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## Dublin Core

### Title

The Science of Clouds | Gwyddor Cymylau

### Subject

Clouds

Weather

Fishguard

Cymylau

Tywydd

Abergwaun

### Creator

Dr Bruce Moffett

### Publisher

Ports, Past and Present Project

### Date

2023

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### Relation

<https://perma.cc/HA4N-M9CS>

### Format

Curatescape story

## Language

English

Welsh

## Coverage

52.004168556811685, -4.993574357891416

# Curatescape Story Item Type Metadata

## Lede

Dr Bruce Moffett is a Fishguard-based independent scientist. He is a leading authority on bio-precipitation; the study of clouds and how they form rain.

## Lede (Welsh)

Mae Dr Bruce Moffett yn wyddonydd annibynnol sy'n byw yn Abergwaun. Mae'n awdurdod blaenllaw ym maes bio-dyddodiad; astudio cymylau a'r ffordd y maent yn ffurfio glaw.

## Story

**Dr Moffett's work has been published widely in scientific journals, and he regularly holds tours and sessions in Fishguard with visitors of all ages. Here he outlines his work and the groundbreaking findings from research carried out on Fishguard's River Gwaun.**

At school, I am sure, most of us were taught that rain is formed by cloud droplets merging, until they get big enough to fall to the ground. Not so...

For rain to fall, ice must first be formed. The surrounding water is then incorporated into the ice crystals which grow as they attract more and more water. This ice is what grows, not the liquid droplets. Eventually they are too large to stay aloft and fall to earth. The ice generally melts on the way down, so we get a lot of rain, rather than snow.

So far, so simple! BUT the water in clouds is pure, having been evaporated from oceans and rivers. Unbelievably it does not freeze anywhere near 0, but -36.5°C! It never gets that cold in clouds, so how is the rain produced?

There exists a very select group of tiny particles: rain making particles, ice making particles. These must be lofted into the clouds for the ice to form at temperatures warmer than -10°C. The vast majority of these particles are biological, from bacteria, pollen and fungi.

It was already known that there are a very low number of ice making particles in the oceans, but rivers had never been investigated. Roger Strawbridge (a local fisherman) and I set out to sample Fishguard Bay. The next day we sampled the River Gwaun.

Analysis of the marine samples confirmed the low number of rain/ice making particles in the oceans. However, the river samples (the first ever to be analysed) were a revelation, containing thousands of times more than the marine samples.

The scientific community were initially sceptical about results obtained from a tiny Welsh river. However similar results have recently been demonstrated in rivers worldwide (e.g., the Mississippi).

The discovery of huge numbers of freshwater rain making particles in Fishguard, has initiated international efforts to determine if ice making particles from rivers are more important for rainfall than those from the oceans.

This research, initiated in Pembrokeshire on the River Gwaun, has important implications for several aspects of climate change, including river management, rainfall prediction, and rainfall control.

### Story (Welsh)

**Cyhoeddwyd gwaith Dr Moffett yn eang mewn cyfnodolion gwyddonol, ac mae'n cynnal teithiau a sesiynau yn rheolaidd yn Abergwaun ar gyfer ymwelwyr o bob oed. Yma, mae'n amlinellu ei waith a chanfyddiadau gwaith ymchwil sy'n torri tir newydd, a gynhaliwyd yn Afon Gwaun yn Abergwaun.**

Yn yr ysgol, mae'n siŵr bod y rhan fwyaf ohonom wedi cael ein haddysgu bod glaw yn ffurfio wrth i ddafnau cymylau ymgyfuno, nes byddant yn mynd yn ddigon mawr i gwmpo i'r ddaear. Nid felly...

Er mwyn i law syrthio, rhaid bod rhew yn ffurfio yn gyntaf. Yna, caiff y dŵr amgylchynol ei gynnwys yn y crisialau rhew sy'n tyfu wrth iddynt ddenu mwy a mwy o ddŵr. Y rhew yw'r peth sy'n tyfu, nid y dafnau hylifol. Yn y diwedd, byddant yn rhy fawr i aros i fyny a byddant yn disgyn i'r ddaear. Yn gyffredinol, bydd y rhew yn toddi ar y ffordd i lawr, felly rydym yn cael llawer iawn o law, yn hytrach nag eira.

Mae'n ddigon syml hyd yn hyn! OND mae'r dŵr mewn cymylau yn bur, ar ôl iddo anweddu o foroedd ac afonydd. Mae'n anodd credu nad yw'n rhewi unrhyw le yn agos at 0, ond -36.5°C! Nid yw hi fyth mor oer â hynny mewn cymylau, felly sut caiff y glaw ei gynhyrchu?

Mae grŵp dethol iawn o ronynnau mân yn bodoli: gronynnau sy'n creu glaw, gronynnau sy'n creu rhew. Rhaid i'r rhain godi i'r cymylau er mwyn i'r rhew ffurfio pan fo'r tymheredd yn gynhesach na -10°C. Mae mwyafrif helaeth y gronynnau hyn yn rhai biolegol, o facteria, pail a ffyngau.

Roedd hi eisoes yn hysbys bod nifer y gronynnau creu rhew yn y moroedd yn isel iawn, ond nid oedd afonydd fyth wedi cael eu hymchwilio. Aeth Roger Strawbridge (pysgotwr lleol) a minnau allan i samplu Bae Abergwaun. Y diwrnod wedyn, aethom i samplu Afon Gwaun.

Roedd gwaith a wnaethpwyd i ddadansoddi'r samplau morol wedi cadarnhau nifer isel y gronynnau creu glaw/rhew yn y moroedd. Fodd bynnag, roedd y samplau o'r afon (y cyntaf erioed i gael eu dadansoddi) yn syfrdanol, ac roeddent yn cynnwys sawl mil gwaith yn fwy na'r samplau morol.

Ar y dechrau, roedd y gymuned wyddonol yn llawn amheuan am y canlyniadau a sicrhawyd mewn afon fach yng Nghymru. Fodd bynnag, dangoswyd canlyniadau tebyg mewn afonydd ar draws y byd (e.e., afon Mississippi).

Mae darganfyddiad niferoedd enfawr o ronynnau creu glaw dŵr croyw yn Abergwaun wedi ysgogi ymdrechion rhyngwladol i bennu a yw gronynnau creu rhew o afonydd yn bwysicach ar gyfer glawiad na'r rhai o'r moroedd.

Mae gan y gwaith ymchwil hwn, a gychwynwyd yn Sir Benfro yn Afon Gwaun, oblygiadau pwysig ar gyfer sawl agwedd ar y newid yn yr hinsawdd, gan gynnwys rheolaeth afonydd, rhagfynegi glawiad, a rheoli glawiad.

### Factoid

### Related Resources

Misstear, R. (2016) 'Study of clouds could change how we deal with climate change'. *Wales Online*. Online article archived at: <https://perma.cc/7HL4-LLKT>.

Moffett, B. F. (2016) 'Fresh water ice nuclei'. *Fundamental and Applied Limnology* 188 (1), 19– 23

**Official Website**