Soils Alive!

(& Productive...)

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• Microbial Ecologist are consumed by things that are $1/1000^{th}$ mm & hidden!

• Microbes evolve within planetary time frames

• First oxygenated our atmosphere and started life as we know it.

• If removed, all other life would cease to exist!
• 5 x 10^{30} bacteria on Earth (5 nonillion!)

• 10^{20} stars in the known universe

• 1g of soil harbours around 10,000 different species, ca. 10 million species globally.

• Your body has 10x more bacterial cells than human cells!
- Cycle most major nutrients required for plant growth & productivity
- Intimately associated with plant growth, productivity and disease suppression
- Produce and consume most types of major greenhouse gases, e.g. CO₂, methane and nitrous oxide
- Purify the environment through degradation of pollutants
Plants won’t grow in sterile soil and microbes need vegetation to prosper.

Whilst we have a good handle on the ‘visual’ aboveground and how to manipulate it…..

we know a lot less about what is ‘hidden’ belowground.

This is a major challenge for 2050

‘Predictive belowground understanding’
In 2001 a monumental event happened which changed the face of biology.

DNA sequencing was becoming the key to understand how complex biological systems worked.
Environmental DNA sequencing reveals the ‘hidden’ microbes by decoding the environmental genome in the same way we decoded humans.

Microbial Diversity is;

- NOT randomly distributed

- CAN be modified by environmental use and Edaphic factors
The Orkney & Shetland microbial diversity has been modified and diverged based purely on land usage.

“When we farm, we actually farm microbes as well, don’t we?”

Acidobacteria

Alphaproteobacteria

When we modify land, we modify microbes into different patterns, despite their huge diversity.
There are ‘Ecological’ Rules that microbes seem to be adhering to
The rules may also be ‘Global’

Either way, we now have a basis for monitoring and prediction
< 10$ DNA Sample Analysis
c.f. >100$ per sample in 2009
Citizen Science Opportunities

Unearth WA’s Hidden Diversity

Already have several thousand samples being taken in 2013 and we haven’t officially launched yet!
Benefits of DNA Citizen Science

- Substantial web based learning opportunities for schoolkids & Adults
- Common ‘Crowd’ ownership of knowledge generation
- Increases SoilREF with minimal staff costs
- Input into the ‘Greater Good’
- Understand the mechanisms at wide scales
Tomorrow’s DNA scientist’s are only a button press away!

Minister John Day
Lyn Beazley & WAFP Panel
Michele Clement
John Berry
Ashley Talbot
Ros Dilworth

Professor Robyn Owens
Professor Tony O’Donnell
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Professor Dan Murphy
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