

LIFESTYLE

The cleanest air blows over Carna

• Connemara Atmospheric Research station sets the baseline for our air quality



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RESEARCH BY BICYCLE

THE man who set up the first atmospheric monitoring equipment there was a Kildare man, Dr Tom O'Connor, who had studied physics, in particular relating to gases, in UCD in the 1940s.

With his wavy red hair and friendly demeanour he would become familiar to thousands of Science students in the Physics department of UCG, now NUI, Galway. In another arena he was also well known to non-scientists as a committed member of Opus Dei.

Having been appointed a lecturer in UCG in 1956, the following year he cycled around Connemara to find a suitable location for an atmospheric research station.

Mace Head presented itself as the perfect spot, and 64 years later it is monitoring in greater detail than ever before what is blowing towards us in the wind.

Those 64 years of data are vitally important. Just as we cannot measure global warming by taking the temperature on any one day or year, but need a consistent set of measurements over decades, so we need to have daily, even hourly analyses of the atmosphere to detect changes.

GOOD NEWS

IN the current climate of pessimism about the future of our planet, we need to know straight away that what is being learned at Mace Head, and in the other research stations that are linked to it in an organisation known as AGAGE (Advanced Global Atmospheric Gases Experiment), is not always bad news.

The shining example of a looming global catastrophe that has been averted by human action is the ozone layer.

Not that many years ago we all worried about the hole in the ozone layer that was widening, particularly over the South Pole.

The loss of ozone was caused by man-made gases – chlorofluorocarbons (CFCs) – being used in the refrigeration industry. For once world governments agreed on a policy benefit humankind. CFCs were

LONG time ago, before most of the people reading this were born, Ireland was clinging to its neutrality in a war-torn world. While the Allied and the Axis powers struggled for supremacy in the Battle of the Atlantic, our government set up the Coastguard, operating from a network of lookout posts around the coast.

They were modest concrete structures with a door, five windows facing seaward and a fireplace.

One of these was at Mace Head, near Carna in Connemara. When the war was over it was here that an atmospheric research station that is now of world-wide importance was born.

The wind that blows into Mace Head is as pure as you will get in the Northern Hemisphere.

It has come more than 3,000 kilometres over the Atlantic, and before that the northern Canadian wastelands.

It is the cleanest air in Europe – but it is still dirty.

Our atmosphere is made up of various gases, the principal ones being Hydrogen, Oxygen and Carbon Dioxide – CO₂ – but when it enters our lungs it carries particles ranging from sea salt to industrial pollutants.

Back in the bad old days of smoky coal, those particles were the cause of lung ailments from asthma to bronchitis and worse.

Because they smelt bad and could be sensed by humans, they were easy for legislators to ban, or otherwise regulate. So no more smog in Dublin.

But many of the substances in our air are so minute, and in such small concentrations, that only the most advanced scientific instruments can detect them.

Such instruments are housed in two modest buildings on the coast at Mace Head, a few hundred yards from the Coastguard lookout post.



In 1956 Tom O'Connor cycled around Connemara to find a suitable location for an atmospheric research station. Mace Head was the perfect spot, and 64 years later it is monitoring in greater detail than ever before what is blowing towards us in the wind.

banned, and the result is the ozone layer repairing itself.

THE MACE MEASUREMENTS

OF the two buildings at Mace Head that look westwards over the island of Croaghneakeela towards Newfoundland, one is devoted to the measurement of particles, the other of gases.

Particles are not necessarily harmful. That healthy seaside air, for example, contains particles of sea salt, which is good for our lungs.

Clouds need particles around which water droplets can form, but there are many other particles in the air arriving on our shores.

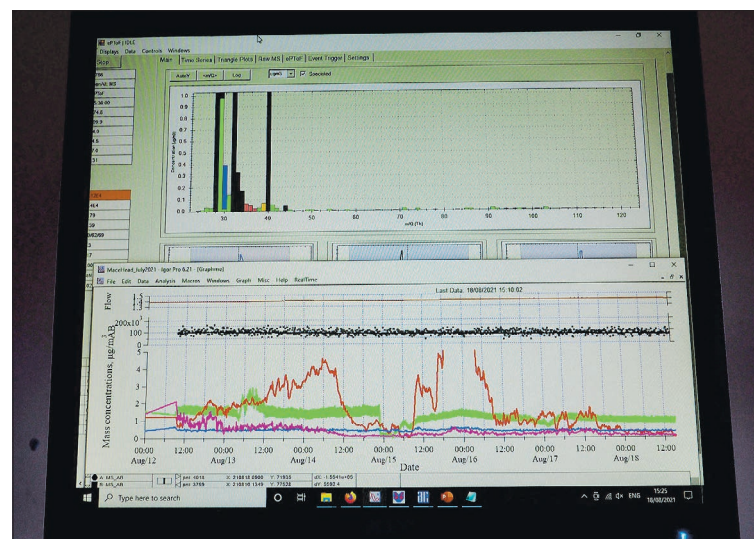
At Mace Head they have identified dust from the Sahara, ash from North American wildfires, and more from Icelandic volcanoes.

In order not to distort the readings, the regime at Mace is strict. The station manager is Gerry Spain, and he outlined some of the precautions: no fridge, because of the danger of refrigeration gas leakage, no food and no smoking. It's as regimented as a monastery, if not more so.

Dr Darius Ceburnis showed us the aerosol mass spectrometer which analyses the air in real time. On a screen a red graph shows acidic elements, blue indicates nitrates (generated by fossil-fuelled traffic), purple is chloride (sea salt) and green is organic, which does not always mean good. Organic is



NUI Galway scientist Dr Liz Coleman in the coastwatch station at Mace Head in which Dr Tom O'Connor placed his first atmospheric research instruments.



THIS screen shows elements in the air: red shows acidic elements, blue indicates nitrates (generated by fossil-fuelled traffic), purple is chloride (sea salt) and green is organic.

produced by carbon and oxygen, which can mean smoke. So far they have identified more than 100 chemicals in the air. Every so often Gerry Spain sends canisters of air from Mace to La Jolla in California where they are compared with an internationally agreed standard. It is this kind of monitoring and comparing that led to the Montréal agreement on the

ban on CFCs. As scientific director, Galway city native Professor Colin O'Dowd has steered the scientific development of Mace Head over the last decade or so, driving the research agenda in tandem with the monitoring activities, developing behind the unassuming façade some of the most sensitive and sophisticated instrumentation found anywhere



BACKS to the wind: Colleagues Gerry Spain, Dr Darius Ceburnis and Dr Liz Coleman at Mace Head.

PHOTOS: MARY RYAN

worldwide. The team at NUIG combine data with state-of-the-art modelling technology to bring climate and air pollution data into the palm of your hand through a real-time app StreamAIR, distilling down the science into useful service to the citizen. Look it up in the app store.

BACK IN NUIG
BACK in a physics laboratory in

NUI, Galway, Dr Liz Coleman works on analysing the data collected at Mace. This Dublin native took a roundabout route to science. Daughter of Christina Whyte from Creggs, who was a Presentation boarder in Tuam, and Tom Coleman from Knock, Liz studied traditional fiddle for two years after leaving school. Inspired by a growing concern



THESE two modest buildings at Mace Head are at the leading edge of climate research.



STATION manager Gerry Spain in the laboratory.

for the environment, she enrolled for a science degree at NUIG and ended up with a PhD based on modelling climate and air quality interactions. She is particularly interested in organic particles such as those which enter the air from burning biomass like turf and wood which interact with our bodies at the cellular level. After all, if we don't want to breathe tobacco smoke, which is also organic, why breathe turf or wood smoke? Liz Coleman is keen on promoting faith in science and the need to support science. The

science being practised at Mace Head and in NUIG is world class, and it is feeding into a vitally important world network. A combination of sophisticated instruments helped to identify pollutants and greenhouse gases. Here there is a paradox: not every greenhouse gas is a pollutant, and not every pollutant affects global warming. This is what makes the task of regulation, which is performed by politicians in government, difficult. Scientists must try to steer policies that, in Liz Coleman's words, are "co-beneficial for climate protection, energy policy,

clean air and protection of the ozone layer." There is more need now than ever for science graduates and physics teachers, and a new degree pathway is opening in Galway for studies combining physics with climate physics. This provides exciting opportunities for students to become part of a scientific army to protect the environment. What better legacy could the man leave who used World War II coastwatch posts to give Ireland a place at the forefront of modern climate research and environmental protection?