Editor: Kevin O'Sullivan
kosullivan@irishtimes.com
@kosullivanIT

Secrets of Mount Etna may yield ways to tackle carbon pollution

Artist Siobhán McDonald and scientists from TCD have been studying the volcano's chemical makeup in the hope of unlocking its potential to combat pollution

Sue Rainsford

With some 200 eruptive episodes to date, Mount Etna is Europe's most active volcano. It also holds the record for the longest continuous eruption. The paroxysms that commenced during its most recent episode have yet to fully cease; an eruption is technically ongoing.

Last June the artist Siobhán McDonald travelled to Catania, Sicily, to study Mount Etna's pulsing, volatile terrain, hoping to unlock the potential of its chemical makeup. Namely, that the ash clouds above Mount Etna might enable us to counter the damage caused by our planet-warming carbon emissions.

McDonald travelled with three scientists from Trinity College Dublin: Prof Jenny McElwain, chair of botany at the School of Natural Sciences, with whom McDonald has been collaborating; Laurence Gill, a professor in environmental engineering in the School of Engineering; and Prof Balz Kamber, chair of geology and mineralogy.

McDonald is a visual artist working in painting, drawing, film and sound. Concerned primarily with elusive knowledge that continues to evade scientific inquiry, her works explores the origins of life on this planet and the information held within plant life.

As such, her practice occasionally entwines with science and its endeavours, and earlier last year McDonald was awarded the Trinity Creative Project on the basis of *Future Breath*, a series of inquiries into breath as our point of overlap with nature and the insidious detriment pollution weaves through our bodies and the ecosystem.

In breath, the reverberations of man-made toxicity are readily discernible: the interface between our bodies and our environment is rich in contaminants that wreak cellular damage in human and plant anatomy alike. As such, McDonald has drawn from wild Irish plant life, considering the templates their respiratory systems may offer for the breaths we will take in the future.

As witnesses to previous and future climatic conditions we have no access to, plant life offers us invaluable information, and it is this material that McDonald seeks to rework and analyse through an artistic lens.

On the expedition to Mount Etna, her intention was again to examine natural processes and forces, as well as the minutiae of the rocks and the history of exploration in the territory. She notes, "For this trip, I was primarily looking at the consequences of our treatment of nature and exploring the notion of breath."

That a natural process might combat the 400 billion tonnes of CO_2 we annually pump into the atmosphere was first suggested by calcite filaments appearing on rock face. These chalky, granular carbonate threads indicated the rock-based substances they coated may absorb CO_2, and so be capable of storing some of our heat-trapping emissions. Since then, basalt, ash and glacier milk have been identified as possible vessels, though which substance is the more pliable, mutable and reactive remains to be seen.

Carbon mineralisation

The carbon-capturing stones in Oman, for instance, consist largely of peridotite, a coarse-grained, igneous rock whose chemical potential is activated once exposed to air and water. The terrain enacts a natural process called carbon mineralisation; a process Dr Peter B Kelemen, a Columbia University geologist, would like to pursue via direct-air capture, sometimes described as a form of geoengineering.

In 2011 in Iceland, hundreds of tons of water and CO_2 gas were injected into layers of porous basaltic rock, the product of ancient lava flows from the Hengill volcano, to determine if the gas could be stored underground.

Mount Etna's ash, however, holds special promise not only because it's in such abundant supply, but because it's available in loose particles rather than solid rock. As such, as well as employing the environmentally benign direct-air capture method, it requires minimal human intervention compared to such high-pressure injection or quarrying.

It was Vincent Fournier's photograph of Kelemen in the *New York Times* that first compelled McDonald to research natural substances that might sequester human-induced carbon emissions. Dwarfed by the unflinching rock-face at Oman, the image of Kelemen captures the magnitude of our planetary crisis as well as the scale of our finite, fleshy bodies against the infinite, immeasurable damage they have caused.

Glacial Rock Flour Garden, a collaborative work by geologist Minik Rosing and artist Olafur Elaisson, similarly combines artistic and scientific inquiry to imagine a scenario where environmental damage to the planet can be halted, if not reversed. Made in 2016, the piece consists of the circular space in the middle of the Bosquet de la Colonnade in Versailles being filled with a thick layer of moraine, which is granite ground by moving glaciers into a fine grey powder.

The claylike material surrounds François Girardon's sculpture of Pluto abducting Persephone, the goddess of fertility, and Rosing plans to export moraine rock flour from Greenland to subtropical and tropical areas, where, as a rich source of mineral nutrients, it will revitalise depleted soil. A degree of poetic interpretation is exercised in linking an abducted symbol of fertility to soil starved of mineral nutrients, and the piece is dependent on scientific rigour and the potential for substantive change if we correctly manipulate our environment.

Akin to McDonald's approach is the desire "to draw attention to the porous nature of reality and the tipping of natural balances in the environment". At Mount Etna, "porous nature" suggested those processes that see hot atmosphere transferred to cool ash, and "the tipping of natural balances" – the possibility that gas might be permanently extracted from the atmosphere.

On site at the volcano, McDonald took part in an in-depth, continuous involvement with the landscape and the substances it consists of. By taking heed of material messages from the earth and the urgency with which they're delivered, we can not only glean new pragmatic knowledge, but also begin to grasp on an emotional level the upheaval occurring within our ecosystems.

Aware of the sensitivity of Mount Etna as a site, McDonald considered the terrain as a barometer for our own vulnerability, and a reminder of how indelibly we are conjoined with nature and its workings. As such, she focused on such details as "the inexorable growth of the tiny plant roots found growing on the walls of the caves" and how this slow, subtle growth runs concurrent with "the headlong pace of human time".

■ **An aerial shot of Mount Etna taken during the visit by the Trinity team. Top right: Jenny McElwain and Weimu Xu of TCD on the slopes of Mount Etna. Bottom right: artist Siobhán McDonald on location in Catania, Sicily**

> **McDonald commemorates the vast diversity of the environment we inhabit and explores our equally diverse responses to it**

'Geological materials'

On the expedition, McDonald says: "My gaze was mostly directly down to my feet, to the geological materials that lie beneath the earth's surface. We talked constantly about geological materials, minerals and metals and plant responses. Our conversations shed light on otherwise invisible themes, offering alternative concepts that have given me a new understanding of the fundamental connection between man, mineral and plants."

McDonald's research on Mount Etna has inspired her to address Bronze Age linear earthworks in Ireland, called the Black Pig's Dyke. In a new exhibition entitled Hidden Monuments, she presents a series of artistic enquires to remind us that the carins and standing stones that foreshadow our landscape act as reminders of climate change.

The work comprises a series of paintings and sculptures using gold and charcoal as materials. Charcoal is steeped in Irish history and connects the invention of tools with the erection of monuments and rituals to the sun when Ireland was in a weather crisis circa 100 AD. As part of her research, she has been investigating a line of geology across Ireland.

Art critic Tom Jeffreys has remarked: "McDonald commemorates the vast diversity of the environment we inhabit and explores our equally diverse responses to it. She does so and with an aesthetic that is at one coherent, understated and quietly powerful."

Siobhán McDonald's exhibition *Hidden Monuments* is a Creative Ireland commission and opens at Limerick City Gallery of Art on January 31st

Sue Rainsford is a writer and researcher based in Dublin. Her debut novel, *Follow Me To Ground*, is published by New Island Books

Insights into infancy offer baseline for a healthy start in life

Claire O'Connell
Research Lives

Deirdre Murray, principal investigator at Irish Centre for Fetal and Neonatal Translational Research (INFANT) and UCC professor of paediatrics

A lot of parents and babies take part in your studies in Cork. What have you been researching?
"One of the great things about being a researcher in Ireland is how willing parents are to get involved in research. Our Baseline study, funded by the National Children's Research Centre, has worked with more than 2,000 mother-child pairs through pregnancy, birth and early childhood up to age five so far. With their help, we have been able to look at many aspects of normal growth and skin barrier function, and we have published over 40 papers in the areas of children's growth, allergy, nutrition and development."

You are particularly interested in a type of brain injury that is linked to a lack of oxygen around the time of birth. Tell us more.
"Hypoxic-ischaemic encephalopathy (HIE) is one of the commonest causes of acquired brain injury in children. Interruption of the oxygen supply for even a few minutes can sometimes lead to permanent disability. Long-term problems are variable, from death in the most severe cases to movement or learning difficulties in those who survive. Over a million babies die worldwide from HIE each year, and in Ireland it affects around 200 babies annually."

How are you looking to minimise the effects?

■ **Deirdre Murray: "I am extremely lucky to be doing a job that I love."**
PHOTOGRAPH: DARRAGH KANE

"One of the ways we can tackle HIE is to cool the baby for 72 hours after birth. The tricky thing can be deciding which babies will benefit. Currently we probably miss about 20 per cent of babies who should be cooled, as the decision has to be made within six hours of birth. With the Karolinksa Institute in Sweden and with funding from the Health Research Board, we have been collecting and analysing blood samples from the umbilical cord. We are seeing patterns in those blood samples that could possibly tell us about encephalopathy in the baby, and we hope this will lead to a reliable bedside blood test to quickly identify if a baby needs help."

You also look at brain and cognitive development in babies and toddlers. Is that a challenge to measure?
"It can be, because current approaches often depend on the child being able to understand someone asking them to do something. So we worked with a gaming company, Hello Games UK, to develop the Babyscreen app that children aged 18 months and up can use on touchscreen devices without the need to understand language. That app is now being used by researchers in London, Cambridge, Doha and Gambia in their projects, and we are just about to start a new project to develop the next version."

What do you do to take a break from work?
"I would love to claim lots of interesting hobbies but I am afraid there aren't enough hours in the day, and around 10pm I collapse on the couch with my husband, Paul. Time with my three kids (who are 11, 13 and 15), doing whatever they want to do, fills my weekends."

And what's the best part of your day at work?
"The great thing about paediatrics is seeing a happy child ready to go home. They bounce back and want to get out and play. Looking at new data with the research team is a close second. I am extremely lucky to be doing a job that I love, answering important questions about children's health. What could be better?"

Deirdre Murray is principal investigator at the Irish Centre for Fetal and Neonatal Translational Research and professor of paediatrics at UCC

The bits of nature that make our hearts sing

Hannah Hamilton

Those of us who notice nature are aware of the lack of it everywhere we go

The light at this time of year has a particular ethereal quality. Dim and hazy, struggling to reach us, it sometimes seems to illuminate only shadows. While beautiful in its own bleak way, it – combined with the post-Christmas slump and the long slog until payday – can play havoc with our minds, making the end of January feel like the darkest time of the year.

It's not, of course (we're on the right side of the winter solstice now), but despite the crocus bulbs sprouting up defiantly in the pots outside my front door, spring still feels a lifetime away and the energy required to get outdoors into the fresh air is difficult to summon.

But according to the science, it'd be worth it: spending time in green spaces can lift our mood and reduce stress, among other psychological and emotional health benefits. Studies have measured cortisol in people who walk through parks versus those who don't, and others have measured the physical and mental wellbeing of hospital patients with a window looking out on to a green area.

A whole industry has sprung up around the findings of observations like these: fields of inquiry with names such as ecopsychology, diagnostic terms like nature-deficit disorder, remedies like ecotherapy. The scientific evidence is on their side.

For nature lovers, though, it can be more of a challenge. There are no studies that show a correlation between wilder, more natural, biodiverse green spaces and higher mental health benefits, though some of us might argue – unscientifically, on the basis of personal experience – that there should be. Can you compare the

> **If it feels this way for us now, imagine what the nature lovers of the generations past might feel**

constricted, manicured rows of geraniums and neatly trimmed lawns in an urban park to the unbounded joy of a hay meadow bursting with flowers, grasses and insect life? Can you heck.

Nor are there studies that I'm aware of that show the negative impact of degraded habitats on mental health. I've ruined many walks in the Wicklow Mountains by informing friends of the ill health of the blanket bog they were admiring, or causing them to notice the almost total lack of birdsong in a conifer forest, or pointing out a freshly scrubbed-out hedgerow that they may not otherwise have seen. Those of us who notice nature notice the lack of it everywhere we go.

This has implications for people working in the field: ecologists, conservationists, wildlife rangers, people who entered this line of work to look after something that is being continually lost and eroded. "Eco burnout" is a thing. Like doctors and nurses struggling to do their jobs in an underfunded hospital, or Gaeilgeoirí watching their treasured language fade from daily use, we get weary. Solace can be hard to find. Optimism can feel naive.

If it feels this way for us now, imagine what the nature lovers of the generations past might feel. The "normal" that we grew up with would be devastation to them: my father remembered the River Nore of his childhood teeming with freshwater pearl mussels, and days spent hunting in pristine waters for the pearls. When I was small, he'd pick shells out of the bed of the river – that was all there was to show me.

Today, I can't even find shells, let alone eels, or pike, or the salmon that we used to watch leaping in the rapids.

It can be hard to focus on the bits of nature that make our hearts sing – it can be hard to even find them – but some are still out there: earlier this month, hundreds of people gathered at spots all over the country to witness one of the greatest natural spectacles this island has to offer. Enormous flocks of starlings wheeled and swelled in the skies, exploding like black fireworks, gliding like smoke.

Murmurations are equal-opportunities captivators: you need no special knowledge or equipment, just a willingness to stand on a cold January evening, look up and be beguiled. Plenty did: young and old, urban and rural, all across the midlands.

It was a life affirming experience, and one I didn't regret driving a 150km round trip to witness. Maybe it was this kind of nourishment on a bleak day that inspired the great poet Emily Dickinson to write: "'Hope' is the thing with feathers."

Hannah Hamilton is a sustainability consultant specialising in biodiversity, conservation and environmental communications; @theriverfield