Clay Research Group Bulletin

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The Clay Research Group

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Climate Change

Much of the work we do is directed at resolving the problems associated with Climate Change. Professor Powrie and his team at Southampton have a climate model that suggests, in fifty years time, every summer day will replicate the conditions we see now in event years, and this aligns with most of the current models.

The **BETWIXT** climate data set for Heathrow suggests the Soil Moisture Deficit will increase by around 50mm over the next 100 years.

Our research into ground treatment will be very relevant. The larger and more aggressive species – Oaks, Willows and Poplars included – can tolerate stress far more than the low risk species like Beech, Alder and Sycamore. We need a strategy in place.

ASTON UNIVERSITY

This is going to be a showcase for the work of The Clay Research Group and we hope everyone will be coming along to see what we are getting up to, and the relevance of the work we have planned.

Test the models, view the research. It is scheduled for the 15th June 2006 and to book a seat (last year we were over-subscribed), phone Helen Mallinson 0121 204 3593 or Claire Wallis 0121 204 3624.

It offers good value and attracts speakers from the industry.

Web Site

We had 400 hits on the web site in December and we are top of the Google search for 'electrokinesis' amazingly. The fact that one of the queries related to muscle shock mustn't dampen our enthusiasm!

The site has been well received, and we hope to keep it current as news breaks.

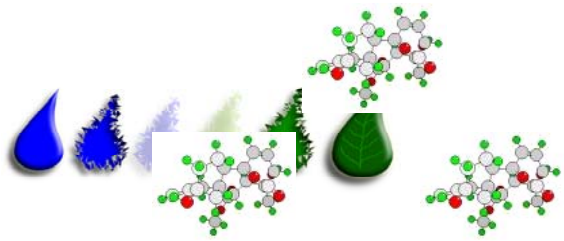
ABA Receptor Found

Razem et al (2006), working in the Department of Plant Sciences in Canada, reports locating the ABA receptor gene. The molecular mechanism for triggering action when this important phytohormone is released.

This gene encodes the RNA response and involves the FCA protein. The paper reports "FCA is a nuclear-RNA binding protein". In simple terms, it is the conduit, to make things happen.

This is good news and it does support the research we are undertaking. The interesting thing is, the world is looking at tackling the problem for different reasons, and we will know a lot more in a few years time.

It seems very likely looking at the work being published over the last 12 months that the Erecta gene will be the DNA codon that mediates the response of vegetation to stress.



The paper concludes that FCA is not required for stomatal response and clearly the whole area of receptors is complex.

Don't worry, we aren't thinking of getting involved in genetic manipulation. No such thing. We are just trying to get the trees to self-medicate.

Soil Treatment

We all agree that treating the ground to solve the problem quickly, and retaining the tree, might be a good idea. Particularly if it shortens the life of the claim – safely and economically.

One aspect of our research involves reducing the hydraulic conductivity (HC) of the soil whilst moving water to where it is needed to rehydrate the ground.

Reducing the HC simulates drought conditions, making the tree work harder. This in turn sets in place an internal, self-protection mechanism within the tree.

Fortunately - or so we hope, and this is the purpose of the research – the net influence is a reduction in transpiration. We are aiming for a 10% reduction, whilst retaining cell turgor. Putting it another way, we would like to leave the trees in place wherever possible.

Plant physiologists tell us that trees don't need to drink as much water as they do to stay healthy. They uses water to 'keep the pump circulating'.

If it isn't possible to keep the tree, we could at least get on and repair the property, buying some time to negotiate tree removal.

Ground treatment is estimated to take one day, and could be carried out at the same time as the initial investigations once the system has been validated.

The major benefit – if we are correct – is the treatment is permanent.

Cavitation

The problem with measuring high negative pressures when we are dealing with suctions is cavitation. The introduction of air into the system.

This is why it is sometimes difficult to measure negative porewater pressure in clay samples, but interestingly it also happens in the xylem of the tree where very thin columns of water are being sucked to relatively great heights, involving huge suctions.

The columns of water recover over night, and the tree produces a clicking noise when cavitation occurs, which is another way of recording plant stress.

Help!!

We urgently need to find a mature tree, on London Clay, with sufficient ground surrounding it to image the root zone. Can anyone help?

A park tree would be ideal of course, as claims tend to be restricted in terms of access and imaging the entire root zone safely, without trespassing on neighbouring land.

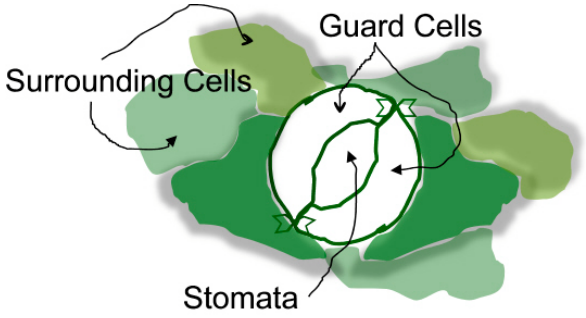
If you do know of a possible site, can you E-mail us at ael@blueyonder.co.uk, or go to our web site and complete the enquiry form.

Stomatal Monitoring

They open and close, and our preferred choice, if we could influence the tree, would be to have them close as much as possible to reduce transpiration.

As with any research we are going to have to monitor every stage of every cycle to detect change. Otherwise we risk recording something happening, but not knowing the cause. The simple act of measuring – introducing shadow, lowering temperature locally – could produce anomalous results.

At the moment we are exploring how to record stomatal activity, and ideally this would be some form of David Attenborough'esque magnifying lens fitted to a recording device taking time lapse images, every hour, every day.



We could then detect the diurnal cycle, and look for change on treatment of the ground.

Add the ERT imagery, and for the first time we would have a complete picture of the benefit or otherwise of ground remediation.