

# Down-to-earth fix for the carbon crisis

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THERE might just be a dirt cheap solution to global warming – dirt itself. Contrary to expectations, the amount of carbon locked away in the world's soils appears to have been increasing for at least 6000 years. If a way could be found to squirrel away even more carbon, it might solve the problem of what to do with the carbon released into the atmosphere as greenhouse gases.

Soil is the second-largest reservoir of carbon compounds on the planet, exceeded only by the oceans. However, the dynamics of how carbon enters and leaves the soil, and how long it stays there once it's locked up by growing plants and microbes, has been difficult to study. Most of the little research so far has focused on the short-term carbon cycling going on in forests or farmland over a period of years or decades.

Now a new study by Rien

Smittenberg of the Royal Netherlands Institute for Sea Research and his colleagues has examined the stability of carbon in soils over millennia.

The team looked at the build-up of soil washed into the sea by rivers in the Canadian Arctic. In the anoxic waters of a fjord called Saanich Inlet, the sediments form distinctive layered beds, with a layer of dark soil laid down in the fall and winter, followed by a whitish layer deposited each spring and summer because of calcifying algae that add carbonates and silicates to the mix, Smittenberg says.

That makes annual layers as easy to count as tree rings, Smittenberg told *New Scientist*, and bits of wood incorporated in the layers can be carbon-dated to verify the layers' ages. Land soil is almost impossible to date this way because it is moved and reprocessed by living organisms, which do not survive in the



Just bury it

oxygen-deprived inlet sediments.

The layers revealed that carbon has been building up in the soil over the past 6000 years. While most climate models assume the carbon remains in equilibrium, constantly absorbed from the air by growing plants and then given off again as the plants decompose, the new work suggests these models might need adjusting.

It also suggests that changing agricultural practices to increase

the rate at which the soil absorbs carbon could help offset what is released into the atmosphere from burning fossil fuels, an idea proposed by physicist Freeman Dyson of the Institute for Advanced Study in Princeton, New Jersey. The process would take a long time to spread enough to make a difference, Smittenberg admits. "It's definitely not a silver bullet," he says, "but it's definitely worth doing." ●

# Just a few genes can keep species apart

EVOLUTION is a complex beast, but it can operate in breathtakingly simple ways. Just a single pair of incompatible genes can help prevent closely related species from hybridising, experiments on a pair of fruit fly species have revealed.

Geneticist Daniel Barbash and colleagues at Cornell University in New York studied *Drosophila melanogaster* and *Drosophila simulans*, two species that although related are unable to fully hybridise. Male offspring produced by female *D. melanogaster* and male *D. simulans* die before hatching, and this barrier

to genetic interchange helps keep the two species distinct.

By manipulating variants of different genes in each species, the researchers found that hybrid males die only if they carry fully functioning copies of two genes, one called *Lhr* from *D. simulans*, and the other *Hmr* from *D. melanogaster* (*Science*, vol 314, p 1292). Many biologists had thought that species were separated by the gradual accumulation of many small genetic differences, but Barbash's experiments are the first to suggest that the mechanism can be much

simpler. "In at least some cases, evolutionary divergence is not a consequence of many dozens or hundreds of genes of very small effect," he says.

The researchers also found that both *Lhr* and *Hmr* have changed more rapidly than one would expect by chance alone since *D. melanogaster* and *D. simulans* split into separate species. This suggests that natural selection operating on the genes' normal functions has played a role in their divergence. The higher than usual number of changes that this produced has increased the chances

"Manipulating the two species showed that hybrids die only if they have fully functioning copies of two particular genes"

of stumbling on a mutation that happened to be lethal to hybrids, Barbash says.

The species barrier may not be quite so simple, however. For one thing, when the researchers combined the two genes in non-hybrid *D. melanogaster*, male offspring developed normally. This implies that some other feature of the hybrid genome also plays a role in separating the species. In other words, the gene pair is necessary, but not sufficient, to create the barrier.

Moreover, *D. melanogaster* and *D. simulans* are fairly distinct genetically – about as different as humans are from macaques. More similar species may not have diverged enough to develop genes with such large effects on hybrids, says Chung-I Wu, an evolutionary geneticist at the University of Chicago. Bob Holmes ●