is the gross national income (GNI) per capita. We chose the World Bank's GNI Atlas method9 with data averaged over the period 1960 to 2009 (Figs S3 and S4). A clear correlation exists between a nation's per capita income and the level of corruption (Fig. 2). The most corrupt nations are the poorest (Figs S5 and S6).

For earthquakes of the twentieth century, particularly the first half, it is not always possible to confirm published fatality estimates or to calculate new reliable ones. Previous catalogues characterize uncertainties in fatality counts by listing estimates from multiple sources uncritically[13]. The weighting of the most reasonable number from these is largely subjective[4].

We devised a new catalogue by examining original sources such as government reports and aid-agency responses. That said, even for the 2010 Haiti earthquake, reported fatality estimates vary by a factor of three from fewer than 85,000 (an investigative count — probably accurate) to 300,000 (an unsubstantiated guess) (Table S1). Our catalogue distinguishes deaths caused by the collapse of dwellings due to ground shaking from the total number of earthquake-associated deaths, which include those from secondary effects[14] such as aftershocks, landslides, fire and tsunami.

The number of deaths attributable to the collapse of dwellings is influenced by population density and the vulnerability of building stock in the epicentral region. In the past 30 years, the rapid increase in urban populations, particularly in developing countries, has adversely influenced building quality. The number of fatalities depends on whether an earthquake happens at night or during the day, in the winter or in the summer, in a mountainous region or in a valley, after strong and protracted foreshocks and with or without warning[15]. An earthquake occurring on a winter night is likely to kill two to five times more people than one on a summer morning, particularly in a rural region.

GEOLOGY'S ACCOMPLICES

We compared earthquake fatalities from 1980 to 2010 with measures of corruption and wealth. We found, as expected, a direct relationship between poverty and deaths from earthquakes. Clearly, poverty can lead to the use of unsatisfactory building materials (such as adobe or poor-quality concrete), and to a paucity of education, resulting in ignorance in construction. We also found that corrupt societies have the largest death tolls from earthquakes. For the period 1995 to 2010, when corruption values can be compared directly with earthquake fatalities, we find a quantitative link between the two (Figs S10 and S11). Because the corruption index changed only slowly in this interval (Fig. S1), we assume that CPI values for 1980–95 are similar to post-1995 data (Fig. S2). This assumption is important, because deaths caused by building collapse depend on the corruption prevailing at the time of construction, not at the time of collapse.

Some countries are less corrupt than others with equivalent income levels (Fig. 2). We assigned these outliers an 'expectation index', between −2 and +3 CPI units, with negative values denoting those more corrupt than might be expected. A three-dimensional plot (Fig. 3) reveals that about 83% of all deaths from earthquakes in the past three decades have occurred in poor countries that are more corrupt than one might expect from their per capita income.

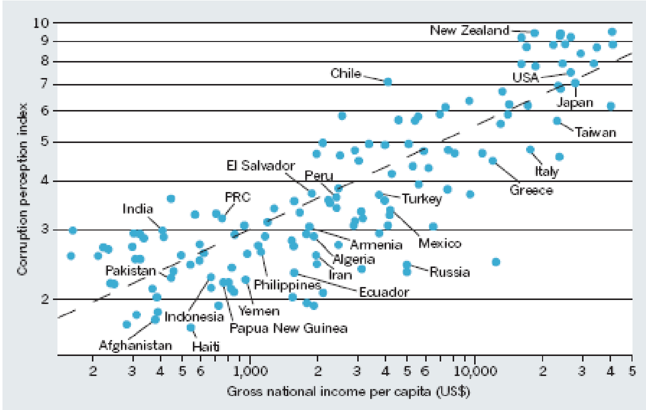

Figure 2. Cash and corruption. The poorest countries are the most corrupt, but some are more corrupt than others. A weighted regression line (dashed) divides nations that are perceived as more corrupt (below the line) than might be expected from the average income per capita from those that are less corrupt (above the line). Named countries have lost citizens in building collapse caused by earthquakes since 1980.

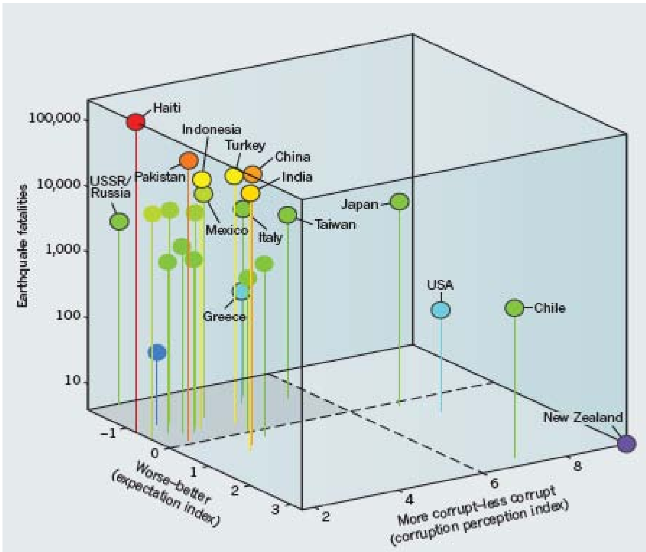

Figure 3. Corruption's toll. Corruption versus the level of corruption that might be expected per-capita income. Of all earthquake fatalities attributable to building collapse in the past 82.6% occur in societies that are anomalously corrupt (left hand corner of the plot).

This striking correlation does not uniquely distinguish between the relative contributions of poverty and corruption, but it suggests that where corruption is extreme, its effects are manifest in the building industry. The wealthiest of nations afflicted by earthquakes can afford both to educate their populations and to purchase good-quality building materials. So it seems probable that large numbers of fatalities from earthquakes in countries below the regression line in Figure 2 can be attributed largely to the effects of corruption. By contrast, Chile and New Zealand are less corrupt than might be expected from their per capita income, and have low earthquake fatalities. Japan, with its high per capita income and low levels of corruption, is an anomaly that we attribute to the collapse of older structures in Kobe that predate the adoption of a code of earthquake-resistant building.

STARK REMINDER

In sum, there is statistical support for widespread anecdotal evidence of a correlation between corruption and loss of life in earthquakes. Haiti and Iran are extreme examples of nations where fatalities from earthquakes are excessive and where perceived levels of corruption are above average. The statistics also support last year's widely voiced opinions that the probability of earthquake-related deaths is less a function of geography and more the ability to afford earthquake-resistant construction and to enforce building codes.

Sadly, these figures have no predictive value. Moreover, even if corrupt practices were eliminated, many present-day impoverished nations will have inherited a building stock that to some degree incorporates the products of corrupt practices. The problem of what to do about these existing poorly built constructions is particularly difficult, if not economically insoluble.

But our analyses suggest that international and national funds set aside for earthquake resistance in countries where corruption is endemic are especially prone to being siphoned off. The structural integrity of a building is no stronger than the social integrity of the builder, and each nation has a responsibility to its citizens to ensure adequate inspection. In particular, nations with a history of significant earthquakes and known corruption issues should stand reminded that an unregulated construction industry is a potential killer.

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Supplementary Materials

We provide here methodology and details for the assembly of materials used in the published text. A table of earthquakes accompanies this supplement.

1. Mean Corruption Perception Index and its uncertainty see
http://www.transparency.org/policy_research/surveys_indices/cpi/2010/in_detail#4

One of the difficulties in quantifying corruption is that what is legally defined or perceived to be corrupt differs between different countries: a political donation legal in some jurisdiction may be illegal in another; a matter viewed as acceptable tipping or 'pourboire' in one country may be viewed as bribery in another. The causes and consequences of, and solutions for, corruption tend to be intertwined and there are numerous special cases for which the lack of long-term observational data prevents the derivation of general rules (Jain, 2001).

Because the CPI index is based on data from the past two to three years it is by nature only an index and its values for different years are not necessarily comparable. This means that a change in perceptions of corruption for a particular country would only emerge in the index over longer periods of time (see Transparency International 2010). Year-to-year changes in a country's score result not only from a changing perception of a country's performance but also from a changing sample and methodology (Wilhelm 2002). Each year, some sources are not updated and must be dropped from the CPI, while new, reliable sources are added. With different respondents and somewhat differing methodologies, a change in a country's score may also relate to the fact that different viewpoints have been collected and different questions been asked, so it is often difficult to improve a CPI score over a short period, such as one or two years.

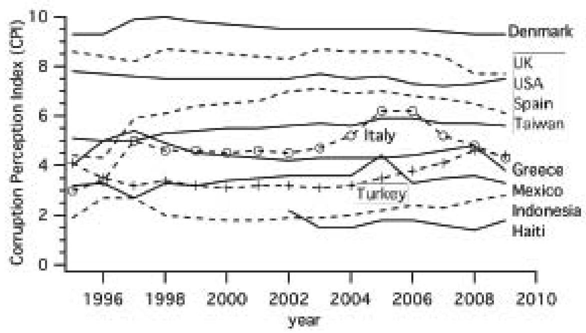

Figure S1. Variation of the annual Corruption Perceptions Index (CPI) for eleven countries for the period 1995 to 2009.

The variation of individual CPI estimates for a particular year is the result of the differences in the number of the sources used for their assessment, so that the greater the number of surveys to which a particular country has been subjected, the more reliable is the assessment of CPI. The greater the variance of the annual mean, the greater the differences of perceptions of a country among the sources, indicating a high degree of deviating opinions, which is typical for corrupt or poor countries that need more surveys. On the other hand a small variance indicates an almost perfect concordance.

Since changes in CPI for a particular country emerge over periods longer than one year the assessment of CPI index depends on the length of time considered. This allows its values to be averaged over a period of time which is more stable than annual estimates. CPI estimates are available for more than 150 countries. An example of the variation of

CPI with time for a number of selected countries is shown in Figure S1.

Figure S2 shows the distribution of the standard deviation of the average CPI estimates for 153 countries over the period 1995-2009, which is less than 10% and is not significant. The uncertainty of CPI increases for countries with decreasing transparency, most clearly evident in the plot of CPI vs the ratio CPI/Standard Deviation CPI. An interesting insight of the regional and national time variation of CPI in Italy can be found in Del Monte and Papagni (2007).

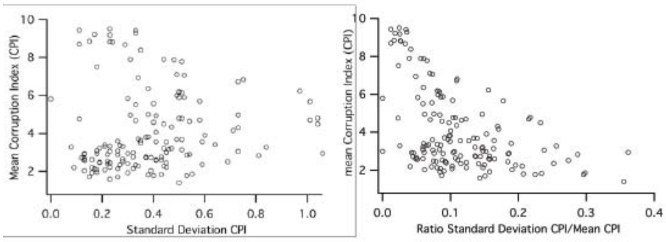

Figure S2. Standard deviations of the mean Corruption Perceptions Indices (CPI) for 153 countries. A CPI score of 10 indicates an absence of perceived corruption.

2. Gross National Income per capita GNI and its uncertainty

The World Bank uses two methods to estimate GNI, the Purchasing Power Parities method PPP and the Atlas method (A), (World Bank, 2010). In the GNIppp method conversion factors take into account differences in the relative prices of goods and services thereby providing an overall measure of the real value of output produced by an economy compared to other economies. GNIppp is measured in current international dollars which, in principal have the same purchasing power as a dollar spent on GNI in the U.S. economy. Because GNIppp provides a realistic measure of the standard of living of residents in a given economy, they form the basis for the World Bank's calculations of poverty rates at $1 and $2 a day. In the GNIAtlas method the World Bank takes into account production in the domestic economy (i.e., GDP) and smoothes exchange-rate fluctuations by using a three year moving average, with a price-adjusted conversion factor. We compare GNIAtlas and GNIppp in Figure S3. The two are comparable for high income levels but GNIppp is biased to a higher numerical value than GNIAtlas for lower income levels. For the measures of wealth used in the article we adopted the GNIAtlas method with data averaged over the period 1960 to 2009.

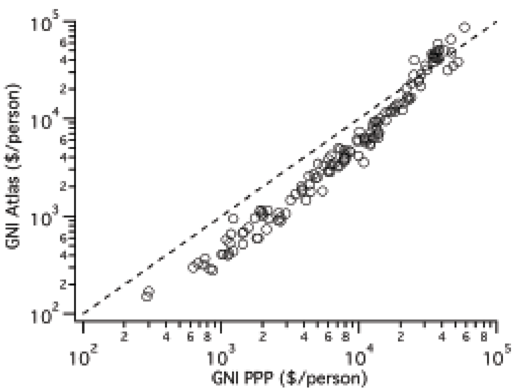

Fig. S3. Comparison of the 2008 GNIAtlas ($) with GNIPPP estimates for 147 countries. The dashed line corresponds to GNIAtlas = GNIPPP, revealing that the two are approximately equivalent for wealthy countries, but that lower values for GNIAtlas are derived for impoverished nations.

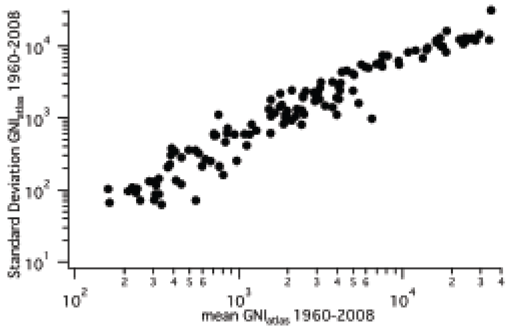

Fig. S4. Standard deviation GNIAtlas vs. mean GNIAtlas for 147 countries for data 1960-2008.

The standard deviation of the mean GNIAtlas for each of the 147 countries considered, as shown in Figure S4 decreases smoothly with increasing values of GNI (R2=0.9) providing a measure of the uncertainty needed for GNIAtlas to be used in other correlations. The effect of the average GNIAtlas on the Corruption Perceptions Index CPI was investigated using the minimum, maximum and average values of GNIAtlas for each country, adopting finally average estimates.

3. Effect of Gross National Income per capita GNI on corruption

We tested first the GNIppp data for the 27 countries of the European Union, for the period 1995 to 2008. As can be seen from Figure S5 the data confirm beyond doubt that the wealth of a country influences the degree of corruption.

Similar results are obtained from the correlation of the average Gross National Income per capita (GNIAtlas) with the mean Corruption Perceptions Index CPI for 130 countries throughout the world. Figure S6 shows a plot of global data for the period 1960 to 2008, which leaves little doubt of the strong dependence between income (GNIAtlas) and corruption (CPI).

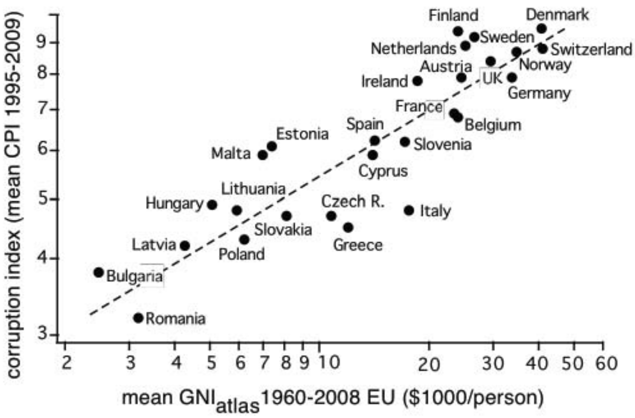

Fig. S5. Effect of average Gross National Income per capita (GNI Atlas) on the average Corruption Perceptions Index (CPI) for the period 1995 to 2008 for countries of the European Union. Dashed line least squares fit [*logCPI=(0.34±.03)logGNI- (0.63±.0.14)*]

Similar correlations exist between GNIAtlas and other indices: education, land distribution and the rule of law (viz. http://filipspagnoli.wordpress.com/statson-human-rights/). Lack of information and the uncertainties involved in the assessment of the available CPI values, particularly of the actual regional distribution of CPI within a large country, does not allow the refinement of the results in a finer scale by taking into consideration other variables.

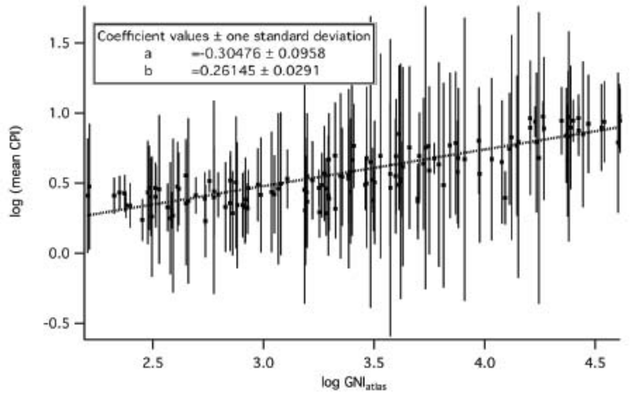

Fig. S6A. Mean Gross National Income per capita (GNIAtlas) vs Corruption Perceptions Index (CPI) for the period 1960 to 2009, for 148 countries world wide (showing unweighted regression coefficients). A least squares fit weighted by the uncertainties in CPI yields *log CPI=(0.261 ±0.03)logGNIAtlas(-0.322±0.09)* with slope similar to Fig. S5. The plot without the uncertainties, and with each data point named, is reproduced as Figure 2 in the main body of the text. Figure 6b names each country.

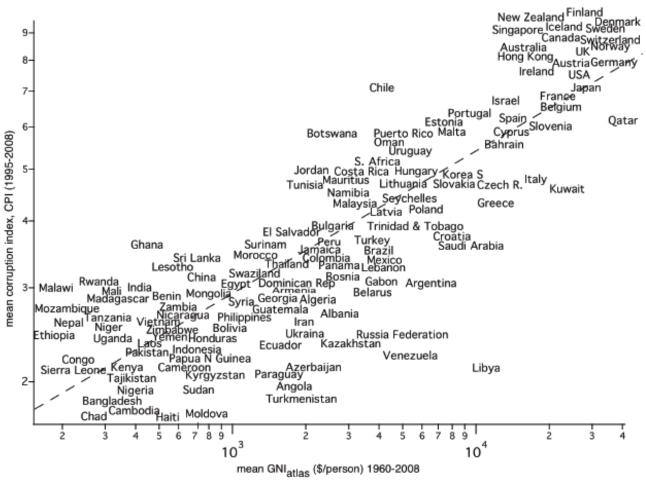

Figure S6B. Same as Figure S6A but with names of countries plotted. Some have been insignificantly offset for clarity.

High indigenous corruption contributes an invisible increase to the annual income of many of its citizens, well above the income estimated by the GNI. In such countries, income from corrupt practices constitutes a second salary for work which was never done, particularly in poor countries where the value of the perceptible corruption index becomes a function of the corruption itself. Corruption thereby causes a redistribution of wealth, the magnitude of which is perceptible, but difficult to assess. In other words, in addition to economic growth rates, corruption may affect the distribution of income within a country regionally causing a skew distribution of a country's gross national income among its citizens (Jain, 2001). An extreme case is Haiti where it is alleged that 1% of its people own nearly half the country's wealth.

No refined method can be suggested at present to test the observed GNIAtlas/CPI relationship (Figure S6) other than by testing its implications which may best be regarded only as an indication to the extent to which they are supported by actual observations.

4. Deaths from the collapse of buildings in earthquakes (DRE).

Estimates of the variation of the death toll during past centuries as a function of global population as well as of deaths as a function of earthquake magnitude are given, among others, by Cheng et al., (1988), Utsu (2002), Hough and Bilham (2006), Wyss and Trendafiloski (2009) by the reference therein. However, as we go back in time the uncertainties of the death toll in a single earthquake increase, becoming barely acceptable, while for early events such estimates are almost meaningless. The compilation of the data-set of DRE values since 1900 (Ambraseys 2010), of which a subset since 1980 is discussed here, required the examination of original sources of information that describe the effect of earthquakes, and separately a uniform evaluation of seismological and building vulnerability parameters.

In government sources and the local press we found examples where the number of fatalities had been exaggerated, presumably with the purpose of attracting attention for more generous assistance, and in some cases the opposite, a political need to downplay fatalities and economic losses. Following the 12 January 2010 Haiti earthquake, for example, on 24 January the official death toll was reported as 150,000, but by 10 February the number had been adjusted to 230,000. Subsequent guesses during media events offered numbers as high as 270,000, but these were retracted. Notwithstanding these retractions later reports, without attribution, have rounded the number to 300,000 (e.g. Crane et al., 2010). At the time that the earliest government estimates were being proposed, district by district investigative reporting (Melissen, 2010) was unable to account for more than 52,000 buried, and possibly as many 30,000 remaining beneath rubble. A death toll of 82,000 is a large number, but is one third of the number loosely cited in reports 9 months after the earthquake. The source of government information on the Haiti death toll has remained elusive, and the true death toll may never be known, but there were clear economic advantages for Haiti to inflate the death toll in the period in which international relief was being discussed. In Table 1 we adopt a death toll of 212,000 recognising that significant uncertainty in this number exists.

Similarly, examples can be found where local intensities from the earthquake have been exaggerated, allegedly to justify the collapse of an unjustifiably large number of otherwise substandard vulnerable houses with great loss of life.

The absence of an accurate census and building by building occupant listings prior to an earthquake is a serious impediment to quantifying fatalities in an earthquake. This was certainly the case for Haiti. The unavailability of census is partly due the not unnatural invasion of privacy associated with counting family members, but also by a suspicion that the census may lead to potential future tax increases or to conscription (Ambraseys 2010). For several historical earthquakes the reported death toll is clearly erroneous, especially in earlier earthquakes in some countries where there was still no accessible regional census from which to glean life losses. Equally wrong death toll figures are known where the regional census was used a pre-earthquke head count and the death toll obtained by subtracting from this the number of the people who were found to be alive after the earthquake.

For some 20th century earthquakes casualty figures were unavailable due to official restrictions in the publication of life losses related to earthquakes, particularly in the USSR, in China, and to a lesser extent elsewhere, a restriction that lasted for a long time (viz. Vladimirov 1972).

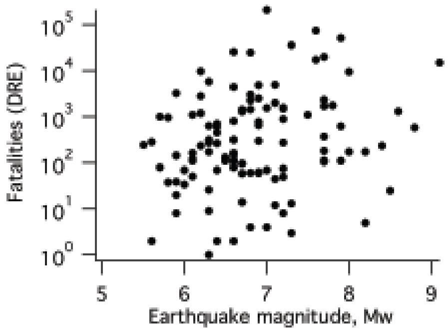

Figure S7. Range of earthquake magnitudes and associated fatalities used in this study

Supplementary Table 1 lists data used for the period 1980 to 2010. The 132 earthquakes in 37 countries in this 31-year period have caused a total loss of 568,759 or an average of 18,347 deaths/yr. The list includes only those earthquakes for which we have quantified building vulnerability parameters etc, and thus excludes numerous less significant earthquakes that are documented elsewhere. The magnitude frequency distribution of the earthquakes in Table 1 and their range in causal fatalities is illustrated in Figure S7.

For each earthquake the location, depth, magnitude and contribution from aftershocks were reassessed, and the vulnerability of the predominant type of affected building stock was recorded. An approximate classification of the perceived vulnerability of houses was derived from reports, recent site visits and from opinions of colleagues familiar with the affected region.

Population density at the time of the earthquake was estimated on a comparative basis and divided into four categories: (i) Regions of normal population density that included both rural and urban sites; (ii) Regions, mainly rural but with few small urban settlements of lower habitation density (SP); (iii) Areas almost entirely rural, in a few cases sparsely inhabited with no urban centres where density was considered to be even lower (SPP), and (iv) Land that did not support human habitation (SD). With few exceptions DRE values are listed from primary sources (see comments below Table 1).

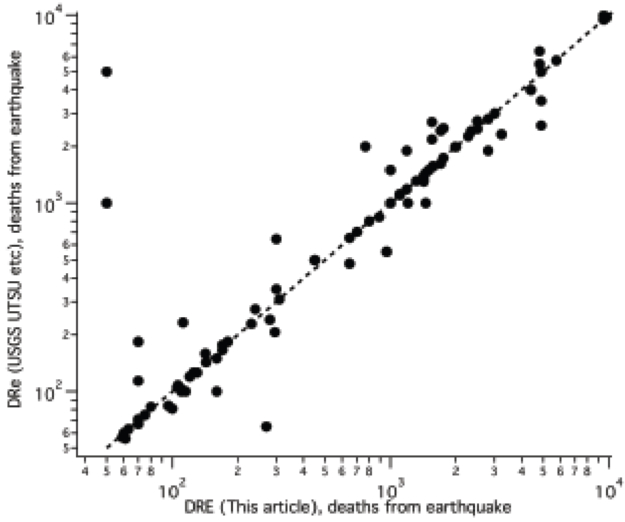

Fig. S8. DRe from various sources and compared to values of DRE estimated here. Points above the line are overestimates of fatalities directly arising from the collapse of structures, whereas those below the line are underestimates.

The data confirm that secondary effects are rarely the main cause of the death toll (Marano et al. 2009). They show, however that such effects can be dominant in some cases such as of the earthquakes of San Francisco of 1906, Messina of 1908, Tokyo 1928, and for the 2004 Andaman/Indonesia earthquake.

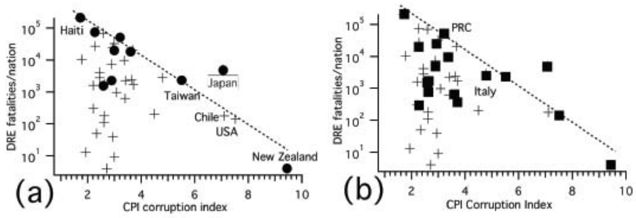

Fig. S9. Crosses indicate cumulative death toll (DRE 1980-2010) for 33 nations for all earthquakes in Table 1 as a function of the mean Corruption Perceptions Index (CPI 1995-2009). Circles in (a) indicate a selected subset of ten nations that include only shallow earthquakes on land (1995-2010) with 7.9>Mw >6.8. Squares shown in (b) extend this subset to the period 1980-2010. Selected countries are indicated.

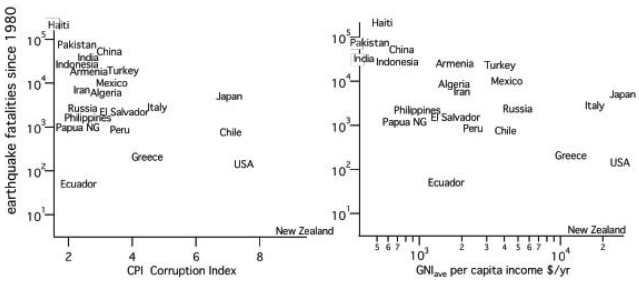

Figure S10. Cumulative death toll (DRE) caused by earthquakes in the period 1980-2010 as a function of corruption Index (left) and wealth (right).

Regressions between DRE fatalities and CPI corruption in Figure S9 were undertaken for all the DRE data, and for a subset of data with reduced range of magnitudes 7.9 ≥M≥ 6.8, depths <35km, and for offshore epicentral distances <20 km, excluding all earthquakes with epicentral areas in very low density or sparsely inhabited regions. A magnitude range 6.8-7.9 is chosen because normal depth earthquakes in this range at epicentral of fault distances of ≤20 km would correspond to spectral ground accelerations at 0.3 sec greater than 0.35g which will guarantee the collapse of substandard constructions and houses not designed to resist earthquakes. By including earthquakes greater than 20 km offshore and in desert regions we risk biasing the sample to include distant earthquakes far from settlements. The inclusion of these distant epicenters biases the resulting regression to shallower slopes since it may not shake a region of exposed, vulnerable structures. A problem arises with subduction and very low angle fault breaks in which the epicentral location is a poor measure of macroseismic shaking. In such cases we have used macroseismic epicentres which are assessed from maximum damage. The perceived classification of vulnerability of houses and population density this was done from opinions of persons familiar with the region and from large scale maps. For a further discussion of these technical issues the reader is referred to pp. 28-31, 37-57, 820-827 and Figures 2.85. 4.4, and 4.9 in Ambraseys (2010).

In Figure S9a we show data for 1995 to 2010, that include DRE estimates for 10 countries derived from 12 earthquakes. A quadratic expression can be fit to these data in a least squares sense with a standard error of 0.72. These data, and the full set of data, fall largely to the lower left of a line with slope *log(DRE)≈ -0.6(CPI)*. Its numerical value has no special significance but we interpret it as representing a probable worst case bounding slope for earthquakes in which centers of population and epicentral maximum macroseismic shaking coincide. In Figure S9b we show data for the extended period 1980-2010 in which cumulative DRE estimates for 16 countries from 27 earthquakes are shown. A least-squares quadratic fit to these data is associated with a standard error of 0.65. This small data base is clearly biased towards countries of low transparency, where recent damaging earthquakes have occurred. Figure S10 provides quantitative evidence for a link between the perceived level of corruption in a country and the number of people killed by earthquakes.

Figure S11 shows these relationships in 3D, and in particular demonstrates that it is not only corruption, but the severity of corruption in country that has the most significant influence on earthquake deaths. We plot both GNI and the CPI Index against an *Expectation Index* defined in Figure S6 as the deviation from the least squares fit relation between GNI and CPI. A positive expectation Index is the number of CPI units a nation lies above the CPI corruption Index anticipated from their GNI per capita income.

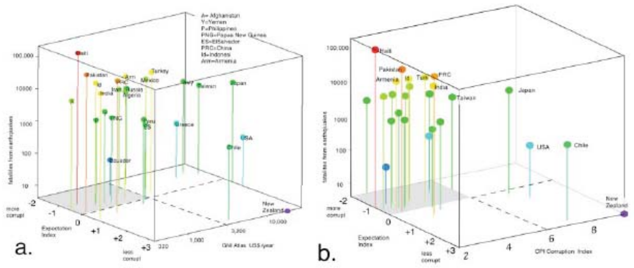

Figure S11. 3-D plots showing the influence of corruption, income and the expectation index. The expectation index is the deviation from the mean regression between *per-capita* income and corruption shown in Fig S6. In each case building collapse is largely found in countries that are more corrupt than expected from their per capita income (ie a negative *Expectation Index*). Ninety percent of these fatalities are in countries with incomes less than $3,200/yr (S11a), and 82% of these fatalities are in countries with a CPI corruption level 1-6 (S11b).

Another, less satisfactory, way of examining the effect of CPI on DRE, and one that can possibly extend the period available for analysis, is to invoke the Gross National Income per capita (GNI Atlas) as a proxy for CPI, the corruption index (from the relation established in Figure S6). This was tested for the period 1980 to 2010. It shows that very similar results can be obtained using the wealth of a country in terms of its GNI as a proxy for the loss of life DRE. As expected the figure shows that the number of fatalities (DRE) do depend on the Gross National Income per capita (GNI), with similar trend and distribution, but with greater scatter. By including events before 1980 it is unlikely that the conclusions on the relationship between fatalities from earthquakes and the prevalence of corruption will be substantially changed.

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(NATURE, 13 January 2011, Vol. 469)

ΔΙΑΚΡΙΣΕΙΣ ΕΛΛΗΝΩΝ ΓΕΩΤΕΧΝΙΚΩΝ ΕΠΙΣΤΗΜΟΝΩΝ

Το βραβείο Thomas A. Middlebrooks της ASCE στους Δημήτρη Ζέκκο και Γιώργο Αθανασόπουλο

Ο **Δημήτρης Ζέκκος**, Επίκουρος Καθηγητής στο Τμήμα Πολιτικών και Περιβαλλοντολόγων Μηχανικών του University of Michigan, Ann Arbor, και ο **Γιώργος Α. Αθανασόπουλος**, Καθηγητής στο Τμήμα Πολιτικών Μηχανικών του Πανεπιστημίου Πατρών και ο τιμήθηκαν με το βραβείο **Thomas A. Middlebrooks της ASCE** (American Society of Civil Engineers) για το 2010. Το βραβείο απονέμεται στους συγγραφείς επιστημονικής εργασίας ως αναγνώριση της ιδιαίτερης επιστημονικής αξίας της στη Γεωτεχνική Μηχανική. Το βραβείο απονεμήθηκε για την δημοσίευση επιστημονικού άρθρου στο τεύχος Ιουνίου 2009 του περιοδικού «ASCE Geotechnical and Geoenvironmental Journal» με τίτλο "Διατμητική Αντοχή Στερεών Αστικών Απορριμμάτων" με συνσυγγραφείς τους Jonathan D. Bray και Michael Riemer από το University of California at Berkeley, και τον Edward Kavazanjian από το Arizona State University.

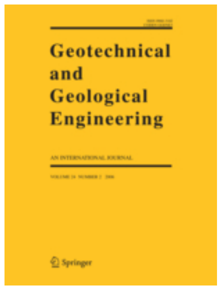
Δημήτρης Ζέκκος
Επίκουρος Καθηγητής
University of Michigan

Γιώργος Αθανασόπουλος
Καθηγητής
Πανεπιστήμιο Πατρών

Ο Καθηγητής Π. Γ. Μαρίνος Editor in Chief του Geotechnical & Geological Engineering

Ο Καθηγητής του Τομέα Γεωτεχνικής της Σχολής Πολιτικών Μηχανικών του ΕΜΠ Παύλος Γ. Μαρίνος είναι από τον Ιούνιο του 2010 editor in Chief του Διεθνούς περιοδικού Geotechnical & Geological Engineering. Το περιοδικό εκδίδεται από τον οίκο Springer με 6 τεύχη κάθε χρόνο.

Geotechnical and Geological Engineering publishes papers in the areas of soil and rock engineering and also of geology as applied in the civil engineering, mining and petroleum Indus-tries. The emphasis is on the engineering aspects of soil and rock mechanics, geology and hydrogeology, although papers on theoretical and experimental advances in ground mechanics are also welcomed for inclusion.



The journal encompasses a broad spectrum of geo-engineering although several areas have been identified which will be given particular priority:

- Soil and rock engineering;
- Foundation engineering;
- Applied geology for design and construction;
- Geo-environmental engineering;
- Earthquake engineering and dynamic behavior of soils and rocks;
- Geohazards and mitigation;
- Mining engineering;
- Geotechnical aspects of petroleum engineering;
- Information technology applications in geo-engineering;
- Novel geotechnical construction techniques;
- Case histories describing important geo-engineering projects.

Geotechnical and Geological Engineering publishes contributions in the form of original and review papers, or as short technical notes. A Book Review section informs the discerning reader of the type and quality of literature available to the geotechnical engineer and engineering geologist.

ΠΡΟΣΚΛΗΣΕΙΣ ΓΙΑ ΣΥΜΜΕΤΟΧΗ ΣΕ ΕΡΕΥΝΗΤΙΚΑ ΠΡΟΓΡΑΜΜΑΤΑ

Doctoral research on 'Non destructive diagnosis of stone deterioration problems'

For students interested in doing doctoral research at the University of Oxford there is a studentship available which will cover UK/EU fees + fieldwork (or make a large contribution to overseas fees) for a project on 'Non destructive diagnosis of stone deterioration problems', funded by Proceq. Please pass this on to any good students who might be interested.

Deadline for initial applications (cv and covering letter only) is 25th February 2011. Further details below:

New techniques for the non destructive diagnosis of deterioration problems on limestone and sandstone cultural heritage (with Proceq).

Supervisor: Professor Heather Viles

The deterioration of stone cultural heritage buildings and objects can be very serious and costly to remediate and predicted climate change may make matters worse. For example, rock art on sandstone surfaces in the Drakensberg Mountains, South Africa, is often badly affected by surface flaking; whilst the historic limestone buildings of Oxford experience crusting and blistering problems. Recent research in our department (see Mol and Viles, 2010; Viles et al., 2010; Edwards, 2010) has established that combined field and laboratory rock hardness testing using a range of Schmidt Hammer and Equotip equipment with different impact energies, as well as ultrasonic pulse velocity testing and other NDT methods, can be used to diagnose deterioration problems. In particular, we have proposed that using devices of different impact energies can help understand the development of surface crusting and flaking problems which affect many stone heritage objects (Viles et al., 2010). The studentship, generously supported by Proceq (leading manufacturers of hardness testing equipment), will test these ideas at a range of heritage sites in the UK and elsewhere.

At present we can offer a fees only scholarship (funded by Proceq) at the UK/EU rate. Overseas candidates are welcome to apply however they will have to cover the shortfall in the fees.

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Mol, L. and Viles, H.A. (2010) Geoelectric investigations into sandstone moisture regimes: Implications for rock weathering and the deterioration of San Rock Art in the Golden Gate Reserve, South Africa. Geomorphology, 118: 280-287.

Viles, H.A., Goudie, A.S., Grab, S. and Lalley, J. (2010) The use of the Schmidt Hammer and Equotip for rock hardness assessment in geomorphology and heritage science: a comparative analysis. Earth Surface Processes and Landforms, DOI: 10.1002/esp.2040

Suitably qualified candidates wishing to apply for this studentship should submit a covering letter, CV, and arrange for two academic references to be sent to Ruth Saxton, Research Degrees Coordinator, School of Geography and the Environment, OUCE, South Parks Road, Oxford OX 3QY or via email to ruth.saxton@ouce.ox.ac.uk by Friday 25 February 2011. Interviews for short-listed candidates are likely to take place in the week starting 7 March 2011.

ΠΡΟΚΗΡΥΞΕΙΣ ΒΡΑΒΕΙΩΝ ΚΑΙ ΔΙΑΓΩΝΙΣΜΩΝ ΓΙΑ ΓΕΩΤΕΧΝΙΚΟΥΣ ΜΗΧΑΝΙΚΟΥΣ

2011 SHAMSHER PRAKASH RESEARCH AWARD

Shamsher Prakash Foundation solicits nomination (no application) for the 2011 SHAMSHER PRAKASH RESEARCH AWARD for young engineers, scientists and researchers (40 years or younger, Date of Birth 03-31-71 or later) from all over the world. Nominations are invited so as to reach the Honorary Secretary on or before March 31, 2011.

The candidates should be specialists in Geotechnical Engineering and/or Geotechnical Earthquake Engineering and it is necessary that they have significant independent contributions and show promise of excellence in research.

The Award consists of cash prize US $1100.00 and a plaque. The nominations may be made on a plain paper and submitted electronically.

All nominations will be reviewed by a Judging Committee of International Experts from Canada, Australia, Hongkong, Japan, and United States and the award will be announced by September 30, 2010. Suitable arrangements will be made for making the award at a function/event which the awardee may choose.

PARTICULARS FOR NOMINATION

Please send only ONE complete nomination package in PDF format (Max: 5MB) to the Foundation electronically and 1 CD-R by mail. The following information must be included in this order in each folder:

1. Name of the Candidate with complete postal address and telephone, fax number, E-mail, date of birth, age on March 31, 2011,
2. Letter of Nomination including a statement of 500 words of the Significant Contributions and/or international impact and future potential
3. Two to Four or more letters of recommendation
4. Chronology of education
5. Chronology of jobs held
6. Area of specialization
7. Complete list of refereed publication in journals only (please attach not more than three (3) significant recent publications).
8. One 5" x 7" color digital photo with citation for listing, if winner
9. Any other relevant information.

Please make sure to put all the above information in a single PDF file only not to exceed 5MB size

For any further information, please contact: Sally Prakash, Honorary Secretary or Shamsher Prakash, 1707 Jackson Circle, Rolla, MO-65401, USA Email: prakash@mst.edu

Σημειώνεται ότι ο πρώτος βραβευθείς με το Shamsher Prakash Research Award ήταν ο καθηγητής της Σχολής Πολιτικών Μηχανικών ΕΜΠ Γιώργος Γκαζέτας (1990), ενώ στη συνέχεια βραβεύθηκαν ο καθηγητής της Πολυτεχνικής Σχολής του Πανεπιστημίου Θεσσαλίας Πάνος Ντακούλας (1995) και ο καθηγητής της Πολυτεχνικής Σχολής του Πανεπιστημίου Πατρών Γιώργος Μυλωνάκης (2002).

Το βραβείο για το 2010 θα απονεμηθή στον Dr.David Masin του Πανεπιστημίου Charles της Πράγας από τον καθηγητή Γιώργο Γκαζέτα κατά την διάρκεια του XV European Conference on Soil Mechanics and Geotechnical Engineering, που θα διεξαχθή στην Αθήνα από τις 12 έως τις 15 Σεπτεμβρίου 2011.

7th Annual Young Professors Paper Competition

CALL FOR PAPERS

DFI 36th Annual Conference on Deep Foundations

October 19-21, 2011 ~ The Seaport Hotel & World Trade Center ~ Boston, MA, USA

The Deep Foundations Institute Educational Trust announces the 2011 Young Professor Paper Competition. Full-time entry level faculty members of an accredited college or university, engaged in teaching and/or research in any of the professional fields including engineering, construction or geological sciences are encouraged to submit a paper for consideration.

The primary author of the winning paper will be invited to attend the DFI 2011 Conference in Boston, Massachusetts, USA to present the paper. Conference registration, two nights of lodging and a $750 stipend for travel expenses will be provided to the winner. Both the winner and first runner-up will receive a library of up to 20 DFI Publications and a gratis two-year Individual Membership in DFI. In brief, DFI is a not-for-profit association of contractors, engineers, manufacturers, suppliers, owners and academia which promotes understanding and advancement of the deep foundations & excavations construction industry through conferences, publications, and community. The Educational Trust is an independent, non-profit, charitable foundation established by DFI in 2005 to promote awareness of the career opportunities available in the deep foundations construction industry and to provide financial assistance for the education of high school and college students pursuing one of these careers. Learn more at www.dfi.org.

Papers are solicited on topics relating to Deep Foundations design and construction as follows:

- Historical evolution of deep foundation design and construction
- Relationship between design, construction and equipment utilization
- Foundation design and construction research

- Quality control, quality assurance and non-destructive testing

- Case studies describing unique deep foundation solutions for design and construction in constrained urban areas or applications for renovations and retrofits of existing structures are specifically encouraged for this year's competition.

Paper Competition Deadlines:

1. **February 14, 2011:** Submit an abstract of approximately 250 words in length describing the subject matter of the paper. In addition to paper title and summary, include the following information in the abstract document: primary author name, additional author names if applicable, school affiliation, mailing address, phone number and email address. *All abstracts submitted will be included in the paper competition, unless the subject matter is deemed inappropriate Professors will be notified by March 1st of abstract acceptability.*

2. **June 6, 2011:** Submit draft paper of no more than 10 pages in length**.** *Papers will be judged based on submitted drafts. Comments will be offered to winning and runner-up papers for preparation of final version to be published in the conference proceedings and possibly in the DFI Journal.*

3. **July 29, 2011:** Papers in their final form are due by the winner and runner-up**.**

Other Important Information:

- Abstracts and papers are to be submitted via email as MS Word Documents to staff@dfi.org.

- Professor must be a full-time entry-level faculty member teaching or involved in research at an accredited college or university.

- Professional field must be engineeing/construction/geological sciences.

- Paper must be based on professor's own work, and may include contributions from his/her research students as secondary authors.

- Samples of past winning papers are available for review upon request.

Correspondence regarding the competition should be addressed to DFI Educational Trust Headquarters, address and contact info shown in header.

7th Annual Student Paper Competition

CALL FOR PAPERS

DFI 36th Annual Conference on Deep Foundations

October 19-21, 2011 ~ The Seaport Hotel & World Trade Center ~ Boston, MA, USA

The Deep Foundations Institute Educational Trust announces the 2011 Student Paper Competition. Students studying in the fields of engineering, construction and geological sciences are encouraged to submit a paper for consideration. The author(s) of the winning paper will be invited to attend the DFI 2011 Conference in Boston, Massachusetts, USA to present the paper. Conference registration, two nights of lodging and a $750 stipend for travel expenses will be provided to the winner. Both the winner and first runner-up will receive a library of up to 20 DFI Publications and a gratis two-year Individual Membership in DFI. In brief, DFI is a not-for-profit association of contractors, engineers, manufacturers, suppliers, owners and academia which promotes understanding and advancement of the deep foundations & excavations construction industry through conferences, publications, and community. The Educational Trust is an independent, non-profit, charitable foundation established by DFI in 2005 to promote awareness of the career opportunities available in the deep foundations construction industry and to provide financial assistance for the education of high school and college students pursuing one of these careers.

Papers are solicited on topics relating to Deep Foundations design and construction as follows:

- Historical evolution of deep foundation design and construction

- Discussions of state of the art foundation technologies and their applications

- Foundation design and construction research

- Quality control, quality assurance and non-destructive testing

- Case studies describing unique deep foundation solutions for design and construction in constrained urban areas or applications for renovations and retrofits of existing structures are specifically encouraged for this year's competition.

Paper Competition Deadlines:

1. **February 14, 2011:** Submit an abstract of approximately 250 words in length describing the subject matter of the paper. In addition to paper title and summary, include the following information in the abstract document: student author name(s), school affiliation, mailing address, phone number, email address, advisor's name and email address. *All abstracts will be included in the competition unless the subject matter is deemed inappropriate. Students will be notified by March 1st of abstract acceptability.*

2. **June 6, 2011:** Submit draft paper of no more than 10 pages in length**.** *Papers will be judged based on submitted drafts. Comments will be offered to winning and runner-up papers for preparation of final version to be published in the conference proceedings and possibly in the DFI Journal, both of which are read by practitioners in the deep foundations engineering and contracting community.*

3. **July 29, 2011:** Papers in their final form are due by the winner and runner-up**.**

Other important information:

- Abstracts and papers are to be submitted via email as MS Word Documents to staff@dfi.org.

- Student must be enrolled in an accredited college or university in an undergraduate or graduate program in the field of engineering/construction/geological sciences.

- Paper must be based on student's own work, and in her/his own writing.

- Multiple students may co-author a single paper submission for the competition but will share the prize should their paper be deemed the winner or runner-up.

- Samples of past winning papers are available for review upon request.

Correspondence regarding the competition should be addressed to DFI Educational Trust Headquarters, address and contact info shown in header.

ΠΡΟΣΚΛΗΣΕΙΣ ΓΕΝΙΚΩΝ ΣΥΝΕΛΕΥΣΕΩΝ

**ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ
ΣΗΡΑΓΓΩΝ ΚΑΙ ΥΠΟΓΕΙΩΝ ΕΡΓΩΝ**

**ΓΕΝΙΚΗ ΣΥΝΕΛΕΥΣΗ 2011
ΔΙΕΝΕΡΓΕΙΑ ΑΡΧΑΙΡΕΣΙΩΝ ΤΗΣ ΕΕΣΥΕ**

Σας ενημερώνουμε ότι με απόφαση του Δ.Σ. της Ε.Ε.Σ.Υ.Ε. καθορίστηκε ως ημερομηνία της Γενικής Συνέλευσης και της Διενέργειας Αρχαιρεσιών για την εκλογή νέων σωμάτων διοίκησης η $14^{η}$ Μαρτίου 2011, και στην περίπτωση μη απαρτίας του 1/5 των μελών η **Δευτέρα, 28 Μαρτίου 2011 και ώρα 18:30 στην αίθουσα τελετών του ΕΜΠ, Κτίριο Διοίκησης, Πολυτεχνειούπολη Ζωγράφου.**

Τα θέματα της Γενικής Συνέλευσης είναι :

1. Εκλογή Προέδρου της Γ.Σ.
2. Απολογισμός πεπραγμένων του απερχόμενου Δ.Σ. (πρόεδρος Δ.Σ.)
3. Οικονομικός απολογισμός (ταμίας Δ.Σ.)
4. Εισήγηση Εξελεγκτικής Επιτροπής
5. Τοποθετήσεις – Διευκρινήσεις - Παρουσίαση Υποψηφιοτήτων
6. Ψηφοφορία επί των Απολογισμών
7. Εφορευτική Επιτροπή για τη διενέργεια Αρχαιρεσιών
8. Αρχαιρεσίες για την εκλογή νέου Δ.Σ.

ΙΙ. Υποψηφιότητες

Από τις υποβληθείσες αιτήσεις μελών και την συμπλήρωση των υποψηφίων από το Δ.Σ, διαμορφώθηκε ο παρακάτω κατάλογος υποψηφιοτήτων.

<u>Για το Δ.Σ. της Ε.Ε.Σ.Υ.Ε.</u>

1. Αγγίσταλης Γεώργιος, Γεωλόγος
2. Γιούτα Μήτρα Παρασκευή, Μετ. Μηχανικός
3. Θανόπουλος Ιωάννης, Δρ Πολ. Μηχανικός
4. Λουκάτος Νέστωρ, Πολ. Μηχανικός .
5. Μπακογιάννης Ιωάννης, Μετ. Μηχανικός
6. Μπούσουλας Νικόλαος, Πολ. Μηχανικός MSc
7. Ντουνιάς Γεώργιος, Δρ Πολ. Μηχανικός
8. Ραπτόπουλος Σταύρος, Πολ. Μηχανικός
9. Τζαρούχη Σοφία, Δρ Γεωλόγος
10. Τσιφουτίδης Γεώργιος, Δρ Γεωλόγος
11. Φορτσάκης Πέτρος, Πολ. Μηχανικός MSc

<u>Για την Ε.Ε.Ε. της Ε.Ε.Σ.Υ.Ε.</u>

1. Γεωργίου Δημήτριος
2. Καζίλης Νικόλαος
3. Μπαρσάκης Σωτήριος
4. Νικολάου Δημήτριος

<u>ΠΡΟΣΚΛΗΣΗ ΣΕ ΤΑΚΤΙΚΗ ΕΤΗΣΙΑ ΓΕΝΙΚΗ ΣΥΝΕΛΕΥΣΗ ΤΗΣ ΕΛΛΗΝΙΚΗΣ ΕΠΙΤΡΟΠΗΣ ΜΕΓΑΛΩΝ ΦΡΑΓΜΑΤΩΝ (ΕΕΜΦ)</u>

Η Ελληνική Επιτροπή Μεγάλων Φραγμάτων (ΕΕΜΦ) καλεί τα μέλη της να συμμετάσχουν στην τακτική ετήσια Γενική Συνέλευση, την Παρασκευή 18 Μαρτίου 2011 στις 16.00, στα γραφεία της ΔΕΗ Α.Ε. / ΔΥΗΠ, Αγησιλάου 56 – 58 Αθήνα, στην Αίθουσα Συγκεντρώσεων του $3^{ου}$ ορόφου.

Θέματα ημερήσιας διάταξης είναι :

- Έγκριση ισολογισμού έτους 2010
- Έγκριση Προϋπολογισμού έτους 2011
- Διοικητική και διαχειριστική λογοδοσία
- Ενημέρωση μελών για δραστηριότητες ΕΕΜΦ έτους 2010
- Άλλα θέματα

Σε περίπτωση μη επίτευξης της απαιτούμενης κατά το Καταστατικό απαρτίας του 50% των εχόντων εκπληρώσει τις ταμειακές τους υποχρεώσεις μελών, η Γενική Συνέλευση θα επαναληφθεί την Τετάρτη, 23 Μαρτίου 2011, την ίδια ώρα και στον ίδιο χώρο. Τέλος, εάν και πάλι δεν επιτευχθεί η απαιτούμενη απαρτία (25%), η Γενική Συνέλευση θα πραγματοποιηθεί την **Τρίτη, 29 Μαρτίου 2011 και ώρα 16.00,** στα γραφεία της ΔΕΗ Α.Ε. / ΔΥΗΠ, Αγησιλάου 56 – 58 Αθήνα, στην Αίθουσα Συγκεντρώσεων του $3^{ου}$ ορόφου.

Για πληροφορίες σχετικά με εξόφληση συνδρομών κλπ, μπορείτε να απευθύνεστε στην Ταμία της ΕΕΜΦ κ. Σοφία Σιάχου (τηλ. 210–5218615, e-mail : s.siachou@dei.com.gr).

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

International Conference on Tunnelling and Trenchless Technology, 1-3 March 2011, Kuala Lumpur (Malaysia), www.iem.org.my/external/tunnel/index.htm

14th Australasian Tunnelling Conference 2011 "Development of Ubderground Space, 8-10 March 2011, Auckland, New Zealand, www.atstunnellingconference2011.com

Geo-Frontiers 2011 - Advances in Geotechnical Engineering, 13-16 March, Dallas, Texas, USA, www.geofrontiers11.com

2nd Annual Tunnels & Underground Construction Middle East "Designing, constructing and operating cost-effective, durable and safe tunnel and underground construction projects", 13 - 16 March, 2011, Beach Rotana, Abu Dhabi, UAE, www.tunnelconstructionme.com

The 2011 Rankine Lecture, 16 March 2011, Imperial College London,
http://bga.city.ac.uk/cms/html/51stRankineLecture.pdf

8th Rencontres Géosynthétiques, 22 - 24 March 2011, Tours, France,
www.rencontresgeosynthetiques.org/index.html

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BGA
THE BRITISH GEOTECHNICAL ASSOCIATION

Eurocode 7 - Today and Tomorrow
23rd March 2011, Cambridge, UK
www.eurocode7.com/todayandtomorrow

"Eurocode 7 - Today and Tomorrow" is a Symposium organised by the British Geotechnical Association (BGA) to discuss British and European experience in implementing Eurocode 7 and to influence plans for the future development of the code. The symposium and the meeting will be an opportunity to showcase the UK's understanding of and commitment to EC7.

The Symposium will be held on Wednesday 23rd March 2011 in Cambridge, UK, immediately before the main Eurocode 7 committee meeting (TC250/SC7) to be held on Thursday and Friday 24th - 25th March 2011.

An impressive lineup of invited speakers will cover a wide range of topics and lead discussion from the floor.

Programme for the day

Time	Lecture	Speaker
09.30	Future development of Eurocode 7	Andrew Bond (Chairman of TC250/SC7)
09.50	Ground structures - slope and retaining wall design in the Netherlands	Adriaan van Seters (Fugro)
10.10	Implementation of partial factors in Austria	Manfred Fross (independent consultant)
10.30	Implementation of pile design in the UK	David Beadman (Byrne Looby)
10.50	Discussion	
11.00	Coffee break	
11.30	Site investigation	David Norbury (independent consultant)
11.50	Water pressures	Brian Simpson (Arup Geotechnics)
12.10	Soil characterization	Tony O'Brien (Mott MacDonald)
12.30	Recommended calculation models for ULS	Andrew Smith (Coffey Geotechnics)
12.50	Discussion	
13.00	Lunch	
14.00	Serviceability - simple calculation models	Malcolm Bolton (Cambridge University)
14.20	Obtaining parameters for simple SLS models	Malcolm Bolton (Cambridge University)
14.40	Serviceability - numerical analysis	Andrew Lees (Frederick University, Cyprus, and Geofem Ltd)
15.00	Obtaining parameters for numerical analysis	Chris Clayton (Southampton University)
15.20	Discussion	
15.30	Tea	
16.00	Panel discussion	
17.00	Close	

In case of any query please contact:
The Coordinator BGA on 020 7665 2229
email: bga@ice.org.uk
http://www.britishgeotech.org.uk

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1st Scientific Symposium on Tunnels and Underground Structures in South-East Europe
USING UNDERGROUND SPACE
April 7-9, 2011, Dubrovnik, Croatia
www.hubitg.com, www.itacroatia.eu

Based on the continuous exchange of information and cooperation of construction industries and consulting offices in the past decade the general understanding was reached that neighbouring tunnelling societies in SE Europe region have common interest to jointly organize a scientific symposium.

This idea has further evolved about the theme that is recently one of the major issues in both developed and developing countries of the world focusing on development of the use of underground space. The region of South-East Europe has enormous demand for new tunnelling technologies and a vast need for the development of new infra-structure including tunnels and underground structures.

The Symposium will be organized by ITA Croatia - Croatian Association for Tunnelling and Underground Structures with the support of members of ITA from all other neighbouring countries and with the cover of sponsoring by ITA-AITES. Our intention is to proliferate the knowledge of tunnelling and use of undergound space which is already the state-of-the art in other parts of the world.

SPECIFIC TOPICS

The topics of the Symposium include, but are not limited to, all aspects of durability of structures from conceptual stage to design, construction, operation and maintenance phases:

- **Planning and Design** – feasibility and planning, structural concept and operation purpose, functional assessment, environmental circumstances, inputs to design, risk and cost estimation, influence of life time cycles on condition of structures, hereditary influence, design measures on old structures
- **Traffic Development using Underground** – traffic development using underground space, metro systems, and undergoround city railway, underground roads, garages and underground railway depots
- **Construction Methods and Technologies** – new materials, new technologies, construction methods providing long term quality level
- **Maintenance and Reconstruction of Underground Structures** – concepts and solutions of maintenance and reconstruction of new structures, operation phase of structures designed for long life period, reconstruction of old tunnels
- **Using Underground Space** – application of underground structures in urban areas, environment and development of urban traffic, underground urbanism and city planning, financing case studies

All further information can be received from Symposium Secretariat that is placed by ITA Croatia, 10 000 Zagreb, Trnjanska 140, Croatia, and main organizer HUBITG Media: **Symposium Secretariat manager Ms. Tanja Rabar**, **Tel.** 00385-51-322-845, **Email:** tanja.rabar@hubitg.com **URL:** www.hubitg.com, www.itacroatia.eu

Mechanics and Physics of Porous Solids: a Tribute to Pr. Olivier Coussy, April 18 to 20, 2011, Paris, http://navier.enpc.fr/events/mpps2011

13th International Conference of the International Association for Computer Methods and Advances in Geomechanics, 9-11 May 2011 Melbourne, Australia, iacmag2011.com

7th International Symposium on "Geotechnical Aspects of Underground Construction in Soft Ground", 16-18 May 2011, Roma, Italy, www.tc28-roma.org

www.rocexs2011.at

The ***Rockfall Expert Network*** **(RocExs.net)** is a forum of international rockfall scientists & practitioners who meet in a three years interval organized as ***Interdisciplinary workshop on Rockfall Protection.*** The workshops aims at a presentation of the current status of research in rockfall hazard and risk assessment, the design of protection measures following the state of the art and last but not least the development and maintenance of an expert-network on the topic.

So far three workshops were held in Japan (Kanazawa 1999), France (Vaujany 2005, organized by Cemagref) and Switzerland (Morschach 2008 organised by WSL, ETHZ und EPFL).

Following this three year interval the 4th workshop is organized by the Geological Service of the Austrian Torrent and Avalanche Control (WLV) in **Innsbruck-Igls** (Austria) on **17-19 May 2011.**

E. g. international researchers in the field of rockfall, but as well as of related fields, are welcome to attend the workshop to encourage a dialogue between scientists and practitioners from a wide range of theoretical background and methodological focus.

Rockfall processes represent a major hazard in many mountainous regions of the world, causing high numbers of damages, fatalities and losses of life each year. High impact characteristics (high velocities, variations in size and lengths of travel distance), suddenly changing travel paths and unexpected deposition location let rockfall belong to the most destructive mass movements. Their diverse process mechanisms, the wide spectrum of predispositional and influencing factors make it difficult to define a single methodology to delineate potentially susceptible and endangered areas. Thus, for a reliable risk assessment and subsequent planning of protective measures, different assessment strategies containing a combination of methods and techniques are required.

The workshop will bring together international researchers to discuss and evaluate new findings and methods that are relevant for the design of a proper protection against rockfall. It provides a platform where scientist and practitioners can transfer scientific knowledge into land use planning purposes and regulations.

It is the aim of the workshop to increase the efficacy and efficiency of rockfall protection and prevention. The workshop envisages the exchange and improvement of existing approaches for detecting, assessing, evaluating and decreasing the hazard and risk posed by rockfall processes. Key-discussion themes for the workshop are the design, performance, reliability, durability, monitoring and extreme loads for protective measures and calibration, validation, and uncertainty for rockfall hazard analysis methods (for detection as well as magnitude, frequency and run-out prediction).
Contributions to this scope of work may come from areas such as:

Topic 1: Rockfall initiation:

- rock mechanics,

- rock slope stability,
- disposition/susceptibility of rock-masses for detachment,
- probability of detachment … detachment processes, probability of detachment

Topic 2: Experimental/field/laboratory tests and results

Topic 3: Modeling and simulations

- Detachment/failure/stability analysis
- Run-out modeling (Empirical Methods, 2D Simulations, 3D Simulations)

Topic 4: Hazard (zone) mapping/assessment and risk evaluation

- Qualitative methods
- Quantitative methods
- Evaluation of quality of input data
- Specification of data validity domain of results
- Frequency-magnitude relationships

Topic 5: Mitigation and Protection Measures

- General: Structural Protection measures (Fences, walls, galleries, dams, forests, anchors etc.)
- Design of mitigation measures: Determination of forces and resistance (in compliance to EUROCODES)
- Construction: experiences, failures, costs,
- Performance, Technical approval/Standards/Guidelines

- National and international Standards and Guidelines

Topic 6: Monitoring methods for assessment of rockfall-failure mechanisms and/or early warning and alarming systems

Topic 7: Open Session (Topics apart from the above mentioned fields of work e. g. rock mass falls/rock slides: modes of failure, evaluation of activity, runout, design of mitigation measures)

Organising Committee

Austrian Torrent and Avalanche Control
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GEDMAR2011 Geotechnical and Highway Engineering - Practical Applications – Challenges and Opportunities at the Future 3rd International Conference on Geotechnical Engineering for Disaster Mitigation and Rehabilitation 2011 combined with 5th International Conference on Geotechnical and Highway Engineering 17 - 20 May 2011, Semarang, Central Java, Indonesia, reliabiity.geoengineer.org/GEDMAR2011

WTC2011 Helsinki, AITES-ITA 2011 World Tunnel Congress and 37th General Assembly, 21-25 May 2011, Helsinki, Finland, www.wtc11.org

The 14th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering Hong Kong, China, 23 - 28 May 2011 www.cse.polyu.edu.hk/14arc

4th Japan - Greece Workshop Seismic Design of Foundations, Innovations in Seismic Design, and Protection of Cultural Heritage, May 26-27, 2011, Kobe, Japan www.civil.tohoku-gakuin.ac.jp/yoshida/4JGW

COMPDYN 2011 – 3rd International Conference on Computational Methods in Structural Dynamics and Earthquake Engineering, 26-28 May 2011, Corfu, Greece, www.compdyn2011.org

Dams and Reservoirs under Changing Challenges, June 1 - 2, 2011, Lucerne, Switzerland, www.swissdams.ch

5ο Διεθνές Συνέδριο Ασφαλτικών Μιγμάτων και Οδοστρωμάτων, Θεσσαλονίκη, 1-3 Ιουνίου 2011, http://iconfbmp.civil.auth.gr

15ο Διεθνές Συνέδριο Γεωμορφολογίας 2011 "Fluvial and coastal systems in tectonic active areas" 1 έως 4 Ιουνίου 2011, Εθνικό & Καποδιστριακό Πανεπιστήμιο Αθηνών, Αθήνα, www.geomorphology2011.geol.uoa.gr

3rd International Symposium on Geotechnical Safety and Risk (ISGSR2011), Munich, Germany, 2 ÷ 3 June 2011 www.isgsr2011.de

Short course on Reliability Analysis and Design in Geotechnical Engineering, June 1st 2011, Munich, Germany, G.Braeu@bv.tum.de

2nd Annual Piling & Deep Foundations India
Overcoming challenges in complex structures by strengthening foundations and innovative piling techniques
13 – 15 June 2011, Hyderabad, India
www.pilingfoundationindia.com

Leading industry professionals and experts from geotechnology and construction will gather at this event to discuss the latest trends and overcome challenges in piling and deep foundations.

2011 RETC Rapid Excavation & Tunneling Conference & Exhibit, June 19-22, 2011, San Francisco, California, USA, gury@smenet.org

"The Atlantis Hypothesis", 3rd International Conference, 25-26 June 2011, Santorini, Greece http://atlantis2011.conferences.gr

GEORISK 2011 Risk Assessment and Management in Geoengineering, June 26 – 28, 2011, Atlanta, USA, http://content.asce.org/conferences/GeoRisk2011

Underground Construction
29th and 30th June 2011, London, U.K.
www.tunnellingshow.com

The eyes of the global tunnelling industry are swivelling towards the UK in anticipation of some of the world's largest underground construction projects getting underway.

Already some £20bn of tunnelling work can be foreseen with Crossrail, the massive Tideway Super Sewer, underground rail line extensions, Dublin's DART project, and tunnels at the new nuclear power stations being started shortly.

In recognition of the interest that these projects will create, together with the need for those involved to be completely up-to-date in the latest developments in techniques and equipment, it has been decided to organise the next of the series of the Underground Construction Conference and Exhibition in central London on 29 – 30 June 2011.

The two-day Conference is being coordinated by British Tunnelling Society, Institute of Materials, Minerals & Mining, and the Pipejacking Association with support from many other professional bodies.

As an international venue, London is hard to beat. A vibrant and exciting capital with many famous, historical and contemporary landmarks, the city throbs with artistic and cultural activity and provides the perfect backdrop for this timely event.

This invitation is extended to all those who wish to come to London in June 2011 to participate in what promises to be a memorable and significant event.

Themes and Topics

- Technical and design developments in underground construction
- Tunnel operation and maintenance
- Sustainable development and minimising the impact of underground works
- A worldwide tunnelling perspective
- UK projects- today and the future
- Ground investigation, treatment and monitoring

For additional information please contact:

Gary Stringer
Tel: +44 (0) 20 7973 6695
Email: g.stringer@hgluk.com

GeoProc 2011 Conference

Cross Boundaries through THMC Integration
6 – 9 July 2011, Perth, Australia
www.mech.uwa.edu.au/research/geoproc

GeoProc is a series of international conferences on Coupled Thermal, Hydrological, Mechanical and Chemical Processes (THMC) in Geosystems: Fundamentals, Modelling, Experiments and Applications.

The first conference was held in Stockholm, Sweden in 2003 followed by Nanjing, China and Lille, France.

In July 2011, the fourth conference will be held in Perth at the University of Western Australia.

A wide range of natural and engineering phenomena in geological systems must be addressed through integrating mechancial, hydrodynamical, thermal and chemical processes from pore to field scale. These phenomena include carbon dioxide sequestration in geological formations, nuclear waste disposal, coal and gas outbursts, enhanced oil and gas recovery, geothermal extraction, formation of mineral deposits, geological hazards and many others. Although each phenomena may have its own characteristics, a number of common scientific issues remain the same.

The primary objective of this conference is to get researchers from different disciplines together to share their research achievements and to explore new ways of thinking about their research problems. This objective will be achieved through:

- Keynote lectures to be presented by a combination of world leading scientists in fundamental sciences closely related to the conference themes, and world-renowed specialists in major natural or engineering fields;
- Interactions among researchers from difference disciplines;
- Pre- or post conference specialist courses

Conference chairs

- Professor Jishan Liu, UWA School of Mechanical Engineering
- Res/Asst/Prof Jianguo Wang, UWA School of Mechanical Engineering

Conference secretary

- Mrs Jill Stajduhar, UWA Energy & Minerals Institute

15th African Regional Conference on Soil Mechanics and Geotechnical Engineering "Resources and Infrastructure Geotechnics in Africa: Putting theory into practice", Maputo, Mozambique, 18 – 21 July 2011, www.15arcsmge-maputo2011.com

IGSH 2011 Fourth International Geotechnical Symposium Geotechnical Engineering for Disaster Prevention & Reduction, 26 - 28 July 2011, Khabarovsk, Russia, www.igsh4.ru

IS – SEOUL 2011 Fifth International Symposium on Deformation Characteristics of Geomaterials, Wednesday-Friday, Aug. 31 – Sep. 3, 2011, Seoul, Korea, www.isseoul2011.org

EYGEC 2011 21st European Young Geotechnical Engineers' Conference, 4 – 7 September 2011, Rotterdam, Netherlands, www.kiviniria.net/EYGEC2011

ICoVP-2011, 10th biennial International Conference on Vibration Problems, September 5-8, 2011, PRAGUE, Czech Republic www.icovp.org/index.asp

6th International Symposium on Sprayed Concrete, 12-15 September 2011, Tromsø, Norway, www.sprayedconcrete.no

XV European Conference on Soil Mechanics and Geotechnical Engineering, 12 – 15 September 2011, Athens, Greece, www.athens2011ecsmge.org

XV European Conference on Soil Mechanics & Geotechnical Engineering, Athens, September 12-15, 2011, Workshop on Education with the theme "Case histories in Geotechnical Instruction: Appropriate cases for each educational level", September 14, Wednesday pm. Organized by ERTC 16, Local host: Dr. Marina Pantazidou, mpanta@central.ntua.gr and manoliu@mail.utcb.ro

Slope Stability 2011 International Symposium on Rock Slope Stability in Open Pit Mining and Civil Engineering, 18-21 September 2011, Vancouver, Canada, www.slopestability2011.ca

24th World Road Congress "Mobility, Sustainability and Development", 26 – 30 September 2011, Mexico City, Mexico, www.piarcmexico2011.org

XIV Panamerican Conference on Soil Mechanics and Geotechnical Engineering (October) & V PanAmerican Conference on Learning and Teaching of Geotechnical Engineering & 64th Canadian Geotechnical Conference, Toronto, Ontario, Canada, 2 - 6 October 2011, www.panam-cgc2011.ca

The Second World Landslide Forum, "Putting Science into Practice", 3 – 9 October 2011, FAO Headquarters, Rome, www.wlf2.org

Landslides and Geo-Environment, Geotechnical Symposium in Balkan Region, October 2011, Tirana, Albania, fatos.cenalia@gmail.com, erjon.bukaci@gmail.com

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60th Geomechanics Colloquy
October 13th and 14th, 2011, Salzburg, Austria
www.oegg.at/index.php?id=20&L=2

The Austrian Society for Geomechanics is pleased to invite you to the 60th Geomechanics Colloquy - "Ernest H. Weiss-Colloquy" - which is held in Salzburg on October 13th and 14th, 2011.

Session topics:

- Benefits of geotechnical measurements
- Accidents, lessons learned and their prevention
- Criteria for the selection of construction methods
- Current large projects

On October 12th two Workshops with following topics will be held:

- Environmental Impact Assessment - Chance or Fetter for projects?
- Methods of analysis in geotechnics - ground characterization and failure mechanisms

For further information please contact: salzburg@oegg.at

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IBSBI 2011 International Conference on Bridges and Soil-Bridge Interaction, 13-15 October 2011, Athens, Greece, http://ibsbi2011.ntua.gr

2nd ISRM International Young Scholars' Symposium on Rock Mechanics, Beijing, China, October 14-16, 2011, www.isrm2011.com

Beijing 2011, 12th International Congress on Rock Mechanics – Harmonizing Rock Mechanics and the Environment, 16 – 21 October 2011, Beijing, China, www.isrm2011.com

HYDRO 2011 "Practical Solutions for a Sustainable Future", Prague, Czech Republic, 17-19 October 2011, www.hydropower-dams.com

2011 AFTES Congress "Espaces Souterrains de Demain", Lyon, France, 17 – 19 October 2011, www.aftes.asso.fr/congres_presentation-organisation.html

XI INTERNATIONAL CONFERENCE UNDERGROUND INFRASTRUCTURE OF URBAN AREAS, 26-27 October 2011 Wroclaw – Poland, www.uiua2011.pwr.wroc.pl

WCCE-ECCE-TCCE Joint Conference 2 SEISMIC PROTECTION OF CULTURAL HERITAGE, October 31 - November 1, 2011 Antalya, Turkey, www.imo.org.tr/spch

3ο ΠΑΝΕΛΛΗΝΙΟ ΣΥΝΕΔΡΙΟ ΟΔΟΠΟΙΙΑΣ Νοέμβριος 2011, Πάτρα, http://portal.tee.gr/portal/page/portal/INTER_RELATIONS/INT_REL_P/SYNEDRIA_EKDHLWSEIS/2011/3odopoiias

ICAGE 2011 International Conference on Advances in Geotechnical Engineering, 7th - 9th November, 2011 - Perth, Australia, http://www.icage2011.com.au

AP-UNSAT 2011 5th Asia-Pacific Conference on Unsaturated Soils, 14 - 16 November 2011, Pattaya, Thailand www.unsat.eng.ku.ac.th

International Symposium on Advances in Ground Technology and Geo-Information (IS-AGTG), 1-2 December 2011, Singapore, www.is-agtg.com

4th International Conference on Grouting and Deep Mixing, February 15-18, 2012, New Orleans, Louisiana, USA, www.grout2012.org

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6th Colloquium
"Rock Mechanics - Theory and Practice" with
"Vienna-Leopold-Müller Lecture"
22-23 March 2012, Vienna, Austria

The colloquium is co-organized by the Sections Rock Mechanics and Rock Engineering and Engineering Geology of the Austrian Society for Geomechanics.

Themes:

- Mechanics of rock slopes and mass movements including modelling of run outs
- Mechanics of foundations in and on rock
- Mechanics of underground excavations in rock

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TERRA 2012 XI Conferencia Internacional sobre el Estudio y Conservación del Patrimonio Arquitectónico de Tierra
XIth International Conference on the Study and Conservation of Earthen Architecture Heritage

XIth International Conference on the Study and Conservation of Earthen Architecture Heritage
22 – 27 April 2012, Lima, Peru
http://congreso.pucp.edu.pe/terra2012/index.htm

Terra 2012 will focus on Conservation of Earthen Architectural Heritage against Natural Disasters and Climatic Change. More than 500 specialists in the fields of earthen architecture are expected to attend.

The conference will provide a unique and invaluable opportunity to discuss and exchange information on the latest advances in the conservation field. Moreover, participants will learn about the cultural identity of earthen architecture in Latin America and be able to observe firsthand conservation issues in Peru, a country with a long and rich tradition of construction with earth and severe seismic activity.

The conference themes are:

Theme 1: Latin-American Earthen Architecture at Risk: Earthquakes, Rain and Flood Damage

Theme 2: World Heritage Earthen Architectural Sites, Natural Disasters and Climate Change

Theme 3: Conservation and Management of Archaeological Sites

Theme 4: Conservation and Development of Human Settlements and Cultural Landscapes

Theme 5: Local and Regional Knowledge, Intangible Heritage and Social Impact

Theme 6: Research in Materials and Technology for Conservation and Contemporary Architecture

Theme 7: Ancient/Historic and Innovative Solutions for Damage Prevention and Performance Improvement in the event of Natural Disasters

Theme 8: Charters, Standards and Guidelines for Heritage and Construction

Theme 9: Education, Dissemination and Outreach

Contact information: terra2012@pucp.edu.pe
Pontificia Universidad Católica del Perú
Av. Universitaria 1801, San Miguel

GEOAMERICAS 2012 II Pan-American Congress on Geosynthetics, Lima, Perú, 6 - 9 May 2012 www.igsperu.org

16th Nordik Geotechnical Meeting, 9-12 May, 2012, Copenhagen, Denmark www.ngm2012.dk

ITA-AITES WTC 2012 "Tunnelling and Underground Space for a global Society", Bangkok, Thailand, 18 to 23 May, 2012, www.wtc2012.com

Fifth International Symposium on Contaminated Sediments: Restoration of Aquatic Environment, May 23 - 25 2012, Montreal, QC, Canada, www.astm.org/SYMPOSIA/filtrexx40.cgi?+-P+EVENT_ID+1857+/usr6/htdocs/astm.org/SYMPOSIA/callforpapers.frm

EUROCK 2012 - ISRM European Regional Symposium - Rock Engineering and Technology, 28 – 30 May 2012, Stockholm, Sweden, eva.friedman@svebefo.se

12th Baltic Sea Geotechnical Conference "Infrastructure in the Baltic Sea Region", Rostock, Germany, 31 May – 2 June, 2012, www.12bsgc.de

ISL 2012 NASL 11th International Symposium on Landslides, 3 ÷ 8 June 2012, Banff, Alta, Canada, corey.froese@ercb.ca

International Conference on Geotechnical Engineering Education, 4-6 July 2012, NUI Galway, Galway, Ireland, bryan.mccabe@nuigalway.ie

ANZ 2012 "Ground Engineering in a Changing World" 11th Australia-New Zealand Conference on Geomechanics, Melbourne, Australia, 15-18 July 2012, www.anz2012.com.au

34th International Geological Congress 5 ÷ 15 August 2012, Brisbane, Australia, http://www.ga.gov.au/igc2012

ICSE-6
6th International Conference on Scour and Erosion
27-31 August 2012, Paris, France
www.icse-6.com

The International Conference on Scour and Erosion (ICSE) provides a forum for hydraulic engineers, geotechnical engineers, scientists, decision makers and administrators to exchange ideas on topics such as hydraulics and geotechnical engineering.

For any information contact contact@icse-6.com

2nd International Conference on Transportation Geotechnics, 10 - 12 September 2012, Sapporo, Hokkaido, Japan, http://congress.coop.hokudai.ac.jp/tc3conference/index.html

EUROGEO5 - 5th European Geosynthetics Conference, 16 - 19 September 2012, Valencia, Spain, www.eurogeo5.org

ISC' 4 4th International Conference on Geotechnical and Geophysical Site Characterization, September 18-21, 2012, Porto de Galinhas, Pernambuco – Brazil, www.isc-4.com

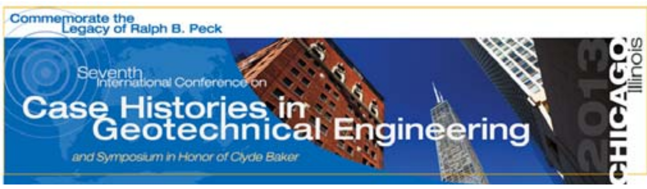
International Conference on Ground Improvement and Ground Control: Transport Infrastructure Development and Natural Hazards Mitigation, 30 Oct - 2 Nov 2012, Wollongong, Australia www.icgiwollongong.com

ACUUS 2012 13th World Conference of the Associated Research Centers for the Urban Underground Space Underground Space Development – Opportunities and Challenges, 7 – 9 November 2012, Singapore, www.acuus2012.com

32. Baugrundtagung with exhibition "Geotechnik", Mainz, Germany, 26 – 29 November 2012

GEOSYNTHETICS ASIA 2012 (GA2012) 5th Asian Regional Conference on Geosynthetics, Bangkok, Thailand, 10 - 14 December 2012, www.set.ait.ac.th/acsig/igs-thailand

First International Congress FedIGS, 12 – 15 November 2012, Hong Kong – China, www.fedigs.org/HongKong2012



Conference to Commemorate the Legacy of Ralph B. Peck, 7th International Conference on Case Histories in Geotechnical Engineering & Soil Dynamics and Symposium in Honor of Clyde Baker, Chicago, USA, April/May, 2013, http://7icchge.mst.edu

ITA-AITES WTC 2013 "Underground – the way to the future", Geneva, Switzerland, 10 to 17 May 2013, www.wtc2013.ch/congress

18th International Conference on Soil Mechanics and Geotechnical Engineering "Challenges and Innovations in Geotechnics", 1 – 5 September 2013, Paris, France www.paris2013-icsmge.org

EUROCK 2013
ISRM European Regional Symposium
Rock Mechanics for Resources, Energy and Environment
23-26 September 2013, Wroclaw, Poland

Contact Person: Prof. Dariusz Lydzba
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Faculty of Civil Engineering
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Fax: (+48) 71 320 48 14
E-mail: dariusz.lydzba@pwr.wroc.pl

ANDORRA 2014 14th International Winter Road Congress 2014, 4-7 February 2014, Andorra la Vella (Andorra), www.aipcrandorra2014.org

10th International Conference on Geosynthetics – 10ICG, Berlin, Germany, 21 – 25 September 2014 www.10icg-berlin.com

13th ISRM International Congress on Rock Mechanics
Innovations in Applied and Theoretical Rock Mechanics
29 April – 6 May 2015, Montreal, Canada

The Congress of the ISRM "Innovations in Applied and Theoretical Rock Mechanics" will take place on 29 April to 6 May 2015 and will be chaired by Prof. Ferri Hassani.

Contact Person: Prof. Ferri Hassani
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ΠΡΟΣΦΟΡΑ ΘΕΣΕΩΝ ΕΡΓΑΣΙΑΣ ΓΙΑ ΓΕΩΕΠΙΣΤΗΜΟΝΕΣ

Disasters Experts

The International Committee on Risk Preparedness (ICORP) has undertaken the establishment of a list of "potential" volunteers for potential response relative to future disasters, including ChristChurch.

Please provide the following using the template:

Stephen J. Kelley, registered architect, registered structural engineer

10 South LaSalle Street, Suite 2600, Chicago, IL 60603 USA

Email: skelley@wje.com

Cell +1 312 560 0697

Expertise in response to earthquakes, hurricanes/cyclones, floods, and tornadoes

Please send your details to Robyn Riddett at rgrd@bigpond.com and copy to the Chairman of ISCRSAH, Stephen Kelley (skelley@wje.com) and the President of ICORP, Rohit Jigyasu (rohit.jigyasu@gmail.com).

Senior Geoscience Development Manager

Weatherford's Geoscience Development group currently has requirements for a senior geoscience development manager in Dhahran, Saudi Arabia. The position requires an individual experienced in geoscience support or development in the oil and gas industry to undertake diverse development initiatives required by various global business units and the region. The successful candidate will have a strong track record of technical publications, numerical and theoretical modeling, field and laboratory data interpretation, and staff and project management. The candidate is expected to be fluent in English, and preferably in Arabic.

https://weatherford.taleo.net/careersection/cs1001/jobdetail.ftl?lang=en&job=369260

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Landslides causing further delays to star-crossed U.S. 20 improvement project

NEWPORT – Ancient landslides that cost the Oregon Department of Transportation millions of dollars in overruns and added years to the task of straightening U.S. 20 have once again brought the project to a halt.

Now, no one can say when the project to eliminate deadly curves will be completed, how much it will cost, who will pay and most importantly, how to stop the slides.

ODOT engineers got their first hint of trouble when contractors discovered "bents," or bridge columns, on two massive bridges had moved out of plumb – the result of the settling of native fill. If the bents continued to move, they could fail, said ODOT project manager Joe Squire.

"That doesn't mean the column falls over, but the concrete might be stressed," said Squire. "The long-term viability is called into question. The concrete could crack."

The OregonianOregon's largest road project to straighten and reroute U.S. 20 from Philomath to Eddyville, shown here in 2007, remains troubled. Most recently, engineers have discovered that the columns under two new bridges have moved, pushed by ancient landslides (Doug Beghtel).

That news was troubling enough. But it got worse. As they monitored the earth around the bents, engineers discovered ancient landslides they thought they had stopped were moving again. The slides could impact four major new bridges – one 210 feet high and the other three each more than 100 feet high.

"The bent issues are significant, that's for sure," said Squire. "In some respects, those would have been fairly straightforward to deal with. The subtle movement in the landslides we identified have been problematic for us. All four of these locations have a very large bridge. That's why we are very concerned."

Engineers haven't figured out why the slides are moving again, but they hope that by monitoring the situation through the rainy season, they might get some answers, Squire said.

"The movement is very slight and subtle, but if you take the amount it moved in a year – a half an inch to a couple of inches – and multiply it by 75 years, it would exceed the capacity of bridge to withstand that type of movement," said Squire. "We're scratching our heads right now. We're looking forward to late February to start making decisions on the rate of movement. The rate of movement is so slow you need months and sometimes a couple of seasons to see the trend line."

The project to eliminate miles of hairpin curves on U.S. 20 with 6.5 miles of new roadway between Pioneer Mountain and Eddyville got under way in 2005 when ODOT awarded the $150 million project to Granite Construction Co. of Watsonville, Calif.

It was and remains the single largest contract ever let by ODOT. The monumental undertaking involved building eight new bridges and cutting new road through forest 300 to 700 feet above sea level, on 30 and 40-degree slopes in a slice of Oregon that can see upward of 100 inches of rain during the winter.

The stretch of highway is notoriously dangerous, with sharp, narrow curves and a high volume of tractor-trailer traffic. The highway is so deadly that locals used to sport bumper stickers imploring, "Pray for me, I drive Highway 20."

It didn't take long for Granite, operating as Yaquina River Constructors, to realize how daunting a task it had chosen.

One year into the project, after contractors cleared 160 acres of forest above the new roadway and failed to erect adequate erosion control, Oregon State Police launched a criminal investigation.

In 2007, the Oregon Department of Environmental Quality levied $240,000 in penalties for water quality violations by Granite Constructors for damaging salmon spawning grounds in the Yaquina River and its tributaries. DEQ also fined ODOT $90,000 for the violations.

The trouble led to disputes between ODOT and Granite, and added up to $61 million in overruns and delayed the finish date – originally slated for October 2009 – to December 2011.

That date is likely to be pushed back again. Meanwhile, new cost overruns continue to mount and ODOT and Granite are again at odds.

"The ground movement is something that was not foreseen," said Bill McGowan, Granite project principal. Nobody anticipated it. The mitigation was not enough. Right now we are in a dispute about the responsibility and who is going to pay for the additional mitigation."

ODOT maintains it is Granite's responsibility, said Richard Little, ODOT spokesman.

"Granite says this is a change to what was anticipated," said Little. "We're saying no, they really should have anticipated them. Something's wrong somewhere with either their approach or engineering. There's got to be explanation for why there is movement and there has to be a suitable fix."

Whatever the outcome, Squire says he is determined to see the straightening of U.S. 20 through.

"The project will be finished," said Squire. "The commitment is there. We are not going to walk away. Under current design, we are slated to finish in 2011. It's likely that may be extended. But we are going to get it right, safety-wise and at the best value to the taxpayer."

(Lori Tobias, The Oregonian , January 06, 2011 στο ASCE SmartBrief, January 07, 2011)

Experts Say Sinking of Mexico City is Getting Worse

Mexico City continues to sink, causing major damage. Over the past century, areas of Mexico City have sunk as much as 42 feet, causing fissures, cracks and other damage to buildings, highways, roads and public infrastructure. Engineers say the land can't be raised, but further sinking could be mitigated if water is added back to the underground lakebed or drawing water from it is stopped.

Mexico City is sinking. While this fact has been known for some time, over the last century, the sinking has gotten far worse.

It is estimated that in the last one hundred years or so, areas of the world's third largest metropolis have sunk up to 42 feet (13 meters). As parts of the city sink, fissures and cracks occur, and they have caused a number of accidents in residential areas and immense damage to buildings, highways, roads and public infrastructure, including sewer lines that are now so slanted that they actually run backwards. The damage can easily be been seen in buildings' uneven foundations and lopsided balconies.

In the 1300s, the city was founded on an island in the middle of Lake Texcoco. As the city outgrew the small original island, more artificial islands were created, and a network of canals was built, with the main roads built on the causeways between the mainland and the islands. When Spain gained control of Mexico City in the 1500s, they drained most of the water from the lake due to flooding problems. Today, due to the draining, about 70 percent of the city's supply now comes from water pumped from aquifers under the city, which are part of the original lake. However, the water is being siphoned faster than it can be replaced by natural resources (i.e. rainfall), and the city's foundation, now just a mud-like lakebed, is not strong enough to hold it up.

Scholars from the National Autonomous University of Mexico (UNAM) say the city's fissures "are generating alarm among the population and even cause significant damage to buildings and (affecting provision of) public services.

Due to the angled, sinking city most of its wastewater can no longer flow out of the city naturally. It has to be forced out by a number of pumps to get it over the rise known as Sierra de Guadalupe.

Landmarks all over the city that are fastened to the bedrock and are not sinking with the rest of the city have had to have steps added over the years so visitors can reach them. Built on underground pylons in 1970, the Insurgents Traffic Circle is now 12 feet higher than the streets leading to it.

Engineers say the only way to stop the city from sinking any farther is to stop siphoning water from the aquifers or inject water back into the lakebed. However, it is unlikely that returning water from the lakebed will reinflate it.

"You can't raise the city again," said hydraulic engineer Ramón Domínguez. "The only hope is to stop it from sinking further."

(Hispanically Speaking News (Chicago), January 17, 2010 στο ASCE SmartBrief, January 18, 2011)

Κατολισθήσεις στην Βραζιλία 12-14 Ιανουαρίου 2011

Πρωτοφανείς κατολισθήσεις – λασπορροές εκδηλώθηκαν στην πολιτεία του Rio de Janeiro της Βραζιλίας λόγω καταρρακτωδών βροχοπτώσεων με εκατοντάδες νεκρούς και αγνοουμένους και χιλιάδες άστεγους. Λεπτομερής περιγραφή των φαινομένων δίνεται από τον καθηγητή Γιώργο Γκαζέτα σε παρουσίασή του που είναι αναρτημένη στην ιστοσελίδα της ΕΕΕΕΓΜ (**www.hssmge.gr**). Στη συνέχεια δίνονται κάποιες χαρακτηριστικές φωτογραφίες που τις συλλέξαμε από δημοσιογραφικές ιστοσελίδες.

Landslides in Brazil

A destroyed church stands surrounded by debris and floodwaters after a landslide in Teresopolis, Rio de Janeiro state, Brazil, Thursday Jan. 13, 2011. (AP Photo/Felipe Dana)

Last week, a series of flash floods and mudslides struck the Serrana mountain region near Rio de Janeiro, Brazil, destroying buildings roads and more. Nearly 14,000 people are now homeless, 759 are reported to have been killed and another 400 remain missing in this, Brazil's worst-ever natural disaster. As soldiers make their way to remote towns with aid and transportation, Brazil's government has said it would accelerate efforts to build up a nationwide disaster-prevention and early-warning system. Collected here are photos from the mountainous regions near Rio that were so hard-hit by these landslides.

The slope on a hill where a landslide occurred in Nova Friburgo, 130 km north of Rio de Janeiro, Brazil, on January 13, 2011. (Shana Reis/AFP/Getty Images)

Residents search for landslide victims in Nova Friburgo, Brazil, Monday, Jan. 17, 2011. (AP Photo/Felipe Dana)

Rescue workers and residents search the rubble of a building that collapsed in a landslide in Nova Friburgo, Brazil on January 13, 2011. (REUTERS/Shana Reis-Government of Rio)

A vehicle remains upside down after recent mudslides at Corrego Dantas neighbourhood, in Nova Friburgo, Brazil on January 16, 2011. (MAURICIO LIMA/AFP/Getty Images)

Aerial view of a house at risk following landslides in the locality of Poco Fundo, an isolated area near Petropolis, Brazil on January 18, 2011. (VANDERLEI ALMEIDA/AFP/Getty Images)

An aerial view of a neighborhood destroyed by landslides in Nova Friburgo, Brazil on Sunday, Jan. 16, 2011. (AP Photo/Felipe Dana)

Slopes covered by mud are seen after landslides in Nova Friburgo, Brazil on Monday, Jan. 17, 2011. (AP Photo/Felipe Dana)

A view of a landslide in Conquista on January 17, 2011. (REUTERS/Bruno Domingos)

A car, dragged inside a church by a mudslide, is seen in Nova Friburgo, Brazil on Friday, Jan. 21, 2011. (AP Photo/Felipe Dana)

(The Big Picture - Boston.com, January 21, 2011)

Software could help prevent disaster in sinking cities

A Nottingham University researcher has been awarded funding to help China prevent human disaster as some of its fastest-growing cities sink under the weight of towering skyscrapers.

Dr Andrew Sowter, a mathematician and scientist at the University of Nottingham Ningbo, China (UNNC), is developing a computer program that will help Chinese authorities identify with greater accuracy exactly where, and by how much, structures are moving.

The UNNC scientist's software will analyse satellite images gathered over several years to reveal how much land has moved, in millimetres, across the entire city.

The National Natural Science Foundation of China – affiliated to China's highest governing body, the State Council – has granted funding of about ¥500,000 (about £50,000) for research that will use Shanghai as a case study.

Shanghai, like several other coastal cities in China, is built on marshy soil, making it vulnerable to sinking. One of the most densely populated cities in the world, it is believed to be sinking at an average rate of 2-4cm a year, putting pressure on underground pedestrian and railway tunnels, and building foundations.

In 2003, subsidence was blamed for the collapse of an eight-storey building in Shanghai's inner-city Bund region, which is known for its iconic commercial real estate.

The pumping of groundwater to cater for a massive, growing population has been a significant contributor to subsidence. The problem has been exacerbated by the country's decades-long building boom amid rapid urbanisation, said Sowter.

Sowter is working in collaboration with Shanghai's Tongji University, which is gathering ground information to confirm the results of data gathered from space.

'We are advancing and refining existing computer programs so that we can identify risks with greater confidence of the accuracy of the results. Rather than just measuring the problem, we are also improving the models to map and identify priority areas,' he said.

The Nottingham Ningbo scientist has also commenced research on the coastal city of Ningbo to assess the extent to which it might be sinking. An underground rail system is being constructed to accommodate the estimated eight-million-plus population of greater Ningbo, which, like Shanghai, has developed rapidly and is on water-logged land.

Sowter said that the technology he is developing can be applied to other risks associated with land, such as earthquake zones, high-risk flood areas, land deformation from mining, and glacier movements. It can, for example, help authorities prevent landslides by detecting where land is starting to move at the stage when changes are slight.

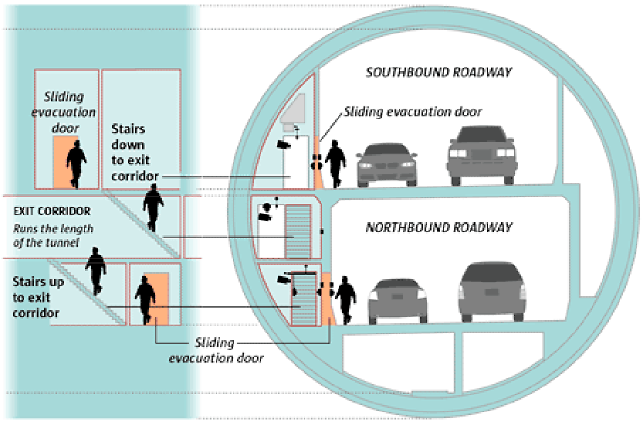
(The Engineers, 25 January 2011)

Hwy. 99 tunnel would be prepared for potential disasters

The notion of a Highway 99 tunnel raises its own set of fears among the public. What about fire, earthquake, tsunami or crashes? It turns out the Seattle project includes engineering solutions that the tunneling industry devised in response to catastrophes in other parts of the world.

Stepping away from a tunnel fire

In the event of extreme heat, smoke or chemical fumes, travelers would flee through escape doors to the west, then take a long walk through the concrete-lined corridor to exit at either Sodo or South Lake Union. Evacuation doors will be placed every 650 feet.



The evacuation doors and exit corridor include:

- Automatic sprinklers
- Cellphone receivers
- Emergency phones/speakers
- Security cameras
- Maintenance phones

Source: Bid proposal by Seattle Tunnel Partners MARK NOWLIN / THE SEATTLE TIMES

The proposed Highway 99 tunnel is supposed to replace a threat to public safety — that the old Alaskan Way Viaduct might topple in an earthquake.

But the notion of going underground raises its own set of fears among the public.

A quake might crack the tube, some argue. Commuters could drown in a tsunami. A crash might trap cars and block ambulances. Toxic fumes might outrun evacuees.

While some doomsday comments are sincere, others are attempts to toss sand into the machinations of pro-tunnel governments as the controversial project, set to open by the start of 2016, moves forward.

It turns out the Seattle project includes engineering solutions that the tunneling industry devised in response to catastrophes in other parts of the world.

"We're looking at a tunnel that's providing state-of-the-art technologies," said project manager Linea Laird.

But tunnels, by their nature, have hazards. Which matter most, and what do they mean for motorists?

Emergency escape doors will be built every 650 feet. On the other side would be concrete-sheltered corridor, designs show. People could then walk to daylight at the Sodo or South Lake Union portals of the 1.7-mile tunnel.

Though firefighters would be dispatched to the scene, sheltering in your car would be a bad move.

"If you're in the tunnel and something happens, we assume you will self-rescue," says Gary English, Seattle assistant fire marshal.

Fire is main threat

Fire is the primary threat to drivers in a tunnel, in the view of state engineers, tunnel contractors and emergency responders.

Worldwide, there have been 188 fires in highway, transit and freight-rail tunnels, according to Promat, a maker of fireproof materials.

Among the worst was a 1999 tragedy in which a truck hauling margarine ignited in the Mont Blanc Tunnel, between France and Italy. Smoke and heat killed 39 people during the 53-hour incident.

Seattle Tunnel Partners is proposing a ventilation system that would suck smoke out in numerous locations, instead of pumping fresh air into the tunnel, which might push smoke and fumes the wrong way.

A confined tunnel reflects and traps heat, so temperatures reach extremes. Moisture within the concrete vaporizes and causes the wall to burst like popcorn, a phenomenon called "explosive spalling." As shards fly, the next layer of concrete is exposed, until a large segment falls to ruin.

A 2008 nonfatal fire in the Channel Tunnel (also known as the Chunnel) between England and France, destroyed 750 meters of concrete lining. Spalling occurred in the Mont Blanc fire, in two other Chunnel fires, and during construction of the Great Belt Tunnel in Denmark.

The worst-case fires follow a pattern called the "RWS Curve," coined by Dutch researchers. An engulfed gasoline truck would generate 300 megawatts of energy, nearly one-third of a nuclear-plant output. Temperatures can spike to nearly 2,200 degrees in 20 minutes, and stay there at least three hours.

U.S. fire codes are results-based. Tunnel walls must be protected so they never exceed 716 degrees.

"Seattle Amendments"

The Highway 99 tunnel codes include another wrinkle: special "Seattle Amendments" that mandate sprinklers. The Mount Baker Tunnel, Interstate 5 beneath the Washington State Convention Center, Battery Street Tunnel and Downtown Seattle Transit Tunnel all feature deluge systems.

"Seattle has more tunnel fire sprinklers than any other city in the country," said English, a national authority. Meanwhile, the Chunnel is being retrofitted with four stations where a burning train can stop and be drenched in mist.

"The way to deal with a fire is to put it out," said Susan Everett, a Washington State Department of Transportation (WSDOT) engineering manager.

Also, gasoline tankers will be banned from the Highway 99 tunnel. Therefore, authorities required that the tunnel withstand a lesser 100-megawatt fire that a freight truck might generate, Laird said, the project manager.

The Seattle Tunnel Partners construction team, led by Dragados USA, says it will install not only sprinklers but coat the interior with a 1.2-inch-thick calcium shield that is designed to withstand a gasoline fire.

Manuel Pardo, Dragados' project executive, said his team was using the best practices from its experience in Europe, including the M30 highway project in Madrid, Spain.

English emphasized that if a gasoline truck, or any suspicious vehicle, enters the Seattle tunnel, control-room operators could identify it and close the highway to traffic.

For its basic design, the concrete tunnel tube must be at least 2 feet thick and contain steel-reinforcing bar, Laird said. New York City has needed to reinforce its older tunnels with steel as a special precaution against terrorism.

Natural disasters

The tunnel is subject to state seismic requirements to withstand a so-called "2,500-year" quake without life-threatening damage.

A severe quake would be expected to cause the cylindrical shape to bend like an oval, about a half-inch, said state engineer Tim Moore.

Tunnels have the advantage of being braced by surrounding soil, said Steven Kramer, a geotechnical-engineering professor at the University of Washington.

In 2005, scientists considered what might happen if a temblor of similar force to the 6.8-magnitude Nisqually earthquake of 2001 were to occur in the Seattle Fault, directly under the city. They predicted 1,600 deaths, severe damage to 29,000 buildings, and $33 billion in losses.

"I think the tunnel would probably be the least of our concerns at that point. The tunnel would likely be in much better shape than the structures over it," Kramer said.

The tunnel team dismisses any risk of tsunami.

A worst-case event would be triggered by a rift in the Puget Sound seafloor generating a wave that covers part of Sodo in water between knee and head height.

However, the only known tsunami from the Seattle Fault occurred about the year 930 and generated a 10-foot wave. To breach the current seawall, which is 9 feet above the average high tide, it would require a record tsunami at high tide. Such an event might occur once in 23,000 to 60,000 years, according to consulting firm Parsons Brinckerhoff.

However, the WSDOT analysis done by Parsons Brinckerhoff doesn't factor in climate change, which scientists believe could raise sea level worldwide by an average of 1 meter by 2100.

Pardo replies: "Even if the sea level rises 1 meter, you won't get water in the tunnel, because the tunnel is higher than that."

How to escape

All the tunnel's emergency doors will be on the west side — left of the northbound lanes and right of the southbound lanes along the double-deck highway.

Cameras, speakers and phones would enable people to be located by workers in the tunnel control room and at WSDOT's regional traffic center in Shoreline. Evacuees would walk either up or down a staircase to reach the passageway out. Disabled people would wait in a shelter zone for firefighters.

In the 2008 Chunnel fire, everybody survived.

"The reason there were no fatalities was due to the fact they had an emergency-evacuation system that looks a lot like the Highway 99 tunnel," English said.

Opponent Christopher Brown, a retired engineer who opposes the tunnel, has argued the tunnel is too narrow for wheelchair ramps to be used, and the disabled wouldn't be able to escape via staircases; the Federal Highway Administration says it's reviewing his critique.

As with light rail in Rainier Valley, where cars and trains share the road, public safety depends on awareness.

An experiment for a European tunnel-safety association found that untrained drivers took five minutes to make the right decision — walk to an escape door — when smoke was pumped into a tunnel. Authors suggest education campaigns, even in-car placards such as those aboard aircraft. The Highway 99 tunnel would include loudspeakers and electronic signs.

Local firefighters have experience reaching crashes on the narrow Highway 520 bridge and Spokane Street Viaduct, English said. They can drive opposite the normal direction of traffic. They could stop on the southbound deck, then descend to a northbound accident scene. Or firefighters might enter through the escape passageway, then hook hoses to hydrants inside. The tunnel, he said, might be easier to deal with than certain high-rise buildings.

"Whatever it takes, we'll carry enough people and enough hose."

(Mike Lindblom, The Seattle Times, 12.02.2011 στο ASCE SmartBrief, 14.02.2011)

ΠΕΡΙΒΑΛΛΟΝΤΙΚΑ

Scientists suggest 'recycled Haitian concrete is safe, strong, cheaper'

Concrete experts at the Georgia Tech have made new concrete, from recycled rubble and other indigenous raw materials using simple techniques.

"There are political and economic dilemmas as well, but we have found we can turn one of the dilemmas - the rubble - into a solution via some fairly simple methods of recycling the rubble and debris into new concrete," said Reginald R. DesRoches.

DesRoches and Joshua J. Gresham studied the methods, tools and raw materials used by local labourers to make concrete mixes.

Neither encountered any mixing trucks.

"Instead, all of the construction crews were manually batching smaller amounts of concrete. Unfortunately, they were mixing volumes of materials 'by eye,' an unreliable practice that probably caused much of the poor construction and building failure during the earthquake," he said.

DesRoches and Gresham manually cast an initial set of standard 3-inch by 6-inch concrete test blocks using mixes from several different construction sites.

Back at the lab, tests indicated that the Haitian-made concrete had an average compressive strength of 1,300 pounds per square inch, while US standards require it to be a minimum of 3,000 pounds per square inch.

Next, they manually crushed the samples with a hammer to provide course aggregate. Then they carefully measured volumes using methods prescribed by the American Concrete Institute. The materials were still mixed by hand to replicate the conditions in Haiti.

Subsequent tests of samples made from each type of sand showed that compressive strength of both of the types of new test blocks, still composed of Haitian materials, dramatically increased, showing an average over 3,000 pounds per square inch.

"Based upon these results, we now believe that Haitian concrete debris, even of inferior quality, can be effectively used as recycled course aggregate in new construction," said Kimberly E. Kurtis.

"It can work effectively, even if mixed by hand. The key is having a consistent mix of materials that can be easily measured. We are confident are results can be scaled up mix procedure where quantities can be measured using common, inexpensive construction equipment."

"Finding fresh aggregate is more difficult than getting rid of the debris. It is costly to find, mine and truck in," said DesRoches.

The trio said they plan on sharing their research with Haitian government officials and nongovernmental organizations working on reconstruction projects.

The study is published today in the Bulletin of the American Ceramic Society. (ANI)

(Sify.com (India)/Asian News International, January 5, 2011 στο ASCE SmartBrief on Sustainability, January 07, 2011)

Contaminated Sediments Turned Into Safe Construction Materials

Chances are, you live near a body of water polluted by carcinogenic chemicals (if you don't think you do, this list of polluted rivers from the Environmental Working Group might change your mind). But what if all the contaminated sediment lingering in, say, the Mississippi River, could be used for good? STABCON, a consortium of Swedish and Norwegian companies and researchers, have figured out a way to turn all that lead and mercury-polluted soil into a concrete-like substance that can be used for construction.

After extensive testing at Oxelösund, a Swedish port, the STABCON team discovered that dredged-up soft sediment strengthened with cement and Merit 5000 (a product used in steel-making), hardened into a safe material that could be used as a building block. ScienceDaily claims that the material is both durable and safe--after building a new harbor with the material at Oxelösund, researchers found that chemicals didn't leak into surrounding waters.

So far, STABCON only has plans to use the new process in Sweden, with multiple local ports interested in seeing their contaminated sediments dredged up. Soon, though, STABCON will extend its research throughout the entire Baltic Sea region.

And after that? If STABCON can prove that its concrete-like substance doesn't degrade over the years and start leaking toxic materials back into the water, ports everywhere might consider turning their dirty soil into construction projects.

(Ariel Schwartz, FastCompany.com, Mon Feb 14, 2011 στο ASCE SmartBrief on Sustainability, 15.02.2011)

University labs look at pulling solar heat from asphalt roads

Could our highways capture the sun's energy? A team of scientists from three universities — University of Rhode Island, Brown University in Providence Rhode Island and the University of Massachusetts at Dartmouth — have a short list of four ideas ranging from simple to complex to harvest solar power from asphalt.

"We have mile after mile of asphalt pavement and in the summer it absorbs a great deal of heat, warming the roads up to 140°F or more, says Kang-Won Wayne Lee, who heads the Transportation Research Center at the University of Rhode Island.

"If we can harvest that heat, we can use it, save on fossil fuels and reduce global warming."

The simplest idea is to wrap flexible photovoltaic cells around meridian barriers.

"This technology already exists," says Lee. "The new generation of solar cells are so flexible, they can be installed so that no matter what the angle of the sun, they generate electricity."

Another idea builds on research from England, Holland and America and involves embedding pipe containing glycol, or other liquid, in the asphalt which collects heat as the road warms under the sun.

The liquid could be piped through bridge decks to melt snow and ice, reducing the use of salt. It could also be piped to nearby buildings to provide heat or hot water.

Andrew Correia, a recent graduate in civil/environmental engineering, has built a prototype and testing different ferent asphalt mixes and piping systems, hoping to show that the technology can work in the field as well as in the laboratory.

He's keen on the idea of using the technology in de-icing applications.

"Say you have an overpass over a roadway," he said. "You could have pipes in the lower level collecting heat during the day and going into some sort of storage facility. As the deck of the overpass cools to near freezing, the stored heat could be piped through the network of pipes embedded in the bridge deck, extending its service life."

A third system earmarked by the researchers involves a thermoelectric effect to generate a small, but usable, amount of electricity. When two types of semiconductors are connected to form a circuit linking a hot and a cold spot, a small amount of electricity is generated.

Chemistry professor Sze Yang says such materials could be embedded in the roadway at different depths and the temperature differential would generate a weak current. With many such systems wired in parallel, enough power could be produced to defrost roadways.

"It's a somewhat futuristic idea," says Yang, noting there's nothing on the market like it. "But it has been demonstrated to work in the laboratory."

Even more futuristic is the solar road, which would use drop-in solar panels as the roadway.

The idea is to develop a solar cell system embedded in a composite material that can be used as a road surface even under severe load conditions.

Each panel might consist of three sub-layers: a surface layer, an electronics layer and a base-plate layer.

The panels would be able to generate electricity, illuminate roadway lanes in a variety of configurations, and provide early warning of any need for maintenance.

Lee says the technology underlying this concept already exists, but is extremely expensive.

Correia said an Illinois researcher created a short section, but it's prohibitively expensive at $100,000 for a 12-by-12-foot section, meaning it's more likely for corporate parking lots before it is practical for roadway use.

(Korky Koroluk, Correspondent, Kingston, R.I., Daily Commercial News, 25 February 2011 στο ASCE Smartbrief, 25 February 2011)

Yorkshire Water facility to test vegetable-oil building blocks

A facility for testing building blocks made with vegetable oil is to open at a Yorkshire Water site near Leeds.

The firm behind the blocks, Leeds University spin-out Encos, hopes it could reduce the environmental impact of construction by providing an alternative to traditional cement, which is responsible for around five per cent of global carbon-dioxide emissions.

The masonry products are composed of graded aggregates recovered from various waste products bound together with vegetable-oil-based binders.

Encos describes the blocks and bricks as carbon negative because the plants used to make the vegetable oil have absorbed CO_2 from the atmosphere.

'We have a very low energy requirement in terms of our production and it's turned negative once we incorporate that biogenic carbon-storage element,' Encos chief executive officer Mark Nicholls told *The Engineer*.

The Knostrop test manufacturing facility will validate the lab-scale trials of the Encos binders and test their use with a number of different aggregates, including those recovered from non-hazardous waste streams.

These include ash produced in the wastewater-treatment process. After extensive testing and validation, product samples will be provided to specifiers and constructors for their evaluation.

The test plant was developed in partnership with Yorkshire Water, with financial contributions from Yorkshire Water and grants from Yorkshire Forward, CO_2 Sense and the Carbon Trust. As well as the site, Yorkshire Water is also providing all utilities and certain test materials.

(Stephen Harris, The Engineer, 24 February 2011)

Built to survive

How is it that New Zealand's recent large and destructive earthquake did so little damage to the bridges in the quake zone? Mary Searle investigates

The magnitude 7.1 earthquake that hit the Canterbury region in New Zealand at 4.35am on Saturday, 4 September was similar in size to the quake that shook Haiti in January. However, the damage in Canterbury was minimal in comparison. A key contributor to this was New Zealand's preparedness for such an event.

Positioned on a major fault line, New Zealand has earned the nickname of 'Shaky Isles' and its residents are well used to earthquakes. Consequently, the country has strict codes when it comes to earthquake-proofing new builds, and many older buildings and structures have been strengthened to withstand such an event.

Liquefaction caused most of the damage in Canterbury: this is where the shaking reduces the strength and stability of the soil, making it behave like a liquid, creating cracks, slumping, sand volcanoes and bringing water to the surface. Immediately after the shake many streets and properties were covered in a thick layer of water and silt.

Where the water and silt was trapped under concrete or asphalt, roads and footpaths were pushed upwards causing lumps and cracking the surface.

Worst affected areas were alongside the Avon River in Christchurch city and in the coastal suburbs – their proximity to water enhancing the risk of liquefaction. Therefore, you could expect the regions bridges to be severely impacted by the quake, right? Not so.

Children play on a bridge that crosses the Avon River in Christchurch. The bridge is buckled and people are advised not to cross it. (Pic: New Zealand Herald)

Of the 400-plus bridges in the region, only eight road bridges were affected, with the damage mostly occurring to the bridge abutments. The bridges themselves have all been deemed structurally sound. Two pedestrian bridges in Christchurch were totally destroyed, their lightweight structures violently twisting as lateral spreading of the ground put enormous pressure on the structures.

So how did the road bridges fare so well?

John Reynolds, principal structures engineer at the NZ Transport Agency, the government body responsible for the country's state highway network, says the survival of the bridges is down to their seismic engineering.

"The majority of the bridges throughout the country were built post-1950. Since the 1950s New Zealand's bridges have been designed to withstand earthquakes. And since the 1960s they have been designed to quite high seismic loading, so they're reasonably robust when it comes to handling the stresses generated in an earthquake," he explains.

"Rather than being designed for vertical loading (weight of traffic), our bridges are designed for lateral loading. This equals robust bridge design – they have a lot of built in resilience and move with the earthquake."

The epicentre of the quake was in Darfield, a small town about 40km from Christchurch.

Reynolds says that in Christchurch the actual seismic shaking was about 60-70% of the loading a new bridge would be designed for. "Had the earthquake been bigger, the newer bridges would have performed well, but some of the older bridges, designed to lower specs, may have been damaged," he says.

In 2000, the NZ Transport Agency (then known as Transit New Zealand) undertook a national seismic screening exercise on all state highway bridges. It was a desktop exercise to assess the strength of bridges.

Some of the earthquake damage to highways. (Pic: New Zealand Herald)

Reynolds says about 20% of bridge stock was found to have some vulnerability. Since then the Transport Agency has provided funds every year for seismic retrofitting to strengthen these bridges. The main activity of the strengthening has been providing linkages for components to prevent the bridge falling apart during an earthquake.

"It has been a significant linkage retrofit programme designed to prevent displacement of superstructure components and prevent dislodgement from the bridge foundation," says Reynolds.

The programme is now largely complete with the Transport Agency confident that its most seismically vulnerable bridges have been brought to a standard where they will withstand a significant seismic event.

Reynolds says ground liquefaction came as a surprise to many people in Canterbury but it is an earthquake issue structural engineers are very familiar with.

Some of the earthquake damage to highways. (Pic: New Zealand Herald)

"Christchurch has extensive areas of soft sands which are vulnerable to liquefaction. However, all the bridges are founded on piles which extend down through the sand to the rock below. Therefore the damage was restricted to the bridge approaches."

The risk of liquefaction damaging bridge abutments has been known for a while. However, Reynolds says the Transport Agency has no programme to deal with this.

"The Agency has allowed bridge approaches to liquefy during an earthquake because the cost of prevention work is hugely expensive but repairs can easily be made after a quake, unlike repairs to a bridge, which are both costly and disruptive."

For many years New Zealand has been a leader in seismic design and has always applied world-best practice. A large quake in the capital city of Wellington in 1855 prompted the use of wood for the design and construction of the four-storey Government Buildings (now the Law School of Victoria University) in 1870.

Not much further thought was given to seismic design until the 1931 Napier earthquake, which killed 256 people and destroyed the town. The rules for Napier's reconstruction led to the first New Zealand standards for earthquake-resilient design.

In the 1960s the government, University of Canterbury and the engineering profession collaborated to address seismic design. This led to the introduction of the concept of capacity design, in which designers could essentially tell a structure how to behave under extreme seismic loading, preventing severe and sudden failures. The capacity design philosophy has since been adopted in earthquake engineering codes around the world.

"Earthquakes are a fundamental part of our bridge design, considered right at the very early stages," says Reynolds. "The form of a bridge is often dictated by earthquake requirements."

A damaged bridge abutment after the earthquake. (Pic: New Zealand Herald)

It's a mantra that has paid off for New Zealand, for although the clean-up bill is predicted to come in at around the NZ$4 billion (about US$3 billion) the cost could have been significantly higher. The quake destroyed or rendered uninhabitable about 2,700 of Canterbury's 160,000 homes and left a further 3,000 exposed to the weather. Fifty-one buildings in the Christchurch central business district were either destroyed or left unsafe.

The greatest damage was to water and sewerage pipes, which were pulverised and their contents mingled into the invasive silt that engulfed houses, sections and streets in a layer up to 300mm deep.

If good luck can ever be attributed to an earthquake so powerful and destructive, it was in its timing, which could not have been better in terms of people being safely tucked up in bed in their timber-framed homes. But credit must be given to the New Zealand's structural engineers who have designed its buildings and bridges to survive disasters such as this.

(06 January 2011 / World Highways eNewsletter 13 January 2011)

Implementation and validation of a new 3D automated pavement cracking measurement equipment

ABSTRACT: In order to maximise road maintenance funds and optimise the condition of road networks thus saving energy and valuable resources, pavement management systems need detailed and reliable data on the status of the road network. To date, reliable crack data has proven difficult and expensive to obtain. To solve this problem, over the last 7 years INO (National Optics Institute of Canada) in collaboration with the MTQ (Ministère des Transports du

Québec) have been developing and testing a new technology called the LCMS (Laser Crack Measurement System). The LCMS is composed of two high performance 3D laser profilers that are able to measure complete transverse road profiles and to process this data using algorithms that automatically extract crack data including crack type (transverse, longitudinal, alligator) and severity. This system was completed in three main phases. The first (2002) aimed at evaluating the 3D laser profilers and was validated by surveying a road section containing artificial cracks created by saw cuts. The second phase validated the algorithms for the detection and classification of road cracks on 400m road segments in 2005. The third phase aimed to perfect the system and software so as to make them robust enough to complete network level surveys. This paper describes results obtained using the LCMS system during the campaign of 2007 when the system was used to survey 10,000 km of the MTQ's road network. An analysis of these results is presented which demonstrates that such equipment can be very useful to feed and maintain a pavement management system (PMS) database. This paper will also explain the 3D laser technology and algorithms and show examples of data acquisitions and processing results.

KEY WORDS: Pavement, cracks, detection, inspection, PMS

INTRODUCTION

The LCMS system is based on two high performance transverse 3D laser profilers that are placed at the rear of the inspection vehicle looking down in such a way as to scan the entire 4m width of the road surface (Laurent et al. 2008, Laurent and Hébert 2002). Figure 1 illustrates the system installed on the MTQ vehicle. The use of 3D laser profilers allows the system to directly measure surface defects such as cracks, ruts, potholes, macro-texture, joints and patches while the intensity data that is also collected allows for the detection of lane markings and sealed cracks. Table 1 summarizes the specifications of the LCMS system and figure 2 shows a close-up picture of the sensors.

Figure 1: Photo of the LCMS on the MTQ Inspection Vehicle

Table 1: LCMS Specifications

Nbr. of laser profiles	2
Sampling rate (max.)	5600 profiles/s
Vehicle speed	100km/h (max)
Profile spacing	Adjustable (down to 5mm)
3D points per profile	4160 points
Transverse field-of-view	4m
Depth range of operation	250mm
Z-axis (depth) resolution	0.5mm
x -axis (transverse) resolution	1mm

Figure 2: Photo of the LCMS System (Sensors and Controller)

The recommended system configuration that was used and tested by the MTQ is the following: two LCMS sensors were placed 2m apart and 2m above the road surface looking down. Instead of placing the sensors at a 90 degree angle perpendicular to the road surface a slight (15 degree) slant was put on the sensors in order to improve the detection of transverse cracks (see figure 3).

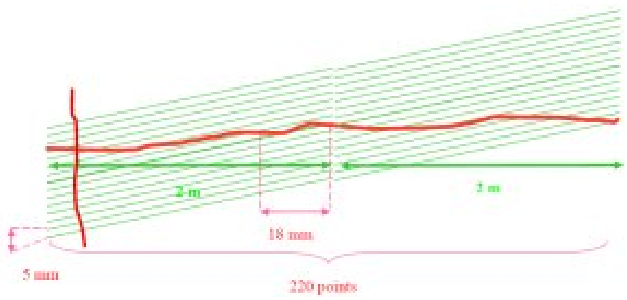


Figure 3: Diagram of the Crack Sampling Interval

With such a configuration it is possible, with the 15 degree tilt angle, to reliably detect both longitudinal and transverse cracks as can be seen with the following illustrations of the sampling intervals for each case. At 100 km/h in the case of transverse cracks, the 15 degree tilt angle results in the fact that each transverse crack will effectively be measured at over 200 different points. For longitudinal cracks, the effective sampling rate is one point every 5 mm.

1 HARDWARE CONFIGURATION AND DATA

The sensors used with the LCMS system are 3D laser profilers that use high power laser line projectors, custom filters and a camera as the detector. The light stripe is projected onto the pavement and its image is captured by the camera. The shape of the pavement is acquired as the inspecttion vehicle travels along the road using a DMI signal from an odometer to synchronize the sensor acquisition. All the images coming from the cameras are sent to the frame grabber to be digitized and then processed by the CPU. Saving the raw images would imply storing nearly 30 Gb per kilometer at 100 km/h but using lossless data compression algorithms on the 3D data and fast JPEG compression on the intensity data brings the data rate down to a very manageable 20 Mb/s or 720 Mb per kilometer. The LCMS sensors simultaneously acquire both range and intensity profiles. On one hand, the range profiles give the 3D shape for a transversal portion of the road. On the other hand the intensity profiles are more or less a greyscale one dimensional image of the road. Figure 4 illustrates how the various types of data collected by the LCMS system can be exploited to characterize many types of road features. Figure 5 shows that the 3D data and Intensity data serve different purposes. The intensity data is required for the detection of lane markings and sealed cracks whereas the 3D data is used for most of the other features.

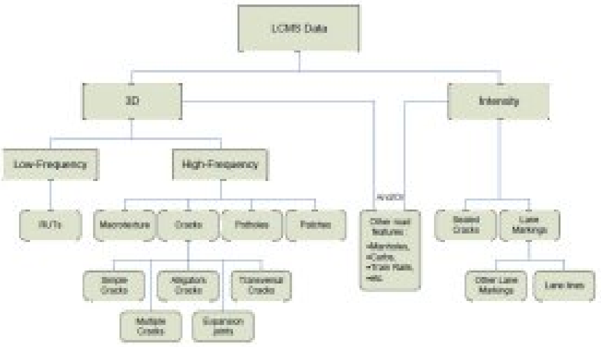


Figure 4: Data analysis library diagram

1.1 Detecting Lane Markings

Intensity profiles provided by the LCMS are actually a continuous picture of the road. The first role of the intensity information is for the detection of road limits. This algorithm relies on the detection of the painted lines used as lane markings to determine the width and position of the road lane (see figure 5). The lane position data is then used by the other detection algorithms to circumscribe the analysis within this region of interest in order to avoid surveying defects outside the lane. Highly reflective painted landmarks are much easier to detect in 2D since they generally appear highly contrasted in the intensity images. With the proper pattern recognition algorithms, various markings can be identified and surveyed. To date, only the detection of lane lines has been implemented and tested. In future work we will also be exploring the possibility of evaluating the 'quality' of the lane marking by computing deterioration as the ratio of the surface of the marking having lost its reflectivity. The following figure shows two intensity images with painted lane marks.

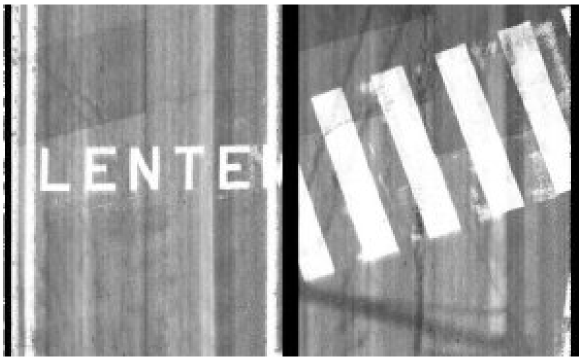


Figure 5: LCMS images of painted lane marks

1.2 Range Data

The 3D data acquired by the LCMS system gives the surface height for every sampled point on the road. The figure (6a) below is an example of the raw range data acquired by the sensors. In this image, elevation has been converted to a gray level. The brighter the point, the lower is the surface. As can be seen, the height varies along the cross section of the road. The areas in the wheel path are usually deeper than the sides and thus appear brighter this would correspond to the presence of ruts. Height variations can also be observed in the longitudinal direction. This is due to the suspension of the vehicle holding the sensors. In this case, the variation comes from the changes in the sensor height rather than the road surface itself. This phenomenon does not affect rut measurements since these are made on a profile-by-profile basis whereas the suspension motion causes relative height changes from one profile to the next. These large-scale height variations correspond to the low-spatial frequency content of the range information in the longitudinal direction. Most features that need to be detected are located in the high-spatial frequency portion of the range data. For instance, cracks correspond to very sudden, sharp transitions in height i.e. high frequencies.

The first step in range analysis is to separate the high frequency content from the low one. This is performed using a specially designed filter. Figure 6b shows the result of this process. The low frequency part is what can be referred to as the mean surface. The high-frequency part clearly shows the presence of surface defects (cracks). Once separated, both frequency parts are then used as an input to the various feature detection algorithms.

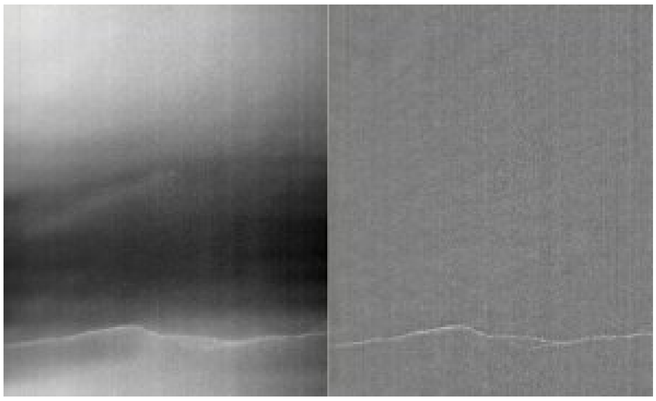


Figure 6: (a) Range (raw) and (b) Range (corrected) images

1.3 Macrotexture

Macrotexture is important for several reasons, for example it can help estimate the tire/road friction level, water runoff and aquaplaning conditions and tire/road noise levels produced just to name these. Macrotexture can be evaluated by applying the ISO 13473 norm. This standard requires the calculation of the mean profile depth (MPD). To calculate the MPD, the profile is divided into small segments and for each segment a linear regression is performed on the data. The MPD is then computed as the difference between the highest point on the profile and the average fitted line for the considered portion. See figure 7 below.

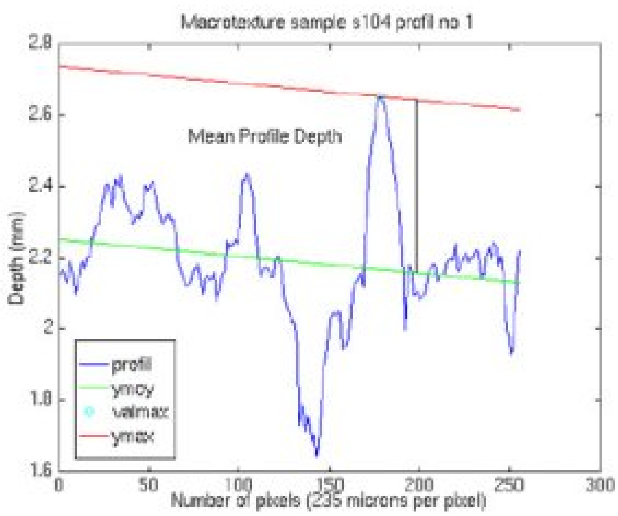


Figure 7 : Macrotexture Analysis Example

1.4 Cracking

Detecting cracks reliably is far more complex than applying a threshold on a range image. As mentioned previously, 3D profile data needs to be detrended due to the effects of rutting and vehicle movements. Macrotexture is also a problem; road surfaces have very variable macrotexture from one section to the next and even from one side of the lane to the other. For example, on roads with low macro texture we can hope to detect very small cracks which will be harder to detect on more highly textured surfaces. It is thus necessary to evaluate and to adapt the thresholding operations based on the macrotexture of the road. Once the thresholding operation is performed, a binary image is obtained where the remaining active pixels are potential cracks. This binary image is then filtered to remove many of the false detections which are caused by asperities in the road surface which are not cracks on the pavement. At this point in the processing, most of the remaining pixels can correctly be identified to existing cracks, however many of these crack segments need to be joined together to avoid multiple detections of the same crack.

2 MTQ PROTOCOL

After the detection process, the next step consists in the characterization of the cracks. This was done using the MTQ protocol. With this protocol, severity level of a crack is determined by evaluating its width (opening). For a single continuous crack, the severity is evaluated every 5 cm. In order to facilitate the interpretation of the detection results, the cracks are classified into three categories as shown in the table below:

Table 2 : Cracks Categories

Severity level	**Width**
Weak	Less than 5mm
Medium	Between 5mm and 20mm
Severe	More than 20mm

The cracks were also grouped into two main categories: longitudinal and transverse cracks. A transverse crack is defined as a crack which has a skew angle of less than 20 degrees. Furthermore, transverse cracks are further divided into complete and incomplete types. A complete transverse crack covers more than 75% of the pavement width. An incomplete transverse crack covers between 25% and 75% of the road lane. Any crack which is less than 25% of the road width is not considered as a transverse crack. Finally, the transverse cracks are graded as weak, medium or severe depending on its maximum severity (width) which composes at least 25% of the transverse crack. The definition of a longitudinal crack is simply a crack that has not been classified as a transverse crack. However, longitudinal cracks are further refined into three subcategories: simple, multiple and alligator.

3 RESULTS

During the summer campaign of 2007 the LCMS system was used by the MTQ to survey 10,000 km of its road network. In order to validate the system, an independent 3rd party under the supervision of the MTQ was mandated to manually qualify the crack detection results of LCMS system over the entire survey. To do this each 10m section was visually analyzed and the results were categorized in 3 classes (good, average and bad). A forth class (NA) was used when, for what ever reason, it was not possible to correctly evaluate a section. Figure 8 shows three examples of good, average and bad crack detection results on a 10m pavement section. Transverse cracks are identified with a bounding box. Regions with a red cross indicate the presence of alligator cracking. Regions with a yellow cross indicate regions with multiple cracks. Green, yellow and red cracks represent weak, medium and severe crack severities respectively. Table 3 shows the results of the compilation of the manual evaluation. The final results are deemed excellent as the overall 'Good' rating reaches 96.5%.

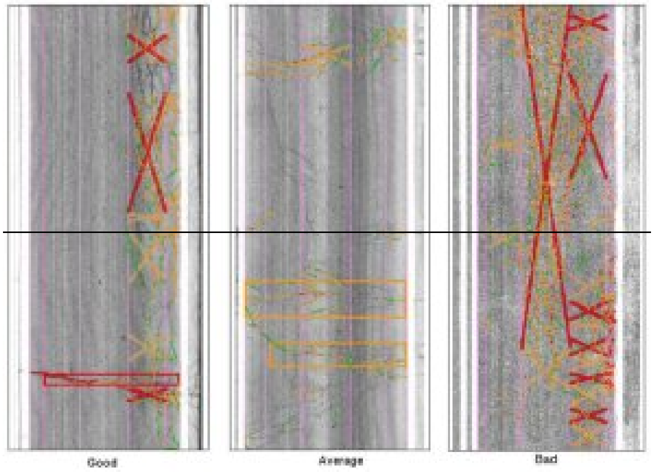


Figure 8: Three crack detection results (Examples of good, average and bad results)

Table 3: 10,000 km survey results

		Results (manual classification)							
		Number of images (10m sections)				Proportion (%)			
District #	**Total (10 m sections)**	**Good**	**Average**	**Bad**	**NA**	**Good**	**Average**	**Bad**	**NA**
84	35288	34144	310	144	690	96,8	0,9	0,4	2,0
85	4243	4101	53	51	38	96,7	1,2	1,2	0,9
86	147903	144040	516	1520	1827	97,4	0,3	1,0	1,2
87	149926	138453	1170	5728	4575	92,3	0,8	3,8	3,1
88	189097	183010	1064	2002	3021	96,8	0,6	1,1	1,6
89	125003	121835	442	2015	711	97,5	0,4	1,6	0,6
90	123653	116930	2980	2434	1309	94,6	2,4	2,0	1,1
91 &92	215513	213142	197	956	1218	98,9	0,1	0,4	0,6
Total	**990626**	**955655**	**6732**	**14850**	**13389**	**96,5**	**0,7**	**1,5**	**1,4**

A second evaluation test was performed on 770 km of the MTQ road network using 77 000 images of 10m sections acquired by the LCMS system that were compared to images of the same sections measured by a video camera. This time, a more detailed analysis was done to evaluate the capacity of the LCMS to detect and correctly classify the following road surface characteristics: longitudinal cracks, transverse cracks, incomplete transverse cracks, patches and potholes). Again, each 10m section was visual analyzed and the detection results were classified as follows: much less (missing 2 or more cracks), less (missing 1 crack), good, more (1 or more false detections). Table 4 summarizes these results. Overall, the results are very good except for what might be expected for the detection of the transverse cracks. The table indicates that a large number of transverse cracks were missed (33.4%). However, most of these missing cracks were complete transverse cracks that were detected as incomplete transverse cracks (80%). Also, since these tests were done, the acquisition rate of the LCMS sensors has been multiplied by 4, the performance of the new sensors is expected to greatly increase the detection rate of the transverse cracks.

Table 4: 770 km detailed survey results

Defect type	Results (manual classification of 77,000 images) Proportion (%)			
	Much Less	Less	Good	More
Longitudinal cracks	1.1	1.9	95.5	1.6
Transverse cracks	6.5	26.9	63.2	3.4
Patches	6.5	18.2	74.0	1.5
Potholes	0.5	7.5	89.6	2.5

4 CONCLUSION

We have presented a system that is based on two high performance transverse 3D laser profilers that are placed at the rear of an inspection vehicle looking down in such a way as to scan the entire 4m width of the road surface. This configuration allows the system to directly measure many different types of surface defects by simultaneously acquiring high resolution 3D and intensity data. Examples of different algorithms and results were shown using the 3D data to detect cracks while the intensity data is used for the detection of lane markings.

The LCMS system was tested at the network level (10000 km) to evaluate the system's performance at the task of automatic detection and classification of cracks. The system was evaluated to be over 95% correct in the general classification of cracks when the 3D crack data was visually present in the images.

The LCMS system was also compared to 770 km of detailed manual video analysis techniques and the system performance was measured to be: 95% accurate for the detection of longitudinal cracks, and 63% accurate for the detection of transverse cracks with a majority (80%) of the missing transverse cracks being partially detected as incomplete transverse cracks.

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(06 January 2011 / World Highways eNewsletter 13 January 2011)

Sprayed waterproofing: 'hot topic'

Sprayed waterproofing is a hot industry topic, and a paper presented at the recent North American Tunnelling Conference not only discussed this method for achieving a dry tunnel but also how it can reduce build costs and construction time.

In traditional SCL-SEM-NATM [Sprayed Concrete Lining-Sequential Excavation Method-New Austrian Tunnelling Method] tunnel construction, regardless of the thickness of concrete sprayed to form the primary lining, from a structural perspective this concrete is ignored, says Stirling Lloyd.

According to the company, the full structural load is supported by the final or secondary lining. A sheet membrane is then tacked to various points of the primary concrete but it is not fully bonded. This compromises the choice for the final lining as it is exceptionally difficult to get sprayed concrete to bond to a sheet membrane system: the sprayed concrete tends to rebound off the membrane surface. This effect can be reduced by the use of lattice girders and reinforcing steel mesh to help support the sprayed concrete during application.

However, this tends to have a detrimental effect on the quality of the final lining as achieving adequate compaction of sprayed concrete through a network of steel reinforcement is difficult, resulting in voids and failure to passivate the steel against corrosion from ground water when it is not adequately encapsulated.

As a consequence the construction method currently favoured for final linings tends to be traditionally reinforced cast in-situ concrete. This is much slower than spraying concrete, claims Stirling Lloyd.

Spray applied waterproofing, such as Stirling Lloyd's Integritank HF membrane, means the final lining can be permanent sprayed concrete instead of cast in-situ concrete

"The great design benefit of spray applied waterproofing, such as Stirling Lloyd's Integritank HF membrane, is that the final lining can be permanent sprayed concrete instead of cast in-situ concrete.

With no requirement for fibre reinforcement, traditional lattice girders and rebars, build speed is increased and cost reduced."

Colin Eddie from Morgan Sindall Underground Professional Services takes the view that, depending on the design of the tunnel, cost savings of up to 50% are achievable with a sprayed solution, when considering the waterproofing and final lining taken together.

The most significant advance that a fully bonded sprayed membrane offers is the composite effect, between the primary and secondary sprayed concrete layers, says Stirling Lloyd.

In construction which includes sprayed waterproofing, the primary and secondary concrete layers are both fully and intimately bonded to the membrane. Consequently, unlike when using sheet systems, both the concrete layers are acting together and therefore both the primary and seconddary linings contribute to the load bearing capability of the tunnel.

"Research carried out by Morgan Sindall, both in its Underground Professional Services division at Rugby, England and supported by further work at Warwick University to test this theory have shown that two concentric rings of sprayed concrete, bonded together by Stirling Lloyd's Integritank HF tunnel waterproofing membrane, behave in the same way as a monolithic ring of the same dimensions,"says Stirling Lloyd.

"While earlier work had suggested that a mechanical key between the concentric rings is required by way of an uneven interface, the Warwick University work shows that this is not the case, and even with a smooth interface the full effect is achieved."

(06 January 2011 / World Highways eNewsletter 13 January 2011)

Καταστροφικές οι πλημμύρες στην Αυστραλία

Ο προσωρινός αριθμός των νεκρών από τις πλημμύρες στο βορειοανατολικό τμήμα της Αυστραλίας έφτασε σήμερα τους δέκα, ενώ έχουν καταγραφεί και 78 αγνοούμενοι καθώς τα ορμητικά νερά ανάγκασαν χιλιάδες πολίτες της τρίτης μεγαλύτερης πόλης της χώρας, του Μπρισμπέιν, να εγκαταλείψουν τις εστίες τους.

Οι τεράστιες ποσότητες των υδάτων που διασχίζουν με μεγάλη ταχύτητα πολλές κοινότητες στο δυτικό τμήμα του Μπρισμπέιν, της πρωτεύουσας του Κουίνσλαντ προκάλεσαν το θάνατο έξι πολιτών, μεταξύ των οποίων τεσσάρων παιδιών, ανακοινώθηκε από την πρωθυπουργό Τζούλια Γκίλαρντ.

Συνολικά οι πλημμύρες που πλήττουν την Αυστραλία από τα τέλη Νοεμβρίου έχουν προκαλέσει το θάνατο 21 πολιτών αλλά η πρωθυπουργός προειδοποίησε ότι η χώρα θα πρέπει να προετοιμαστεί για έναν αριθμό νεκρών πολύ υψηλότερο.

«Με τόσο επικίνδυνες πλημμύρες που προχωρούν ταχύτατα πρέπει να προετοιμαστούμε για ένα αριθμό νεκρών πολύ πιό μεγάλο. Βλέπουμε τεράστιους όγκους νερού να καταστρέφουν σπίτια και αυτοκίνητα σε δευτερόλεπτα» ανέφερε η μαυροφορεμένη κ. Γκίλαρντ.

Από την πλευρά του ο επικεφαλής της τοπικής αστυνομίας Μπομπ Ατκινσον χαρακτήρισε τις πλημμύρες «χερσαίο τσουνάμι» και δήλωσε ότι οι δυνάμεις του κάνουν ότι μπορούν για να βοηθήσουν τον πληθυσμό που βρίσκεται αντιμέτωπος με τις χειρότερες πλημμύρες των τελευταίων 120 χρόνων.

(Η ΚΑΘΗΜΕΡΙΝΗ, 11 Ιανουαρίου 2011)

Οι πλημμύρες στην Αυστραλία

Δείτε τις διπλές φωτογραφίες,.. Μετακινήστε τον cursor δεξιά-αριστερά, για να δείτε τις διαφορές πριν και μετά τις πλημμύρες !!!

Σελίδα πρώτη:

http://www.abc.net.au/news/infographics/qld-floods/beforeafter.htm

και σελίδα δεύτερη:

http://www.abc.net.au/news/infographics/qld-floods/beforeafter2.htm

(ABC News, 17 January 2011)

Apple Engineer Recreates Antikythera Mechanism with Legos

Andrew Carol, a software engineer in his day job, has successfully recreated the Antikythera Mechanism — an ancient analog computer that was lost for 2,000 years — using Legos.

The Antikythera Mechanism was an analog computer built by the ancient Greeks somewhen between 150-100 BC to calculate celestial events, notably eclipses. It did so using a series of gears to perform the calculations, the kind of technology not attempted again (that we know about) until Charles Babbage began working on his Difference Engine in 1822.

Unfortunately for the world of science, the Mechanism was lost to history when it sunk to the bottom of the sea while being transported by ship. While it’s hard to fathom how the world may have been different had it remained in use, it wasn’t found until 1901. Even then, however, the rusted, sea-claimed device remained a mystery until it was X-rayed and photographed in 2006, a process that lead to researchers being able to reverse engineer its purpose and abilities.

In 2009, according to Fast Company, Andrew Carol decided to take on the Antikythera Mechanism as his next Lego project. A noted Lego buff, Mr. Carol had previously built a functioning Difference Engine, and when he was approached by Nature.com about making a Antikythera Mechanism, he jumped at the chance.

“The Mechanism is interesting to me because people think of these astronomical predictions only being possible with sophisticated NASA computers,” Mr. Carol told the magazine. “But to realize that someone actually built a mechanical machine to do that 2000 years ago is pretty impressive - and figuring out to do it myself in Lego is fascinating too.”

When he set out to recreate the device, he used Lego Technic, a specialized line of blocks and gears (and other stuff) Lego offers to users wanting to do a bit more than make houses and Mammoth Cars out of their Legos. Because he was limited to the gears offered by Lego, his recreation is not a gear-for-gear copy of the original, but rather a series of modules that each performs different calculations that were also performed by the original Greek device.

“My machine uses about 110 gears, and 7 complete differentials, to do most of what the original one did, he said. “But their calendar and ours are completely incompatible, so I also had to add complexity to make the eclipse predictions understandable. My machine has two extra indicators: one for the decade and one for the year. That way, as you turn the crank on the machine, you can read the dials and say ‘OK, a solar eclipse will happen in April of 2024.’”

See the video at http://www.greece.org/blogs/scholars/?p=1043

The movie was shot by filmmaker John Pavlus as part of his article for Fast Company.

(Hellenic Electronic Center, January 17, 2011)

☙ ❧

A Scientific Theory of the WTC 7 Collapse

This year will mark the 10th anniversary of the September 11, 2001 disaster. In these 10 years, not only have extremely important scientific questions about this tragedy gone unanswered, but they have even been ridiculed to the point of deranged absurdity. We owe a valid scientific explanation to the 3000 victims on that day, the steadily dying health-stricken first responders, the dead and wounded soldiers, and the untold thousands upon thousands of dead and injured Afghans and Iraqis resulting from the terrifying never-ending "war on terror". Critics of those skeptical of the official story of 9/11 have often objected that an alternative theory has never been put forth. To that end, this article will put forth a scientific theory for one important aspect of the 9/11 event, the Building 7 collapse.

On September 11, 2001 a third building came down. This building was 7 World Trade Center (WTC 7), a 47-story building about the width and length of a football field. NIST, the National Institute of Standards and Technology, was tasked with officially explaining how WTC 7 fell. Their theory is documented in the report entitled Final Report of the Collapse of Building 7[1]. Many people are under the mistaken impression that NIST's theory of how WTC 7 fell down is a valid scientific theory. In science however, a valid theory must be the simplest theory available that best explains all the available empirical data.[2] This article will show that the NIST theory is a highly convoluted theory that cannot explain important observations.

A major piece of evidence in the WTC 7 collapse is the fact that WTC 7 underwent free-fall acceleration for a period of at least 2.25 seconds.[3] A free-falling building means there is no supporting structure whatsoever below to slow the building's fall. The NIST theory does not explain this astounding fact. However, if their theory is to believed, the 2.25 seconds of free fall must have resulted from near-simultaneous buckling and breaking of the 58 perimeter columns and most of the 25 core columns over eight stories. The only evidence NIST provides to support their theory is in the form of a computer model. While it could possibly be argued that the model does show some buckling occurring over eight stories, it most certainly does not show a period of free-fall. So NIST's theory has absolutely no scientific evidence whatsoever for the fact of free-fall. In other words the NIST theory cannot explain key empirical data.

Another requisite for a scientific theory is that the empirical data the theory is based on must be reproducible by others. Other scientists must be able to perform the exact same experiments and obtain the exact same results. Unfortunately, NIST's only empirical data to explain the eight story buckling, the data their computer model is based on, is unavailable to independent researchers. It is unavailable because NIST refuses to release it. NIST has stated that releasing the data "might jeopardize public safety".[4] So because the NIST model cannot be verified, it is meant to be taken on faith. The NIST model, then, is faith-based, not science-based. Since NIST's theory does not explain fundamental facts of the WTC 7 incident and other important facts are so far unreplicated, we can categorically state that NIST's theory is in no way scientific. At best, it could be referred to as faith-based pseudo-science. Since the NIST theory is in no way scientific, competent conscientious scientists must reject it in favor of a science-based theory.

The best alternative to NIST's WTC 7 theory is the controlled demolition theory. This theory states that additional sources of energy other than fire and gravity were used to bring down WTC 7. The strongest theories contend that these alternate energy sources included explosives and incendiaries. It is common knowledge that shaped charges can cut through steel support columns.[5] If all remaining support columns of WTC 7 were rigged with shaped charges on both sides, on each story for eight stories and were set off in the correct precisely timed manner, they could remove all remaining resisting support for WTC 7 allowing it to free-fall for 2.25 seconds. So unlike the official story, the controlled demolition theory does explain all the observables: the rapid onset of collapse, the largely symmetrical collapse into the building's footprint, the roof line kink causing the building to fall in on itself, minimizing damage to other buildings, the intricate roll to the south at the end of the collapse away from valuable real estate, and the free-fall period.

There definitely are problems with the controlled demolition explosives theories. For instance, although there is some evidence of explosive sounds,[6] in the available audio/visual evidence of the WTC 7 collapse, you don't see the flashes and the loud booms typically seen with explosive controlled demolitions. But the sounds and flashes could be muted by Romex blasting mats,[7] for example. Non-typical technologies could also have been used. Recent experiments by the engineer Jonathan Cole have shown that relatively small amounts of thermate, thermite mixed with sulfur, can cut through vertical support beams like a shaped charge and yet produce much less noise.[8] These experiments also show that thermate can also easily weaken beams and cut bolts. Note that in typical controlled demolitions the building's structure is weakened as much as possible to minimize the amount of high explosive needed. Explosive nano-thermite has also been found in the WTC dust.[9]

So the inescapable and disturbing conclusion is that the most scientific theory available for the WTC 7 collapse is that it was a controlled demolition, brought down with explosives. This conclusion shows without a doubt that a thorough independent scientific investigation into the 9/11 event must be undertaken. Until now, this has not been done. I strongly urge all scientists and scientifically-oriented individuals to support Scientists For 9/11 Truth (http://www.scientistsfor911truth.org/) in calling for an real unbiased scientific investigation of the 9/11 tragedy.

Notes

[1] NIST NCSTAR 1A, Final Report of the Collapse of Building 7 http://wtc.nist.gov/NCSTAR1/PDF/NCSTAR%201A.pdf

[2] Merriam-Webster.com Merriam-Webster Dictionary: Theory in Science http://www.merriam-webster.com/dictionary/occam%27s%20razor

[3] NIST admits freefall of WTC 7 http://www.youtube.com/watch?v=Ii49BaRDp_A

[4] http://911blogger.com/news/2010-07-12/nist-denies-access-wtc-collapse-data

[5] Shaped Charge Explosion Compared to Explosion at WTC http://www.mefeedia.com/watch/30834556

[6] http://www.youtube.com/watch?v=ERhoNYj9_fg

[7] Y. Kasai. The International Union of Testing and Research Laboratories for Materials and Structures. Demolition and reuse of concrete and masonry http://books.google.ca/books?id=Q3wOAAAAQAAJ

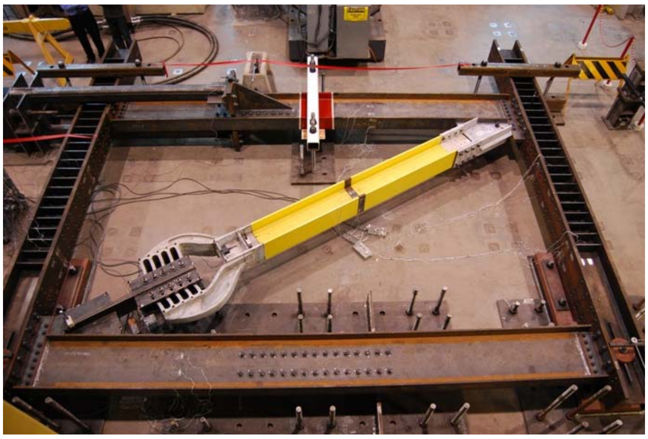
[8] 9/11 Experiments: The Great Thermate Debate http://www.youtube.com/watch?v=5d5iIoCiI8g

[9] Niels H. Harrit, Jeffrey Farrer, Steven E. Jones, Kevin R. Ryan, Frank M. Legge, Daniel Farnsworth, Gregg Roberts, James R. Gourley, Bradley R. Larsen, "Active Thermitic Material Discovered in Dust from the 9/11 World Trade Center Catastrophe," *The Open Chemical Physics Journal*. Volume 2, 2009, pp. 7-31. Available from: http://www.bentham-open.org/pages/content.php?

(Michael Fullerton, Foreign Policy Journal, February 14, 2011 στο ASCE SmartBrief, 14.02.2011)

Scorpion braces buildings for seismic resistance

A new system for making buildings resistant to earthquakes was successfully tested at full scale at the University of Toronto's Civil Engineering Structural Testing Facility last year.



The Scorpion system being tested at University of Toronto last November

Known as the "Scorpion" yielding bracing system (YBS), the system looks like a giant wrench. The prototype tested at U of T was designed for a second storey brace in a fictitious 6-storey office building in an extremely seismically active region, like Vancouver or Los Angeles.

It was laid diagonally across a test building and then subjected to seismic forces of a half-million pounds.

The system was developed over five years under the supervision of Professor Constantine Hristopoulos, Professor Jeffrey Packer and doctoral research student Michael Gray. It is being commercialized by a company called Cast Connex.

(DAILY NEWS, Feb 7, 2011 στο Canadian Consulting Engineer)

Satellite system could provide earlier earthquake warnings

British and Russian scientists are planning a satellite system that will monitor seismic activity from space in the hope of one day predicting the occurrence of earthquakes and volcanic eruptions.

The TwinSat project will put one micro-sized and one nano-sized satellite into low earth orbit some 400km apart, which will work in unison to collect and interpret electromagnetic signatures from the ground.

Geologists have known for some time that as stress builds up in the earth prior to an earthquake, subtle electromagnetic signals are released.

Prior to last year's Haiti earthquake, sensors picked up electromagnetic signals from the area.

However, present methods for collecting and analysing seismic-related electromagnetic emissions are too crude and not sensitive enough to be of any real predictive value, as project researcher Dr Dhiren Kataria of University College London explained.

'The signatures are much too weak and the signal-to-noise level is much worse. Also, to be able to observe it, you need the sensors to be very close to the earthquake site and that is not always possible because most of our ground sensors are at fixed locations.

'On the other hand, when you're up in space the noise is reduced and the spread of the signal is over a much wider region, so you can capture it far easier.'

The team, which comprises researchers from UCL's Mullard Space Science Laboratory and Russia's Institute of Physics of the Earth and International Science and Technology Centre, plan to launch the TwinSat in 2015.

The two linked satellites will then monitor zones with high seismic and volcanic activity, in particular Iceland and the Kamchatka Peninsula in the far east of Russia.

'The key thing that this project could add is a sense of time. You can easily say strain is increasing in an earthquake-prone area, but there's no real indication when the earthquake may go. By measuring an additional parameter it gives you a better chance to do that,' said Prof Peter Sammonds, a geophysicist from UCL who is working on the project.

Currently the best earthquake systems, most of them in Japan, are based on measuring crystal strain in rocks and can give around three minutes of advance warning. In theory, a satellite detection system could offer far better preparation time and be useful for less-developed nations such as Haiti.

'The exciting thing about nano-satellite technology is it's incredibly cheap. To make it really predictive you would have to have many more satellites to create a far larger coverage,' Sammonds said.

Prof Vitaly Chmyrev from the Institute of Physics of the Earth and Prof Alan Smith from UCL will head the project.

(Andrew Czyzewski, The Engineer, 22 February 2011)

Earthquake Early Warning System a Reality in California

What if you could be alerted before the only natural disaster that offers no warning actually hits? Even if the alert came just seconds sooner?

In California's Coachella Valley around Palm Springs, a state-of-the-art, first-in-the-world earthquake early warning system in now installed and operational. Twelve locations are now in place with 120 sites planned, all meant to detect an earthquake and give people a chance to get under a table, or in the case of a fire station, get the engines outside of the building.

A state-of-the-art, first-in-the-world earthquake early warning system in now installed and operational in California.

Created by a Silicon Valley startup, QuakeGuard sensors are designed to detect the initial, or "P" energy waves given off by every quake, even though it's only the later, or "S" waves that do all the damage. The time in-between the two waves varies depending on the proximity to the epicenter and as the first sensor closest to the quake goes off, it can offer advance notice -- from a few seconds to a full minute-- to other locations farther away.

As former seismic safety commissioner Dennis Mileti tells us, "This is the No. 1 line of defense to accomplish the most basic objective in responding to an earthquake ... duck, cover and hold on, and it can motivate people to do that before the ground starts shaking. Every other natural hazard has warnings issued for it, earthquakes don't. This is the way to provide some warning."

The system can also be set to automatically open fire station doors, and water and gas valves for municipalities could be shut off. Back-up generators for hospitals could be turned on and, most importantly, warn school kids to duck and take cover. During a tour of a Palm Springs Fire Station, Tom Kirk from the Coachella Valley Association of Governments, says, "For this fire station, doors roll up; for a school, an alarm might sound, teachers tell the kids to duck and cover; for a hospital, maybe backup generators go on."

If 15 or 20 seconds doesn't seem like much, consider this: During last April's huge Baja, Calif., quake, fire trucks in Calexico were trapped behind jammed fire station garage doors for almost 20 minutes and had to cut their way through the doors before they could deploy and respond to people in trouble. Other stations had pieces fall from the ceiling and damage equipment. With QuakeGuard, this would not have happened because in as little as 15 seconds the doors could be opened and the engines driven outside.

Of the 12 sets of sensors currently set in place throughout the Coachella Valley, all tied to fire stations, they will soon be networked to every school in the area. Down the road, local officials see it linked to hospitals, private businesses and even people's homes. Eventually, the designers would like to see it become like another utility, with alarms installed in every home willing to fork over a minimal monthly "subscription" fee. At this point, it costs between $1 million and $3 million to install such a network throughout a community, and there are four others in various stages: San Diego, the Bay Area, the Antelope Valley and Hawaii.

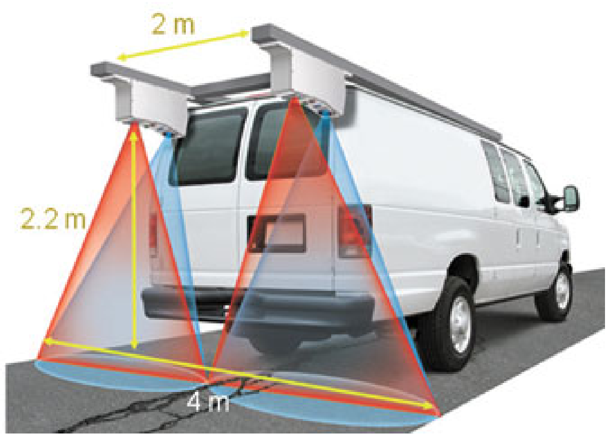
A mobile system is also in development and would be essential for rescue crews that deploy to places like Haiti or Chile when an aftershock hits. A few seconds could get rescuers out from under the rubble and thus out of harm's way. Also, if you think this a California centered story, think again. Major earthquakes have struck throughout the United States, and places like St. Louis and even New York City are in harm's way.

(Adam Housley, FoxNews.com, February 23, 2011 στο ASCE SmartBrief, 24.02.2011)

Truck-mounted laser finds, maps and assesses road condition

A new tool to help engineers make decisions about resurfacing or replacing roads is coming to Ontario this summer.

It's a laser device mounted on a van and capable of finding, mapping and assessing the severity of cracks, ruts and holes in the pavement and colour-coding them accordingly.



PAVEMETRICS SYSTEMS INC.

The system is mounted atop a van, 2.2 metres above the roadway, and consists of two transverse three-dimensional laser profilers that take images up to four metres wide, about the width of a traffic lane.

The tool was developed by the National Optics Institute of Canada (INO) with the co-operation of the Ministère des Transports du Québec (MTQ).

Now the Laser Crack Measurement System, or LCMS, is being commercialized by Pavemetrics Systems Inc., an INO spin-off.

The system will help optimize maintenance, saving money in the long run, says John Laurent, vice-president for business development and chief technical officer.

The system is mounted atop a van, 2.2 metres above the roadway, and consists of two transverse three-dimensional laser profilers that take images up to four metres wide, about the width of a traffic lane.

One pulse, or measurement, is taken every millimetre of travel and sent to a computer inside the van travelling up to 100 km/h. The images are compressed so a kilometre takes up about 723 megabytes of computer memory.

He says there was some skepticism among engineers about the accuracy of the system, but since then the Georgia Institute of Technology has evaluated the system positively.

Montreal engineering giant SNC-Lavalin was the first commercial customer for the laser system, after MTQ. It was followed recently by the Ministry of Transportation Ontario, which plans to use it this summer.

Laurent said pavement management systems contain a mass of data — how and when roads were built, design, life expectancy and maintenance record. "You scan a road once and compare it and to look at how the road evolves over time. So if you have, say, a 15 mm rut on one road and you see that the rut hasn't moved in the last five years, well, probably you don't need to do anything.

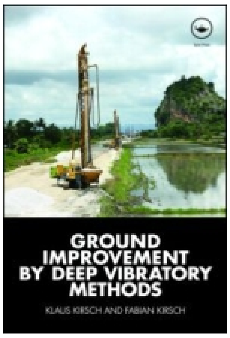
"But if you have no ruts one year, 5 mm ruts the second year and 15mm ruts the third year, probably by the fourth year you're going to have big holes in the road.

It's not only engineers who are interested in the data.

"In Quebec," Laurent said, road owners "were able to use these (road) models to convince politicians to give them more money for road maintenance in the short term because it would save them a lot more in the medium and long term."

(Korky Koroluk, Correspondent, Quebec, Daily Commercial News, 24 February 2011 στο ASCE Smartbrief, 25 February 2011)

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



Ground Improvement by Deep Vibratory Methods

Klaus Kirsch & Fabian Kirsch

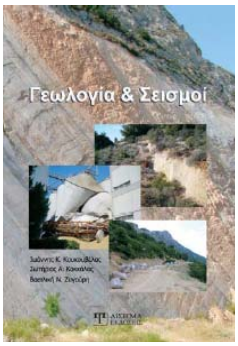
Vibro compaction and vibro stone columns are the two dynamic methods of soil improvement most commonly used worldwide. These methods have been developed over seventy years and are now in a position of unrivalled importance amongst modern foundation measures. The first works on granular soil by densification, and the second is used to displace and reinforce fine grained and cohesive soils by introducing inert material.

This practical guide for professional geotechnical engineers outlines the development of vibratory deep compaction, describes the equipment used, sets out the methods and techniques and provides state of the art design principles and quality control procedures. It also identifies the practical limitations of the methods. Case studies from South East Asia and the Middle East are used to illustrate the methods and to demonstrate how they apply in real world conditions. The book concludes with some variations of the basic methods, evaluates the economic and environmental benefits of the methods and gives contractual guidance.

Contents

- Ground improvement methods
- History of vibratory deep compaction
- Deep soil improvement by vibratory methods
- Compaction of granular soils
- Improvement of fine grained and cohesive soils by vibro replacement stone columns
- Method variations and related processes
- Environmental considerations
- Contractual implications

(Spon Press, 07.06.2010)



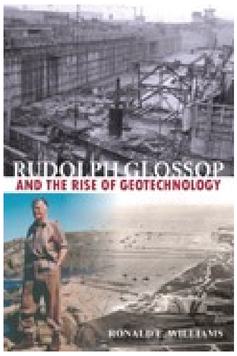
ΓΕΩΛΟΓΙΑ ΚΑΙ ΣΕΙΣΜΟΙ

Ι. Κουκουβέλας, Σ. Κοκκάλας και Β. Ζυγούρη

Ο σεισμός είναι ένα φυσικό καταστροφικό φαινόμενο συχνό στον ελληνικό χώρο, το οποίο οι γεωεπιστήμονες καλούνται να αντιμετωπίσουν. Το πρόβλημα της αντιμετώπισης των σεισμών έχει πολλές συνιστώσες και αφορά την ανθρώπινη ζωή, το δομημένο περιβάλλον και την πολιτιστική κληρονομιά.

Ο στόχος του βιβλίου είναι η ανάδειξη της σημασίας της γεωλογίας στην κατανόηση διεργασιών που θεωρείται ότι σχετίζονται με γεωγικές ανακατατάξεις στο εσωτερικό και έχουν επιπτώσεις στην επιφάνεια της Γης στη διάρκεια των σεισμών.

(Εκδόσεις ΔΙΣΙΓΜΑ, 05.01.2011)



Rudolph Glossop and the Rise of Geotechnology

Ronald E. Williams

A personal account of the role played by Rudolph Glossop, one of the founders of geotechnical engineering in the UK

Based upon previously unpublished personal journals, diaries and letters including correspondence with Bjerrum, Skempton and Terzaghi

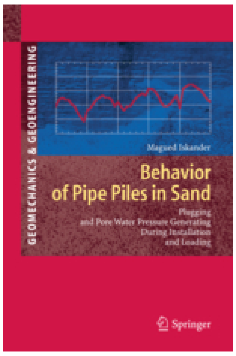
Rudolph Glossop made a unique contribution to the early development of both geotechnical engineering and engineering geology and this volume presents a fascinating and revealing perspective on his involvement by means of selected extracts from personal diaries, letters and journals. From his early experience as an undergraduate and the four years spent in the Gold Coast to the establishment of Soil Mechanics Ltd and his time as director of Mowlems, Glossop became one of the key figures and was involved in many of the key stages in the development of geotechnology. His journal provides a fuller understanding of the Mulberry Harbour, which was a key factor in the success of the D-Day landings in northern France, June 1944; while his diaries give a unique account of the significant challenges that had to be overcome during construction of Derwent Dam, N.E. England.

The famous Skempton, in his obituary of Glossop, refers to "works of original scholarship, written with the clarity and style of which Glossop was a master … by his own example and by the example of others, he never lost sight of the importance of bringing together the practical and academic aspects of both geology and soil mechanics."

Ron Williams has painstakingly pieced together a fascinating account of the life and career of an outstanding engineer, and in the process has painted a vivid portrait of Rudolph Glossop and his achievements. Not before time will today's engineers and scientists have the opportunity to appreciate the achievements of one of the key figures in geotechnical engineering.

Contents: Selected Journals (Royal School of Mines, Introduction to civil engineering, The Gold Coast, The Second World War); Later Journals (Louis Leakey: A portrait, The Norwegian Geotechnical Institute 1955, Highways in Persia 1955–58, North America 1958); **Selected Diaries and Letters; Selected Writings** (The development of geotechnology, Geotechnology and Géotechnique, Engineering geology and Soil Mechanics, The Quarterly Journal of Engineering Geology, **The Influence of Karl Terzaghi** (The John Mowlem – Siemens Schuckert Partnership, From Theory to Practice in Soil Mechanics. book review, Karl Terzaghi: A personal tribute, The place of site investigation in foundation engineering, The influence of Terzaghi on civil engineering practice in England); **Technical Papers: The Early Years** (The construction of pavements on a clay foundation soil, Particle-size in silts and sands, Soil drainage with particular reference to road engineering, Soil stability problems in road engineering); Bibliography; refer--ences.

(Whittles Publishing UK, 2011)



Behavior of Pipe Piles in Sand

Plugging & Pore-Water Pressure Generation During Installation and Loading

Springer Series in Geomechanics and Geoengineering

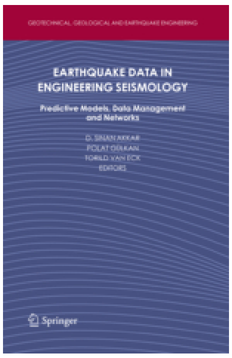
Iskander Magued

One of the major difficulties in predicting the capacity of pipe piles in sand has resulted from a lack of understanding of the physical processes that control the behavior of piles during installation and loading.

This monograph presents a detailed blue print for developing experimental facilities necessary to identify these processes. These facilities include a unique instrumented double-walled pipe-pile that is used to delineate the frictional stresses acting against the external and internal surfaces of the pile. The pile is fitted with miniature pore-pressure transducers to monitor the generation of pore water pressure during installation and loading. A fast automatic laboratory pile hammer capable of representing the phenomena that occur during pile driving was also developed and used. Finally, a pressure chamber; feedback control system; data acquisition system; loading frame; sand handling, pluviating, saturating, and drying apparatus have been integrated to allow convenient load testing of piles under simulated field conditions. The experimental apparatus is presented with sufficient details to allow readers to duplicate or modify the design to suit their own needs.

A number of load tests were carried out to identify the effects of inertia and build-up of pore water pressure on pile plugging. Continuous measurement of dynamic and static excess pore pressures, frictional and end bearing stresses, and the elevation of the soil inside the pile during installation and loading are presented. The results of the testing program validates the performance of the developed apparatus, and provide unique insights into soil-structure interaction during pile driving and subsequent loading. The work contributes to a better understanding of pile behavior.

(Springer, 2011)



Earthquake Data in Engineering Seismology

Predictive Models, Data Management and Networks

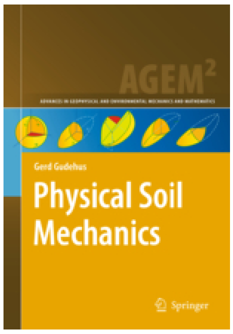
Geotechnical, Geological and Earthquake Engineering, Vol. 14

Akkar, S., Gülkan, P. & van Eck, T. (Eds.)

This book addresses current activities in strong-motion networks around the globe, covering issues related to designing, maintaining and disseminating information from these arrays. The book is divided into three principal sections. The first section includes recent developments in regional and global ground-motion predictive models.

It presents discussions on the similarities and differences of ground motion estimations from these models and their application to design spectra as well as other novel procedures for predicting engineering parameters in seismic regions with sparse data. The second section introduces topics about the particular methodologies being implemented in the recently established global and regional strong-motion databanks in Europe to maintain and disseminate the archived accelerometric data. The final section describes major strong-motion arrays around the world and their historical developments. The last three chapters of this section introduce projects carried out within the context of arrays deployed for seismic risk studies in metropolitan areas.

(Springer, 2011)



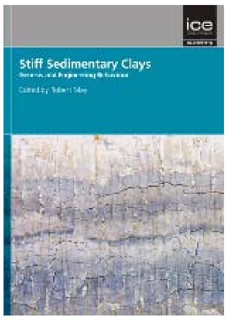
Physical Soil Mechanics

Series: Advances in Geophysical and Environmental Mechanics and Mathematics

Gudehus, Gerd

Soil is matter in its own right. Its nature can be captured by means of monotonous, cyclic and strange attractors. Thus material properties are defined by the asymptotic response of sand- and clay-like samples to imposed deformations and stresses. This serves to validate and calibrate elastoplastic and hypoplastic relations with comparative plots. Extensions capture thermal and seismic activations, limitations occur due to localizations and skeleton decay. Attractors in the large characterize boundary value problems from model tests via geotechnical operations up to tectonic evolutions. Validations of hypoplastic calculations are shown with many examples, possible further applications are indicated in detail. This approach is energetically justified and limited by critical points where the otherwise legitimate continuity gets lost by localization and decay. You will be fascinated by the fourth element although or just as it is so manifold.

(Springer, 2011)



Stiff Sedimentary Clays: Genesis and engineering behaviour

Edited by Robert May Atkins

Many major cities are built on stiff sedimentary clays and the increasing demands for large earthworks, major foundations, deep excavations and tunnels, often in close proximity with each other, stretches our scientific understanding and engineering skills to their limits.

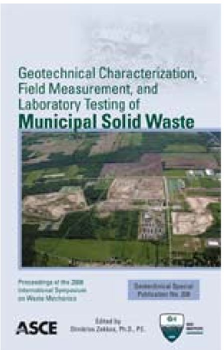
The fourteenth Géotechnique Symposium in Print, returned to geo-materials, focusing on the genesis and engineering behaviour of stiff sedimentary clays and was divided into four sessions – Formation and engineering geology of stiff clays; Laboratory and in situ techniques and their interpretation; Engineering characterisation of stiff clay formations and material models; and Engineering in stiff clays.

This book includes all the related papers, by leading international researchers, published in Géotechnique along with keynote speeches, informal discussions on key submissions that were presented at the Symposium at the Institution of Civil Engineers on 14 May 2007 and additional papers, published in Géotechnique between 2000 and 2006, which add further insights on the major topics of the Symposium.

Contents

- Preface
- Keynote Speeches
- Session 1: Formation and Engineering Geology of Stiff Clays
- Session 2: Laboratory & In Situ Techniques and their Interpretation
- Session 3: Engineering Characterisation of Stiff Clay Formations & Material Models
- Session 4: Engineering in Stiff Clays
- Related papers from Geotechnique

(ICE Publishing, 24.02.2011)



Geotechnical Characterization, Field Measurement, and Laboratory Testing of Municipal Solid Waste

Edited by Dimitrios Zekkos

Geotechnical Special Publications (GSP) 209

Developed from papers and discussions presented at the International Symposium on Waste Mechanics, held in New Orleans, Louisiana, March 11-13, 2008. Sponsored by the Geo-Institute of ASCE.

Geotechnical Special Publication No. 209 integrates current knowledge of the properties of municipal solid waste and the challenges it presents with adequate guidance for researchers and practitioners who work directly with issues related to waste behavior. This collection broadens understanding of waste mechanics and improves waste disposal practices both domestically and internationally. The first section is a review of the state of the art in some of the most critical properties of municipal solid waste. The next group of papers attempts to reach some consensus or provide some minimum requirements or recommended procedures for waste characterization. The collection include five opinion papers submitted by the invited panelists from the United Kingdom, Brazil, Canada, Japan, and the United States.

This volume will be valuable to researchers and practicing engineers in the field of waste mechanics.

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

www.geoengineer.org

Κυκλοφόρησαν τα Τεύχη #73 και #74 του Newsletter του Geoengineer.org (Ιανουάριος και Φεβρουάριος 2011) με πολλές χρήσιμες πληροφορίες για όλα τα θέματα της γεωτεχνικής μηχανικής. Υπενθυμίζεται ότι το Newsletter εκδίδεται από τον συνάδελφο και μέλος της ΕΕΕΕΓΜ Δημήτρη Ζέκκο (secretariat@geoengineer.org).

INTERNATIONAL TUNNELLING AND UNDERGROUND SPACE ASSOCIATION
ita@news n°38
http://ita-aites.org/index.php?id=814&no_cache=1

Κυκλοφόρησε το Τεύχος No. 38 – Φεβρουάριος 2011 των ita@news της International Tunnelling Association.

www.piarc.org

http://www.piarc.org/library/aipcr/6/3174,Newsletter23-EN-December2010.pdf

Κυκλοφόρησε το Τεύχος No. 39 (Φεβρουάριος 2011) του Newsletter της World Road Association (PIARC) και το Τεύχος No. 23 (Δεκέμβριος 2010) του Newsletter των PIARC National Committees.

http://www.itacet.org/Newsletter/01_2011/newsletter_1_2011.php

Κυκλοφόρησε το Τεύχος No. 6 (Φεβρουάριος 2011) του ITACET Foundation.

ΕΕΕΕΓΜ
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