CHERISH

Newid Hinsawdd a Threftadaeth yr Arfordir
Climate Change and Coastal Heritage
Athrú Aeráide agus Oidhreacht Chultúrtha

Newyddion CHERISH News

RHIFYN 4 / ISSUE 4
GORFFENNAF 2019 / JULY 2019

CYNNWYS / CONTENTS

Dan Hunt, un o ymchwilwyr CHERISH, yn cynnal arolwg GNSS ar Ynys Enlli, Gwynedd, Mai 2019.

CHERISH Investigator Dan Hunt carrying out GNSS survey on Bardsey Island, Gwynedd, May 2019.

Clawr Blaen: Mwnt Glascarrig, Swydd Wexford. Un o safleoedd monitro man cychwyn CHERISH y tynnwyd lluniau ohono yn ystod hediad rhagchwilio cyd-genedl ar 20 Mawrth 2019.

Front Cover: Glascarrig Motte, County Wexford. A CHERISH baseline monitoring site photographed during joint-nation aerial reconnaissance on 20 March 2019.

CROESO

i Rifyn 4 Newyddion CHERISH

Croeso i bedwerydd rhifyn newyddion CHERISH sy'n nodi canol ein prosiect pum-mlynedd. Yn y rhifyn hwn edrychwn ar rai o uchafbwyntiau'r prosiect yn ystod cyfnod prysur rhwng mis Ionawr a mis Mehefin 2019. Tynnir sylw at beth o'n gwaith mwyaf uchelgeisiol hyd yma, sy'n cynnwys rhaglen newydd gan y ddwy genedl i dyllu creiddiau mawn yn ne-orllewin Iwerddon, defnyddio drôn (UAV) i fapio ardaloedd cyfan o arfordir erydol Iwerddon, cloddiadau wyneb-clogwyn i gasglu gwybodaeth am gaer arfordirol sy'n disgyn i'r môr, a seminar ac ysgol hyfforddi ar ddefnyddio awyrennau a dronau i gynnal arolygon archaeolegol o'r awyr.

I gael y newyddion a gwybodaeth ddiweddaraf – ac i weld ble mae'r tîm CHERISH yn gweithio – cofiwch edrych ar ein gwefan a'n tudalennau Facebook a Twitter. Rhoddir y manylion isod.

WELCOME

to Issue 4 of CHERISH News

Welcome to the fourth issue of the CHERISH newsletter which marks the middle of our five-year project. This issue brings you the project highlights of a busy period between January and June 2019, with some of our most ambitious work to date, which includes a new programme of joint-nation peat coring in south-west Ireland, UAV mapping of entire stretches of eroding Irish coast, cliff-face excavations of a threatened coastal fort, and a seminar and training school on archaeological aerial survey using aircraft and UAVs.

For day-to-day news and features – and to see where the CHERISH team is working – don't forget to look at our website, Facebook and Twitter pages, details of which can be found below.

www.cherishproject.eu

CHERISH Project

@CHERISHproj

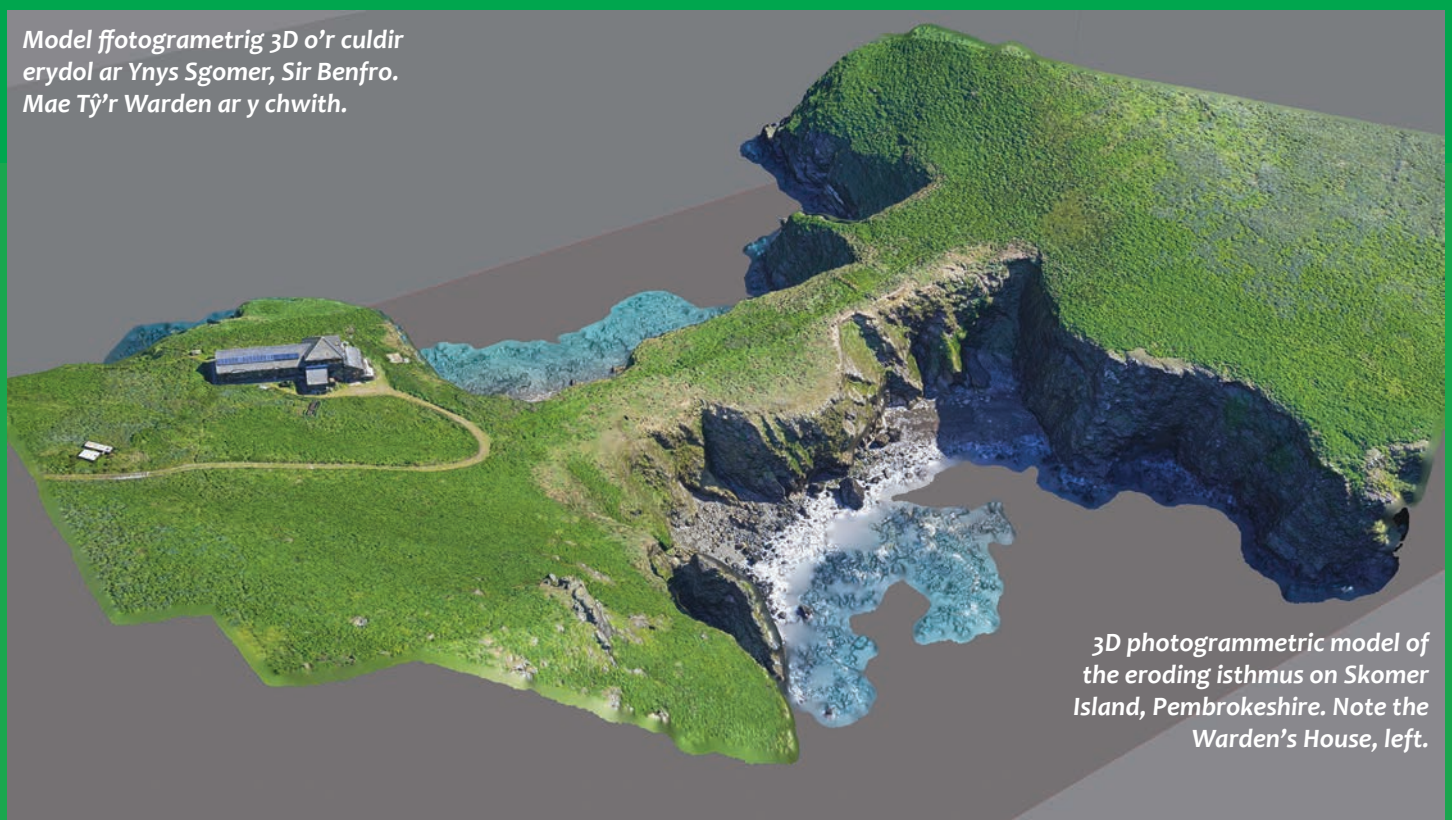
YNGHYLCH CHERISH / ABOUT CHERISH

Prosiect Iwerddon-Cymru pum mlynedd o hyd yw CHERISH. Mae'n dwyn ynghyd bedwar partner o'r ddwy genedl: Comisiwn Brenhinol Henebion Cymru; y Rhaglen Ddarganfod, Iwerddon; Prifysgol Aberystwyth: Adran Daearyddiaeth a Gwyddorau Daear; a'r Arolwg Daearegol, Iwerddon. Dechreuodd ym mis Ionawr 2017 a bydd yn para hyd fis Rhagfyr 2021. Bydd yn derbyn €4.1 miliwn o'r Undeb Ewropeaidd drwy Raglen Gydweithredu Iwerddon Cymru 2014–2020.

Prosiect gwirioneddol drawsddisgyblaethol yw CHERISH sydd â'r nod o godi ymwybyddiaeth a dealltwriaeth o effeithiau newid hinsawdd, stormydd a thywydd garw ar dreftadaeth ddiwylliannol gyfoethog ein môr a'n harfordir yn y gorffennol, y presennol a'r dyfodol agos. Byddwn yn cysylltu tir a môr ac yn defnyddio amrywiaeth o dechnegau a dulliau i astudio rhai o leoliadau arfordirol mwyaf eiconig Cymru ac Iwerddon, er enghraifft, sganio laser ar y ddaear ac o'r awyr, arolygon geoffisegol, mapio gwely'r môr, samplu palaeoamgylcheddol, cloddiadau a monitro llongddrylliadau.

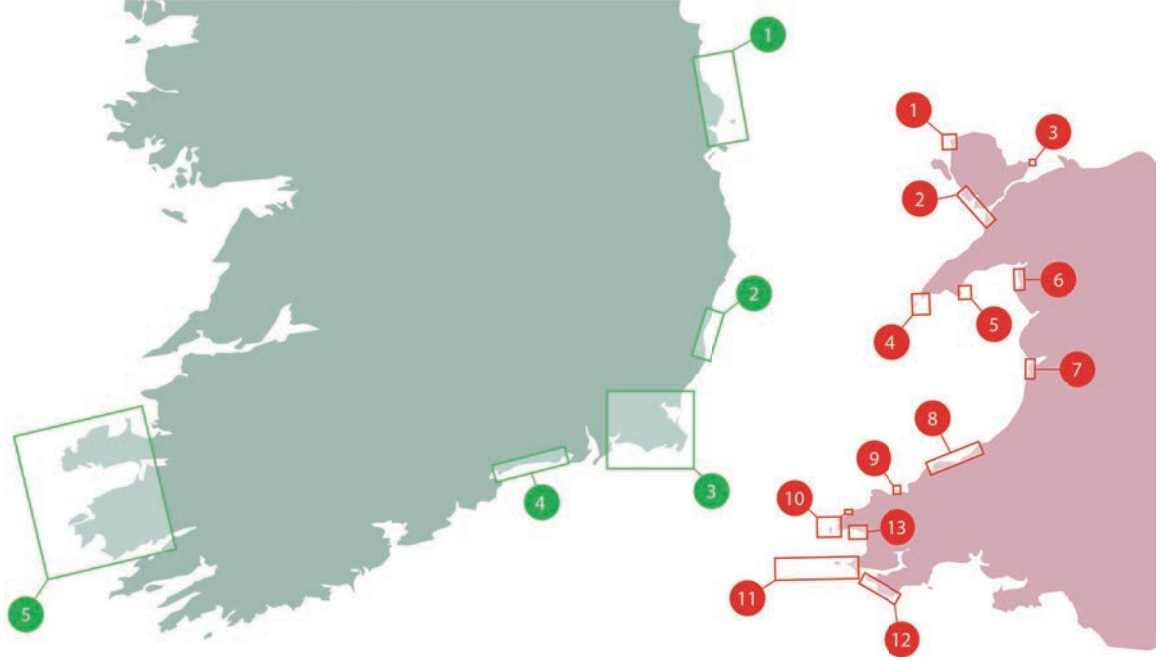
CHERISH is a five-year Ireland-Wales project, bringing together four partners across two nations: the Royal Commission on the Ancient and Historical Monuments of Wales; the Discovery Programme, Ireland; Aberystwyth University: Department of Geography and Earth Sciences; and Geological Survey Ireland. It began in January 2017 and will run until December 2021; it will receive €4.1 million of EU funds through the Ireland Wales Co-operation Programme 2014–2020.

CHERISH is a truly cross-disciplinary project aimed at raising awareness and understanding of the past, present and near-future impacts of climate change, storminess and extreme weather events on the rich cultural heritage of our sea and coast. We link land and sea and employ a variety of techniques and methods to study some of the most iconic coastal locations in Ireland and Wales. These range from terrestrial and aerial laser scanning, geophysical survey and seabed mapping, through to palaeoenvironmental sampling, excavation and shipwreck monitoring.



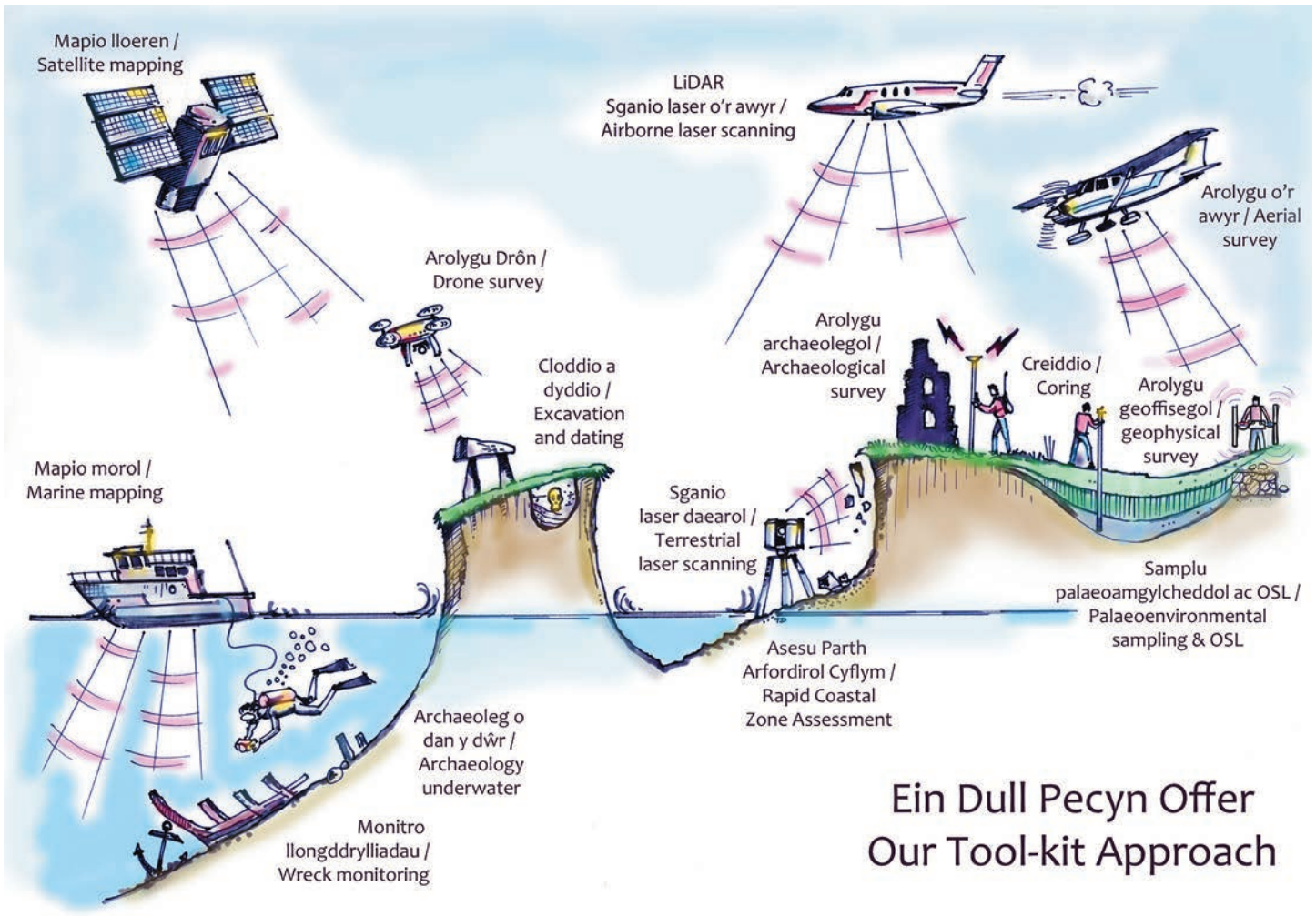
Model ffotogrametrig 3D o'r culdir erydol ar Ynys Sgomer, Sir Benfro. Mae Tŷ'r Warden ar y chwith.

3D photogrammetric model of the eroding isthmus on Skomer Island, Pembrokeshire. Note the Warden's House, left.



Yn ystod blwyddyn gyntaf y prosiect buom yn gweithio'n galed gydag asiantaethau, rhanddeiliaid, tirfeddianwyr a grwpiau lleol i benderfynu ar yr ardaloedd y byddai'r ddwy wlad yn eu hastudio. Dewiswyd y rhain ar sail bylchau mewn gwybodaeth a data (yn enwedig ynysoedd a phentiroedd anghysbell), ardaloedd blaenoriaethol lle mae perygl o erydiad, neu lle mae potensial ar gyfer gwneud gwaith arolygu ar y cyd. Ewch i'r adran 'Gweithgareddau' ar wefan y prosiect i gyrchu map y gallwch glicio arno i ddysgu mwy am bob ardal astudio.

During our first year of the project we worked hard with agencies, stakeholders, landowners and local groups to finalise our joint-nation working areas. These have been selected on the basis of knowledge and data gaps (particularly islands and remote headlands), priority areas of erosion risk or where there is potential to collaborate on survey work. Visit the 'Activities' section of our project website for a clickable map where you can learn more about each study area.



Ymagwedd integredig at arolygu ar y tir ac o dan y môr. Y graffigyn hwn sy'n disgrifio orau yr ymagwedd amlddisgyblaethol at gofnodi arfordirol ac arforol a ddefnyddir gan CHERISH yng Nghymru ac Iwerddon.

An integrated approach to survey on land and under the sea. This graphic best describes the multidisciplinary approach to coastal and maritime recording that CHERISH employs in Wales and Ireland.

UCHAFBWYNTIAU
IONAWR–MEHEFIN 2019

HIGHLIGHTS
JANUARY–JUNE 2019

CASGLU DATA O'R AWYR, AR Y MÔR AC AR Y TIR / DATA GATHERING FROM THE AIR, ON SEA AND LAND

Prif sail y prosiect CHERISH yw gweithio ar y cyd, gan gyfuno sgiliau ac arbenigedd y pedwar partner i weithio fel un Tîm Arolygu CHERISH. Caiff technegau arolygu eu cyfuno yn yr ardaloedd astudio hefyd, gan ddefnyddio dull 'pecyn offer' i ymdrin â phob agwedd ar bob safle – ni waeth pa mor anodd ac anghysbell ydynt!

Bu chwe mis cyntaf 2019 yn gyfnod prysur iawn i staff y prosiect CHERISH. Parhaodd staff y pedwar partner i gasglu data monitro man cychwyn o'r tir, yr awyr a'r môr, ac i gyfarfod a gweithio gyda pherchenogion tir, rhanddeiliaid, gwirfoddolwyr, a myfyrwyr i symud y prosiect yn ei flaen.

The CHERISH project is all about joint working, combining the skills and expertise of the four partners to work as a single CHERISH Survey Team. It's also about combining survey techniques in our study areas, using a 'toolkit' approach to tackle a site from every angle – the more difficult and remote the better!

The first six months of 2019 have been very busy with CHERISH staff across all four partner organisations continuing to gather baseline monitoring data from the land, air and sea as well as continuing to meet and work with landowners, stakeholders, volunteers and students to continue moving the project forward.

Patrick Robson a Sarah Davies yn tyllu creiddiau yn Ninas Dinlle, Gwynedd, Mehefin 2019.

Patrick Robson and Sarah Davies coring at Dinas Dinlle, Gwynedd, June 2019.

Louise Barker a Hywel Griffiths yn cofnodi rhan o'r arfordir yn Henllwyn, Ynys Enlli, Mai 2019.

Louise Barker and Hywel Griffiths recording a coastal section at Henllwyn, Bardsey Island, May 2019.

◀ *Yr Athro Helen Roberts o Labordy Ymchwil Ymoleuedd Prifysgol Aberystwyth yn cymryd samplau o'r clogwyn erydol ar safle caer arfordirol Dinas Dinlle, Mehefin 2019.*

◀ *Professor Helen Roberts of Aberystwyth University's Luminescence Research Laboratory taking samples from the eroding cliff at Dinas Dinlle coastal fort, June 2019.*

Parhau i gofnodi'r gweladwy a'r anweladwy

Ar ddechrau 2019, ymgymerwyd â'r arolygon geoffisegol cyntaf ar draws Cymru ac Iwerddon gan staff CHERISH a thimau allanol (manylir ar arolygu geoffisegol isod o dan y pennawd 'Technegau Arolygu'). Gwnaed ein harolwg cychwynnol gan aelodau'r tîm CHERISH o Raglen Ddarganfod Iwerddon, a hynny yn y castell mwnt a beili o'r Oesoedd Canol cynnar yn Glascarrig, Swydd Wexford, er mwyn ymchwilio i'r posibilrwydd bod olion archaeolegol wedi'u claddu y tu mewn iddo. Dilynwyd y gwaith hwn gan arolwg arall a wnaed yn fuan wedyn, y tro hwn yng nghaer bentir a chastell Ferriter's yn Dingle. Ym mis Mawrth, ymgymerwyd ag arolygon cyffelyb o gaerau pentir Castell Bach a Phenpleidiau yng Nghymru, gan SUMO Services ar ran y prosiect. Cafwyd canlyniadau cymysg, i raddau gan fod daeareg y safleoedd yn effeithio arnynt, yn enwedig yng nghaer Penpleidiau sydd wedi'i lleoli ar frigiad o graig igneaidd (math o graig sy'n enwog am effeithio ar arolygon magnetig). Byddwn yn derbyn canlyniadau'r arolygon hyn yn ystod y misoedd nesaf, felly gobeithiwn y bydd gennym newyddion cyffrous i chi yn y rhifyn nesaf!

Continuing to record the visible and invisible

The beginning of 2019 saw CHERISH geophysical surveys undertaken across Wales and Ireland, carried out by both CHERISH staff and external teams (more details on geophysical survey can be found below in 'Survey Techniques'). Our initial survey was undertaken by members of the team from the Discovery Programme in Ireland at the early medieval motte and bailey castle of Glascarrig, County Wexford, to investigate the potential for archaeological remains buried within its interior. This work was quickly followed up with a further survey in Dingle on Ferriter's promontory fort and castle. In March, similar surveys where carried out at the promontory forts of Castell Bach and Penpleidiau in Wales by SUMO Services on behalf of the project. Results were mixed, with geology playing its part in obscuring results, especially at Penpleidiau which is situated on an outcrop of igneous rock (a type of rock renowned for affecting magnetic surveys). We will be getting the results for these surveys over the coming months, so we hope to bring you exciting news in the next issue!

Paratoi ar gyfer yr arolwg magnetomedr yn Ferriter's Cove.
Preparing for the magnetometer survey at Ferriter's Cove, County Kerry.

Cert magnetometreg SUMO Survey, a ddefnyddiwyd yn ystod arolwg wedi'i ariannu gan CHERISH ar arfordir gogledd Cymru.

The SUMO Survey magnetometry cart during CHERISH-funded survey on the north Wales coast.

Bu'r tîm yn brysur hefyd yn cynnal arolygon topograffig a cherdded-drosodd o sawl safle. Yng Nghymru, gwnaed arolygon manwl, gan ddefnyddio GNSS, o dair caer bentir arfordirol sy'n eiddo i'r Ymddiriedolaeth Genedlaethol, sef Castell Bach yng Ngheredigion, a Phenpleidiau a Phorth y Rhaw yng ngogledd Penfro. Gwnaed yr arolygon yn ystod misoedd y gaeaf a'r gwanwyn i sicrhau bod y llystyfiant yn ddigon isel i gael golwg clir o'r gwrthgloddiau cynhanesyddol. Cymerodd rhwng un a dau ddiwrnod i gwblhau pob arolwg: cerddodd Louise a Dan o'r Comisiwn Brenhinol dros y safle gan ddefnyddio cyfarpar arolygu GNSS i gofnodi'r archaeoleg weladwy. Gan ein bod ni'n cofnodi caerau pentir arfordirol, y prif fath o nodwedd y daethom o hyd iddo oedd y rhagfuriau a adeiladwyd yn y gorffennol pell i gau ardaloedd a phentiroedd pwysig a/neu strategol. Bydd deall y nodweddion hyn, eu maint a'u cyfnodau adeiladu posibl, yn darparu sylfaen gadarn ar gyfer gwneud gwaith arolygu pellach (drôn, geoffisegol, cloddio).

The team have also been busy carrying out topographic and walkover surveys over several sites. In Wales, three eroding National Trust owned coastal promontory forts at Castell Bach in Ceredigion and at Penpleidiau and Porth y Rhaw in north Pembrokeshire were surveyed in detail using GNSS (Global Navigation Satellite System). The surveys were carried out during the winter and spring months to ensure vegetation was low enough to get a clear view of the prehistoric earthworks. Each survey took between one and two days to complete with Louise and Dan from the Royal Commission walking over the site using GNSS survey equipment to record the visible archaeology. Because we were recording coastal promontory forts, the main type of feature we encountered were the ramparts constructed by past people to enclose important and/or strategic areas and headlands. Understanding these features, their scale and their potential construction phases, provides a solid foundation from which further work, such as UAV and geophysical survey, and excavation, can build on.

Draw yn Kerry, roedd y tîm yn falch o groesawu Stirling MacKinnon III, myfyriwr doethurol ym Mhrifysgol Rhydychen, sy'n gweithio gyda ni fel rhan o'i ymchwil. Ymunodd â'r tîm am wythnos brysur o waith ar benrhyn

Over in Kerry the team was pleased to welcome Stirling MacKinnon III, a doctoral student at the University of Oxford, who is working with CHERISH as part of his research. He joined the team for a busy week of work

Model 3D o gaer bentir Porth y Rhaw y defnyddiwyd delweddaeth ddrôn ffotogrametrig i'w greu.

3D model of Porth y Rhaw promontory fort in Pembrokeshire created with photogrammetric UAV imagery.

Dingle, pan fu'r tîm yn gwneud arolygon cerdded-drosodd o'r Three Sisters ar Ceann Sibeal, Smerwick a chaer bentir a chastell Ferriter's. Aethom hefyd i weld llongddrylliad y *Sunbeam* yn Rossbeigh er mwyn ymgymryd ag arolwg GNSS o'r safle a nodi lleoliad yr hyn sydd ar ôl.

Cafodd ein harchaeolegwyr arforol gyfle hefyd i fynd i'r dŵr i archwilio anomaledd a ddarganfuwyd gan Arolwg Daearegol Iwerddon yn ystod rhaglen o fapio tanddwr. Ymunodd staff CHERISH o Arolwg Daearegol a Rhaglen Ddarganfod Iwerddon ag Uned Archaeoleg Danddwr y Gwasanaeth Henebion Cenedlaethol ar gyfer y deifiau ymchwilio a hyfforddi. Yna buont yn gwneud gwaith arolygu pellach ar sawl safle ar Ynys Lambay ar y cyd â Choleg Prifysgol Dulyn.

on the Dingle peninsula, which saw the team undertake walkover surveys of the Three Sisters on Ceann Sibeal, Smerwick and Ferriter's promontory fort and castle. A trip to see the wreck of the *Sunbeam* at Rossbeigh also allowed us to undertake a GNSS survey of the site to accurately locate and position the remains of the wreck.

Our maritime archaeologists were also able to get into the water to explore an anomaly found by the GSI during a programme of underwater mapping. CHERISH staff from GSI and the Discovery Programme joined forces with the Underwater Archaeology Unit, National Monuments Service team for the investigative and training dives. Further collaborative survey saw the team work with University College Dublin to undertake survey work on Lambay Island where several sites were visited and surveyed.

Louise Barker, a rhai merlod chwilfrydig, yng Nghastell Bach, Ceredigion.

Louise Barker, and some inquisitive ponies, at Castell Bach, Ceredigion.

Daeth mis Mehefin i ben gyda mwy o waith yn Ninas Dinlle, Gwynedd. Parhaodd staff CHERISH â'u hymchwiliadau cyffrous ar safle'r gaer bentir arfordirol gynhanesyddol hon, gan weithio'n agos â'r Ymddiriedolaeth Genedlaethol, Cadw, a Chyfoeth Naturiol Cymru. Roedd y gwaith newydd yn dipyn o her: sut i archwilio ymyl clogwyn serth sy'n erydu ar heneb wedi'i diogelu? Cafwyd yr ateb gan staff Canolfan Awyr Agored Genedlaethol Plas y Brenin a osododd raffau i'r archaeolegwyr a'r daearyddwyr ac a fu'n eu goruchwylio. Aeth y gwaith yn ei flaen yn syfrdanol o ddidrafferth o ystyried iddo gael ei wneud sawl metr uwchben y traeth islaw! Hefyd cymerwyd creiddiau o gloddiau a ffosydd deheuol y gaer er mwyn ceisio deall sut y cafodd ei hadeiladu. Byddwn yn cynnal ymchwiliadau drwy

June culminated with further work at Dinas Dinlle, Gwynedd. CHERISH archaeologists and geographers continued their exciting investigations at the prehistoric coastal promontory fort, working closely with the National Trust, Cadw, and Natural Resources Wales. This new work presented a real challenge: how to examine a steep, collapsing cliff edge on a highly protected monument? The answer came with help from Plas y Brenin National Outdoor Centre who safely rigged and supervised the rope access. The work went surprisingly smoothly, considering it was carried out several metres above the beach below! Cores were also taken from the southern banks and ditches of the fort to understand how it was constructed. Investigations will continue throughout the project to monitor how

Patrick a Louise yn defnyddio rhaffau i gyrraedd wyneb erydol y clogwyn yn Ninas Dinlle, Gwynedd er mwyn archwilio nodweddion archaeolegol a gwaddodion sydd wedi'u dinoethi.

Patrick and Louise using roped access to investigate exposed sediments and archaeology in the eroding cliff face at Dinas Dinlle, Gwynedd.

gydol y prosiect i ddarganfod faint o'r gaer sy'n cael ei golli i'r môr a bydd hyn yn cynnwys cloddiad cyffrous gan wirfoddolwyr dan arweiniad Ymddiriedolaeth Archaeolegol Gwynedd ym mis Awst. Cynhelir diwrnod agored i'r cyhoedd ar Ddydd Sadwrn 17 Awst. Hwn fydd y cloddiad agored cyntaf erioed i gael ei gynnal yn Ninas Dinlle. Gyda lwc fe fyddwn ni'n datgelu mwy o gyfrinachau'r gaer yn ystod y cloddiad!

Cofnodi mewn 3D

Mae'r tîm yn parhau i gynnal arolygon drôn a laser-sgan allweddol o safleoedd CHERISH. Gan ddefnyddio'r dechneg hon, roedd y tîm yn gallu casglu delweddau ffotogrametrig gwych ar gyfer Porth y Rhaw a Phenpleidiau a ddefnyddir ar y cyd â'r arolygon topograffig. Cafodd dronau eu defnyddio hefyd yn ystod y gwaith ar y clogwyn yn Ninas Dinlle ym mis Mehefin, er mwyn casglu delweddau manwl iawn o ffos erydol. Ym mis Mehefin hefyd fe basiodd Toby Driver, un o aelodau tîm CHERISH, ei brawf hedfan dronau a achredir gan yr Awdurdod Hedfan Sifil. Mae hyn yn golygu bod dau beilot drôn cymwysedig ac yswiriedig bellach ar gael i'r Comisiwn Brenhinol (sy'n hwb aruthrol!).

much is being lost to the sea and will include our exciting volunteer excavation being led by Gwynedd Archaeological Trust in August, with a public open day on Saturday 17 August. This will be the first open excavation ever held at Dinas Dinlle. Hopefully we will be able to prise out some more of the fort's secrets during the excavation!

Recording in 3D

The team continue to carry out crucial UAV and laser scan surveys of CHERISH sites. Using this technique, the team were able to gather fantastic photogrammetric imagery for Porth y Rhaw and Penpleidiau in Pembrokeshire which will be used in conjunction with the topographical surveys. UAVs were also used during the rope access work carried out at Dinas Dinlle in June to capture highly detailed imagery of an eroding ditch section. June also saw CHERISH team member Toby Driver pass his CAA accredited UAV flight test, meaning that the Royal Commission can now deploy two qualified and insured UAV pilots (a huge boost!).

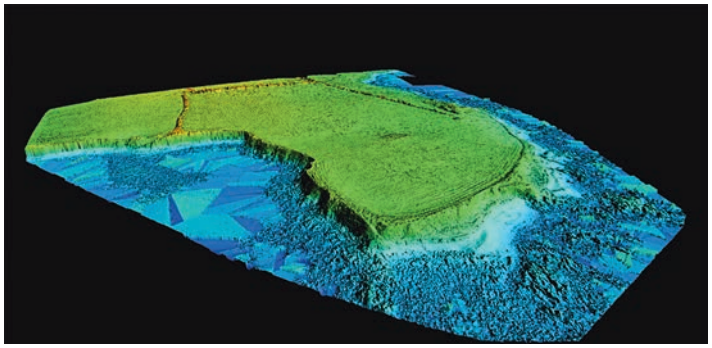
Dan Hunt yn defnyddio drôn i wneud arolwg o Benpleidiau, Sir Benfro.
Dan Hunt surveying Penpleidiau in Pembrokeshire with a UAV.

Cafodd ymdrechion Arolwg Daearegol Iwerddon i wneud gwaith maes eu llesteirio braidd gan y tywydd gwael. Ond er nad ydym wedi cael heulwen fendigedig 2018, manteisiwyd ar sawl cyfle i wneud gwaith maes ar hyd y glannau. Rydym wedi gallu casglu data drôn o safleoedd yn swyddi Dulyn, Wexford, Waterford, a Kerry, a mapiwyd mwy na 18 km o'r arfordir.

Yr haf hwn, ar ôl cael caniatâd, buom yn gwneud arolygon mewn parthau hedfan cyfyngedig ac yn cydweithio gyda'r Gwasanaethau Parc Cenedlaethol a Bywyd Gwyllt i asesu effaith gwneud arolygon â dronau ar adar sy'n nythu. Mae hyn yn arbennig o bwysig oherwydd bod llawer o'r safleoedd CHERISH yn Iwerddon wedi'u diogelu oherwydd y bywyd gwyllt cyfoethog sy'n ffynnu arnynt.

For the GSI, waiting for weather windows was the name of the fieldwork game. While we have not quite had the fantastic sunshine of 2018, several opportunities for coastal fieldwork were taken. We have been able to acquire UAV data from sites in counties Dublin, Wexford, Waterford, and Kerry, with over 18 km of coastline mapped.

This summer, and with permission, the GSI has been surveying in restricted fly zones and have partnered with the National Park and Wildlife Services to assess the impact of UAV surveying on nesting birds. This is particularly important as many of the CHERISH sites have protected status in Ireland due to the resident wildlife.



Model Uchder Digidol (DEM) o Bremore, Swydd Dulyn, yn dangos clogwyni erydol a harbwr o'r unfed ganrif ar bymtheg.

DEM of Bremore, County Dublin with eroding cliffs and sixteenth-century harbour.

Ar ddechrau'r flwyddyn, dechreuodd Arolwg Daearegol Iwerddon ddefnyddio'r orsaf gyflawn sganio Trimble SX10 hefyd. Mae'r cyfarpar laser-sganio hwn yn ei gwneud hi'n bosibl i gynhyrchu cwmwl pwyntiau dwysedd-uchel o fewn ffrâm gyfeirio gyfesurynnol. Rydym wedi'i defnyddio yn Bremore, Swydd Dulyn ac yn Kilmichael Point, Swydd Wexford, ac wedi llwyddo i gyfuno setiau data drôn a laser-sgan i gynyddu hyd a lled yr ymdriniaeth a gwella holi data. Drwy gyfuno data gallwn asesu newid arfordirol ar raddfa o filimetr hyd at fetr.

The start of this year has also seen the GSI deploy the Trimble SX10 scanning total station. This bit of laser-scanning kit allows the generation of a high-density point cloud within a coordinate reference frame. Deployed in Bremore, County Dublin, and Kilmichael Point, County Wexford, we've successfully merged UAV and laser-scan data sets to increase coverage and permit further interrogation of data. Combining data permits an assessment of coastal change from the metre up to millimetre scale.

Model 3D o glogwyni bach erydol yn Ballinskelligs, Swydd Kerry.

3D model of eroding cliffs at Ballinskelligs, County Kerry.

Model 3D o Kilmichael Point, Swydd Wexford, lle ceir til rhewlifol erydol dros lwyfan o greigwely.

3D Model of Kilmichael Point, County Wexford, with eroding glacial till over bedrock platform.

Croesi ffiniau gydag arolygon o'r awyr

Ar ddiwedd Mawrth, ymunodd Toby Driver, Archaeolegydd o'r Awyr y Comisiwn Brenhinol, â Robert Shaw, Geoarolygydd Uwch y Rhaglen Ddarganfod, i ymgymryd â dau ddiwrnod o ffotograffiaeth o'r awyr uwchben safleoedd arfordirol blaenoriaethol rhwng Dulyn a Wexford. Un o'r nodau allweddol oedd cael lluniau newydd o safleoedd astudio CHERISH ym Mae Dulyn, sydd o dan y llwybr hedfan i mewn i Faes Awyr Dulyn. Gan fod awyrennau ar hediadau rhyngwladol yn glanio ac yn esgyn bob 8 munud, mae'r gofod awyr wedi'i reoli'n llym, a bu'n anodd defnyddio dronau.

Crossing boundaries with aerial survey

In late March, the Royal Commission's Aerial Archaeologist Toby Driver joined Senior Geosurveyor Robert Shaw from the Discovery Programme to carry out two days of joint-nation aerial photography over priority coastal sites between Dublin and Wexford. One of the key aims was to obtain new photography of CHERISH study sites in Dublin Bay, which lie beneath the final approach to Dublin Airport. With international flights landing and taking off about every 8 minutes, the airspace is tightly controlled, and we have found it difficult to use UAVs.

Toby a Rob cyn mynd ar yr awyren yn y Ganolfan Hedfan Genedlaethol, Maes Awyr Weston, Dulyn.

Toby and Rob before take-off at the National Flight Centre, Weston Airport, Dublin.

Ar 20 Mawrth, ar ôl aros am dywydd braf, hedfanasom o'r Ganolfan Hedfan Genedlaethol ym Maes Awyr Weston i gynnal arolwg o'n holl bentiroedd ac ynysoedd blaenoriaethol ym Mae Dulyn, gan gadw o dan 500 troedfedd a bron ar yr un lefel â goleudai Baily, Howth, a Rockabill! Tynnwyd cannoedd o awyrluniau newydd o Ynys Lambay, Ireland's Eye, Drumanagh, Skerries, a Bremore. Gwnaed mwy o arolygon o'r awyr ar hyd arfordir dwyreiniol Dulyn, o Bray i Arklow a thu hwnt, gan roi sylw arbennig i'r safleoedd astudio CHERISH yn Glascarrig a Kilmichael Point. Arolygwyd Kilmichael Point yn fuan ar ôl i Arolwg Daearegol Iwerddon gwblhau ei arolwg drôn lefel-isel ei hun.

With a lucky break in the weather on 20 March we flew out of the National Flight Centre at Weston Airport to survey all our priority headlands and islands in Dublin Bay, keeping below 500ft and almost at eye-level with the lighthouses at Baily, Howth, and Rockabill! Hundreds of new aerial photographs of the key islands and headlands of Lambay Island, Ireland's Eye, Drumanagh, Skerries, and Bremore were obtained. Over the two days we carried out further aerial surveys along Dublin's east coast from Bray to Arklow and beyond, taking in CHERISH study sites at Glascarrig and Kilmichael Point – the latter not long after the GSI had finished their own low-level UAV survey.

Golwg o'r awyr o Ynys Shenick a'r Tŵr Martello, Skerries, Bae Dulyn.
Aerial view of Shenick's Island and Martello Tower, Skerries, Dublin Bay.

Datgelu amgylcheddau'r gorffennol

Yn ystod cyfnod o dywydd cynnes ym mis Mawrth, aeth y tîm o Brifysgol Aberystwyth i Ystâd Stagbwll yn Sir Benfro i astudio Twyni Stagbwll. Mae'r Warchodfa Natur Genedlaethol hon, lle mae cyfres o dwyni tywod wedi crynhoi ar ben clogwyni calchfaen 30 metr o uchder, rhwng traethau ysblennydd Broadhaven a Barafundle.

Darganfuwyd arteffactau yn ystod cloddiadau archaeolegol blaenorol ar y safle a chasglwyd tystiolaeth bod pobl yn byw yma o'r oes Fesolithig hyd y cyfnod Rhufeinig cynnar a bod y tir yn cael ei drin hyd yr unfed ganrif ar bymtheg. Fodd bynnag, mae'n bosibl i'r anheddiad gael ei gladdu deirgwaith gan dywod dros y canrifoedd, gan effeithio'n fawr ar fywydau'r trigolion.

Credir i'r cyfnod cyntaf o ffurfio twyni ddechrau yn yr Oes Efydd Ddiweddar, tua 3,500 o flynyddoedd yn ôl, ac i hyn barhau'n ysbeidiol am ychydig o ganrifoedd. Mae tystiolaeth hefyd fod cyfnod arall o symudiad tywod wedi arwain at gladdu anheddiad a oedd yno yn yr Oes Haearn tua 2,200 o flynyddoedd yn ôl. Yn olaf, credir bod cyfundrefnau caeau canoloesol wedi cael eu claddu gan dywod yn ystod stormydd erbyn yr unfed ganrif ar bymtheg.

Revealing past environments

During the spell of warm weather in March, the team from Aberystwyth University visited the Stackpole Estate in Pembrokeshire to investigate the dunes of Stackpole Warren. This National Nature Reserve lies between the spectacular beaches of Broadhaven and Barafundle, where a series of sand dunes have accumulated on top of the 30-metre-tall limestone cliffs.

Previous archaeological excavations carried out around the site have recorded artefacts and evidence that indicate human occupation spanning the Mesolithic to the early Roman period and agriculture into the sixteenth century. However, it is suggested that three separate phases of wind-blown sand invaded the settlement site, which undoubtedly would have had a significant impact on the lives of the inhabitants.

The first period of dune building is thought to have begun in the Late Bronze Age, around 3,500 years ago, which may have continued sporadically for a few centuries. There is evidence for a separate phase of sand movement during the Iron Age occupation period around 2,200 years ago, and finally it is thought that medieval field systems were buried by wind-blown sand by the sixteenth century.

Y tîm CHERISH o Brifysgol Aberystwyth yn cymryd creiddiau o Dwyni Stagbwll. Llun drwy garedigrwydd Paul Culyer, Cyfoeth Naturiol Cymru.

The CHERISH team from Aberystwyth University coring the sand dunes of Stackpole Warren in Pembrokeshire. Image courtesy of Paul Culyer, NRW.

Awyrlun o Dwyni Stagbwll, Sir Benfro, gyda Llynnoedd Bosherton y tu hwnt iddynt (Hawlfraint y Goron CBHC AP_2007_1831).
Aerial photograph of Stackpole Warren, Pembrokeshire, with Bosherton Lily Ponds beyond (Crown Copyright RCAHMW AP_2007_1831).

Mae'r symudiadau tywod cyfnodol hyn yn rhoi darlun hynod ddiddorol i ni o newid amgylcheddol a newid hinsawdd posibl – a all fod wedi digwydd hefyd ar safleoedd arfordirol eraill y mae CHERISH yn ymchwilio iddynt. Ein nod yw rhoi prawf ar y llinell amser hon o ddigwyddiadau drwy ddyddio'r tywod yn Labordy Ymchwil Ymoleuedd Aberystwyth. Mae'r dechneg hon yn mesur yr egni sy'n crynhoi yn adeiledd crisialog gronynnau tywod o ganlyniad i belydriad cefndir naturiol a chyfrifo am ba hyd y gall y tywod fod wedi aros yn ei leoliad presennol. Gan ddefnyddio creiddiwr taro, tyllwyd drwy'r maes twyni yn Stagbwll mewn tri lle gwahanol i godi samplau y gobeithiwn y byddant yn dangos pryd y ffurfiodd y twyni ac yn helpu i wella ein dealltwriaeth o newid amgylcheddol ehangach ar hyd yr arfordir.

Ym mis Mai, ymunodd y tîm CHERISH o Brifysgol Aberystwyth â chydweithwyr o'r Rhaglen Ddarganfod am ryw bythefnos o waith creiddio yn Kerry, de-orllewin Iwerddon. Y rhanbarth hwn yw un o ardaloedd gwlypaf Ewrop, felly roedd y tîm yn ffodus i fwynhau deg diwrnod o awyr las a heulwen gynnes ar gyfer y rhaglen greiddio ar safleoedd ar hyd arfordir dramatig Swydd Kerry. Yn

This periodicity of sand movement presents an intriguing picture of environmental change and possibly climatic change that may be replicated at other coastal sites that CHERISH is investigating. Our aim is to test this timeline of events by dating the sand using our Aberystwyth Luminescence Research Laboratory. This technique aims to measure energy that accumulates in the crystalline structure of sand grains from natural, background radiation and to calculate how long the sand may have remained in its current location. Using a percussion corer, we therefore cored through the dune field at Stackpole in three different locations to recover samples that we hope will provide a clear timeframe for the formation of the dunes and help increase our understanding of wider coastal environmental change.

In May the CHERISH team from Aberystwyth University joined colleagues from the Discovery Programme for nearly two weeks of joint-nation coring in Kerry, south-west Ireland. The region is one of the rainiest parts of Europe, so the team was fortunate to have ten days of blue skies and warm sunshine for a coring programme at sites on the dramatic coast of County Kerry. At

Toriad drwy graidd a gymerwyd o Lough Gill, Castlegregory.

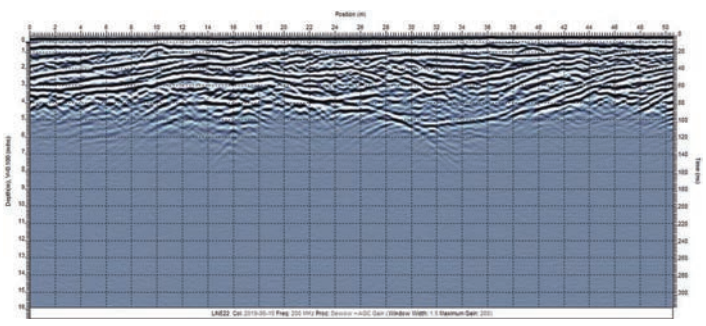
A section of core from Lough Gill, Castlegregory.

Ballinskelligs, mae'r Priordy Awstinaidd a sefydlwyd gan fynaich o ynys Skellig Michael yn y ddeuddegfed ganrif dan fygythiad erydiad arfordirol. Yn yr un modd, mae'r môr yn bygwth tŵr McCarthy Mór nid nepell i ffwrdd. Er mwyn darparu cyd-destun hirdymor ar gyfer y newidiadau hyn, tyllwyd creiddiau gwaddod o dri safle yn y cyffiniau: y fawnog yn Emlagh, gwern gyrs fewndirol ger yr harbwr, a mawn sydd wedi'i ddinoethi ar flaendraeth Emlagh.

Yn Ballyferriter ar Benrhyn Dingle, mae olion anheddiad amddiffynedig i'w gweld ar y pentir cul trawiadol sy'n ffinio ar Ferriter's Cove. Wrth i rai o aelodau'r tîm gasglu data magnetig o'r safle, bu Patrick Robson a Henry Lamb yn cymryd creiddiau o wern gerllaw sy'n llenwi sianel gul rhwng y cildraeth a Harbwr Smerwick. Hefyd cafwyd craidd o ymyl Lough Gill, llyn bas sy'n ffinio ar dwyni tywod ger Castlegregory ar ochr ogleddol Penrhyn Dingle. Mae'r creiddiau bellach yn ôl yn y labordy yn Aberystwyth yn barod ar gyfer dadansoddi palaeoecolegol a geocemegol, a ddylai roi amcan o newidiadau arfordirol yn y gorffennol, gan gynnwys stormydd mawr (ar sail tywod wedi'i chwythu gan y gwynt sydd yn y gwaddodion mawn).

Ballinskelligs, the Augustinian Priory founded by monks from the island of Skellig Michael in the twelfth century is threatened by coastal erosion. Similarly, the sea is encroaching on the nearby McCarthy Mór tower. In order to provide long-term context for these changes, we obtained sediment cores from three sites in the vicinity: the peat bog at Emlagh, a reedswamp inland from the harbour, and exposed peats on the Emlagh foreshore.

At Ballyferriter on the Dingle Peninsula, the remains of a fortified settlement are evident on the remarkable narrow promontory bordering Ferriter's Cove. While part of the team gathered magnetic data from the site, Patrick Robson and Henry Lamb cored a nearby marsh that occupies a shallow channel between the cove and Smerwick Harbour. We also obtained a core from the margin of Lough Gill, a shallow lake bordered by sand dunes near Castlegregory on the north side of the Dingle Peninsula. The cores are now back in the lab at Aberystwyth ready for palaeoecological and geochemical analysis, which should provide an insight into past coastal changes, including storm events from traces of windblown sand in the peat sediments.



Enghraifft o ddata treiddio'r ddaear crai yn dangos y gwahanol adeileddau o dan yr wyneb yn y Borth. Drwy garedigrwydd Charlie Bristow.

An example of raw ground-penetrating data from Borth, Ceredigion, showing the different sub-surface structures. Courtesy of Charlie Bristow.

Rhwng cawodydd trwm mis Mehefin, roedd y tîm allan yn y maes yn Y Borth, Ceredigion hefyd yn ymchwilio i ddatblygiad tafod Y Borth/Ynys-las ac am ba hyd y bu yn ei safle presennol. Rydym eisoes wedi cymryd creiddiau o ychydig o gefnennau traeth siâp-arc y gellir eu gweld o ddelweddaeth o'r awyr megis LiDAR, ac rydym wrthi'n dyddio'r tywod a'r gwaddodion sy'n gorwedd dros y mawn sy'n ffurfio ymyl Cors Fochno. Rydym ni'n defnyddio dyddio ymoleuedd yma gan ein bod ni'n gobeithio darganfod pryd y dyddodwyd y tywod gyntaf a faint o amser a gymerodd iddo grynhoi. Casglwyd hefyd ddata radar treiddio'r ddaear (GPR) ar hyd trawsluniau rhwng Y Borth ac Ynys-las er mwyn cael gwybodaeth am adeiledd y tafod. Mae'r gwaith arbenigol hwn yn cael ei wneud ar y cyd â'r Athro Charlie Bristow a Lucy Buck, myfyrwraig PhD o Birkbeck, Prifysgol Llundain.

In between the downpours of June, the team were also out in the field at Borth, Ceredigion, investigating the development of the Borth-Ynyslas spit and how long it has been in its current location. We have already cored through a few of the arc-shaped beach ridges that are visible from airborne imagery such as LiDAR, and we are in the process of dating the sands and sediments that overlay the peat that forms the edge of Cors Fochno. Here we are employing luminescence dating as we hope to establish when the sands were first deposited, and how long they took to accumulate. Ground penetrating radar (GPR) data along transects between Borth and Ynyslas (see 'CHERISH in focus', below) was also gathered to understand the structure of the spit. This specialist work is being undertaken in collaboration with Professor Charlie Bristow and PhD student Lucy Buck from Birkbeck, University of London.

Awyrlun o Warchodfa Natur Genedlaethol Ynys-las, Ceredigion, 2017.
Aerial photograph of Ynyslas National Nature Reserve, Ceredigion, 2017.

YMGYSYLLTU / ENGAGEMENT

Mae ymgysylltu â'r cyhoedd yn agwedd bwysig iawn ar y prosiect CHERISH, ac yn ystod y gaeaf a'r gwanwyn 2019 cynhaliwyd nifer o sgyrsiau a digwyddiadau a fynychwyd gan fwy na 1700 o bobl. Mae proffil a chyrhaeddiad y prosiect CHERISH ar gyfryngau cymdeithasol yn parhau i dyfu a chyrhaeddwyd 1000 o ddilynwyr ar Facebook yn gynnar yn y flwyddyn ac rydym bellach yn agosáu at 1500. Mae postiadau'n parhau i gynyddu ac wedi cyrraedd dros 580,000. Ein postiad mwyaf poblogaidd fu gwaith CHERISH ar Illauntannig yn Swydd Kerry sydd hyd yma wedi cyrraedd bron 30,000 o bobl.

Mae'r tîm CHERISH yn parhau i ledaenu'r neges am y prosiect ar hyd a lled Ewrop a bu aelodau'r tîm yn mynychu cynadleddau yng Ngwlad Pwyl, Croatia, a'r Iseldiroedd, ac yn nes at adref yng Nghaeredin, Caerdydd, Leeds, a Stockport. Nodir rhai o'r uchafbwyntiau isod.

Seminar Awyr a Daear a'r Ysgol Arolygu o'r Awyr

Ar 4 Mehefin yn y Gerddi Botaneg Cenedlaethol yn Nulyn, cynhaliodd y Rhaglen Ddarganfod seminar proffesiynol CHERISH llwyddiannus, 'Air and Earth 2: Developments in Aerial Archaeology', a fynychwyd gan 70 o gynrychiolwyr. Cynhaliwyd y seminar di-dâl fwy na deng mlynedd ers i'r Cyngor Treftadaeth gynnal cynhadledd (2005) a chyhoeddi ei adolygiad (2008) ar ddefnyddio Archaeoleg o'r Awyr yn Iwerddon. Cafodd y papurau o Iwerddon, Cymru, yr Alban, a Lloegr eu cyflwyno mewn pedair sesiwn ar y themâu canlynol:

Public engagement is a large part of the CHERISH project, and winter and spring 2019 saw a number of CHERISH talks and events in which we engaged with over 1700 people. The social media profile and reach of the CHERISH project continues to grow and we hit our 1000th follower on Facebook early in the year and are now closing in on 1500 followers. Post reaches are continuing to grow and are now in excess of 580,000. Our most popular post has been the CHERISH work on Illauntannig in County Kerry which has so far reached nearly 30,000 people.

The CHERISH team continue to spread the word about the project across Europe with members of the team attending conferences in Poland, Croatia, the Netherlands, and closer to home in Edinburgh, Cardiff, Leeds, and Stockport. Below are some of the highlights.

Air and Earth 2 Seminar and Aerial Survey School

On June 4 in the National Botanic Gardens, Dublin, the Discovery Programme organised a successful CHERISH professional seminar, 'Air and Earth 2: Developments in Aerial Archaeology', attended by 70 delegates. The free seminar was held more than a decade since the Heritage Council hosted a conference (2005) and published its review (2008) on the application of Aerial Archaeology in Ireland. Papers from Ireland, Wales, Scotland and England ranged across four sessions: *Recent Aerial*

Rob Shaw yn siarad yn y seminar Awyr a Daear.
Rob Shaw speaking at 'Air and Earth Seminar 2'.

Un o'r myfyrwyr yn tynnu llun o Fryn Tara yn ystod Ysgol Hedfan CHERISH.
A student photographs the Hill of Tara during the CHERISH Flying School.

James Barry o Arolwg Daearegol Iwerddon yn cyfarwyddo cynrychiolwyr Ysgol Hedfan Dronau CHERISH cyn arolwg.
James Barry of the GSI briefs delegates of the CHERISH UAV Flying School before a survey.

Yr ysgol hedfan – myfyrwyr hapus!
Flying school – happy students!

Darganfyddiadau diweddar o'r awyr, Archifau awyrluniau, LiDAR a dulliau synhwyro o bell eraill, ac *Addysg ac ymwneud y gymuned.*

Discoveries, Aerial Photographic Archives, Lidar and other remote sensing methods and *Education and community involvement.*

Y digwyddiad nesaf ar ôl y seminar hwn oedd Ysgol Arolygu o'r Awyr deuddydd. Pwrpas yr ysgol oedd darparu hyfforddiant mewn rhagchwilio o'r awyr ac arolygu â dronau i'r 13 chynrychiolydd, a darparu sesiynau ystafell dosbarth mewn gwesty yn Leixlip. Arweiniwyd elfen arolygu'r ysgol gan dri thiwtor, sef Robert Shaw (y Rhaglen Ddarganfod), a James Barry a Ronan O'Toole (Arolwg Daearegol Iwerddon), a lleoliad yr hyfforddiant oedd yr Hill of Uisneach, Swydd Westmeath. Cyflwynwyd y myfyrwyr i systemau drôn adain-sefydlog a rotor, a thrafodwyd dewisiadau ar gyfer mapio 3D tra manwl, delweddaeth arosgo, a chipio fideo. Hoffem ddiolch yn fawr am gael caniatâd i hedfan dronau dros y dirwedd gysegredig hon ac am y croeso cynnes. Parhaodd yr ysgol hedfan ym Maes Awyr Weston yn Nulyn, dan arweiniad yr hyfforddwyr Toby Driver (Comisiwn Brenhinol) a Damian Grady (Historic England). Mwynhaodd y cynrychiolwyr fwy na phum awr o hedfan a thynnu lluniau o nodweddion archaeolegol o'r awyr yn ystod y ddau ddiwrnod – ac wrth lanio am y tro olaf ar y maes awyr cawsom y pleser o weld enfys fendigedig. Roedd y llwybr hedfan yn caniatáu i'r myfyrwyr dynnu lluniau o Gastell Trim, Bryn Tara, a Safle Treftadaeth Byd Bru Na Boinne.

A two-day CHERISH Aerial Survey School followed the successful 'Air and Earth 2' seminar. The school was designed to provide 13 delegates with training in active aerial reconnaissance and UAV survey over two days, with classroom sessions based at a hotel in Leixlip. The survey side of the UAV school, led by tutors Robert Shaw (Discovery Programme), James Barry and Ronan O'Toole (GSI), was based at the Hill of Uisneach, County Westmeath. Delegates were introduced to both fixed wing and rotor UAV systems, looking at options for precision 3D mapping, oblique imagery and video capture. A big thank-you to our hosts who kindly gave permission to fly over this sacred landscape and made our groups very welcome. The flying school continued at Weston Airport in Dublin led by instructors Toby Driver (Royal Commission) and Damian Grady (Historic England). Delegates enjoyed more than five hours flying and aerial archaeology over the Irish landscape during the two days - and our final descent to the airfield was even marked by a glorious rainbow. The flight path allowed the students to take pictures of Trim Castle, the Hill of Tara, and Bru Na Boinne World Heritage Site.

Yr ysgol hedfan – glanio ym Maes Awyr Weston.

Flying school – landing at Weston Airport, Dublin.

2il Sgowtiaid Môr Port Dunmore East ar fwrdd yr RV Keary yn dathlu Diwrnod Morwrol Ewrop a Gŵyl Harbwr Dunmore East.
The 2nd Port Dunmore East Seascouts on board the RV Keary celebrating European Maritime Day and the Dunmore East Harbour Festival.

Dyddiau agored ar ein llongau arolygu a theithiau cerdded

Cyn i'r tymor arolygu ddechrau, rydym wedi bod allan yn cyfarfod â'r cyhoedd ar fwrdd llongau ac ar deithiau cerdded ar hyd yr arfordir. Aeth Kieran Craven o Arolwg Daearegol Iwerddon ag aelodau o Ymddiriedolaeth Bywyd Gwyllt Iwerddon ar daith gerdded ar hyd Traeth Killiney, Swydd Dulyn, ar 31 Mawrth lle trafodwyd gwaith y tîm CHERISH ac effeithiau newid arfordirol.

Survey vessel open days and walks

In advance of the survey season, we have been out and about meeting members of the public on board the vessels and during coastal walks. Kieran Craven from Geological Survey Ireland took members of the Irish Wildlife Trust on a coastal walk along Killiney Beach, County Dublin, on 31 March where the work of the CHERISH team and the impacts of coastal change were discussed.

Yr RV Keary wedi'i hangori yn Harbwr Dunmore East, Swydd Waterford.

The RV Keary berthed at Dunmore East Harbour, County Waterford.

Mewn cysylltiad â Diwrnod Morwrol Ewrop, ac ar yr un pryd â Gŵyl Harbwr Dunmore East (yn dathlu mwy na 200 mlynedd), cawsom ddau ddiwrnod o ymweliadau ar fwrdd yr RV Keary ar 18 a 19 Mai. Tywynnodd yr haul, a daeth mwy na 250 o bobl i fwynhau'r achlysur. Roedd treftadaeth forwrol gref Waterford yn amlwg, gyda physgotwyr, criw hofrennydd gwylio'r glannau, personél chwilio ac achub, a sgowtiaid môr i gyd yn dod i'n gweld, ynghyd â phobl eraill yr oedd ganddynt ddiddordeb yn y maes (gan gynnwys côr a fu'n canu ar y dec blaen!). Gwnaed rhai cysylltiadau gwych, a chawsom sgyrsiau difyr iawn am longddrylliadau yn yr ardal. Hefyd fe gyfarfu'r tîm â rhywun a anwyd yn Rosslare Fort (un o'r safleoedd niferus y mae CHERISH yn ymchwilio iddo) ac a roddodd fanylion arlunydd lleol sydd wedi paentio nifer o ddarluniau o'r gaer.

Dilynwyd y digwyddiad llwyddiannus hwn gan un arall a gynhaliwyd ar 24 a 25 Mai yn Kilmore Quay, tref arall â hanes morwrol cyfoethog. Cawsom gyfweliad radio 10-munud hyd yn oed ar raglen Alan Corcoran, 'Morning Mix', ar South East Radio, a helpodd i dynnu sylw gwrandawyr at ein gweithgareddau yn yr harbwr.

Linking up with the European Maritime Day and coinciding with the Dunmore East Harbour Festival (celebrating over 200 years), we had two days of visits aboard the RV Keary on 18 and 19 May, when the sun shone and over 250 people came on board. The strong maritime culture of Waterford came through with fishermen, coastguard helicopter crew, search and rescue personnel, and sea scouts all coming on board, along with interested members of the public (including a choir singing on the front deck!). Some great connections were made, with great chats had about the shipwrecks in the area, and the team meeting someone born in Rosslare Fort (one of the many CHERISH sites under investigation) and directed to a local artist who has painted the fort in various guises.

This event was followed by another successful event on 25 and 25 May in Kilmore Quay, another town rich in maritime history. We even had a 10-minute radio interview slot on the Alan Corcoran Morning Mix on South East Radio, which helped point listeners towards the harbour.

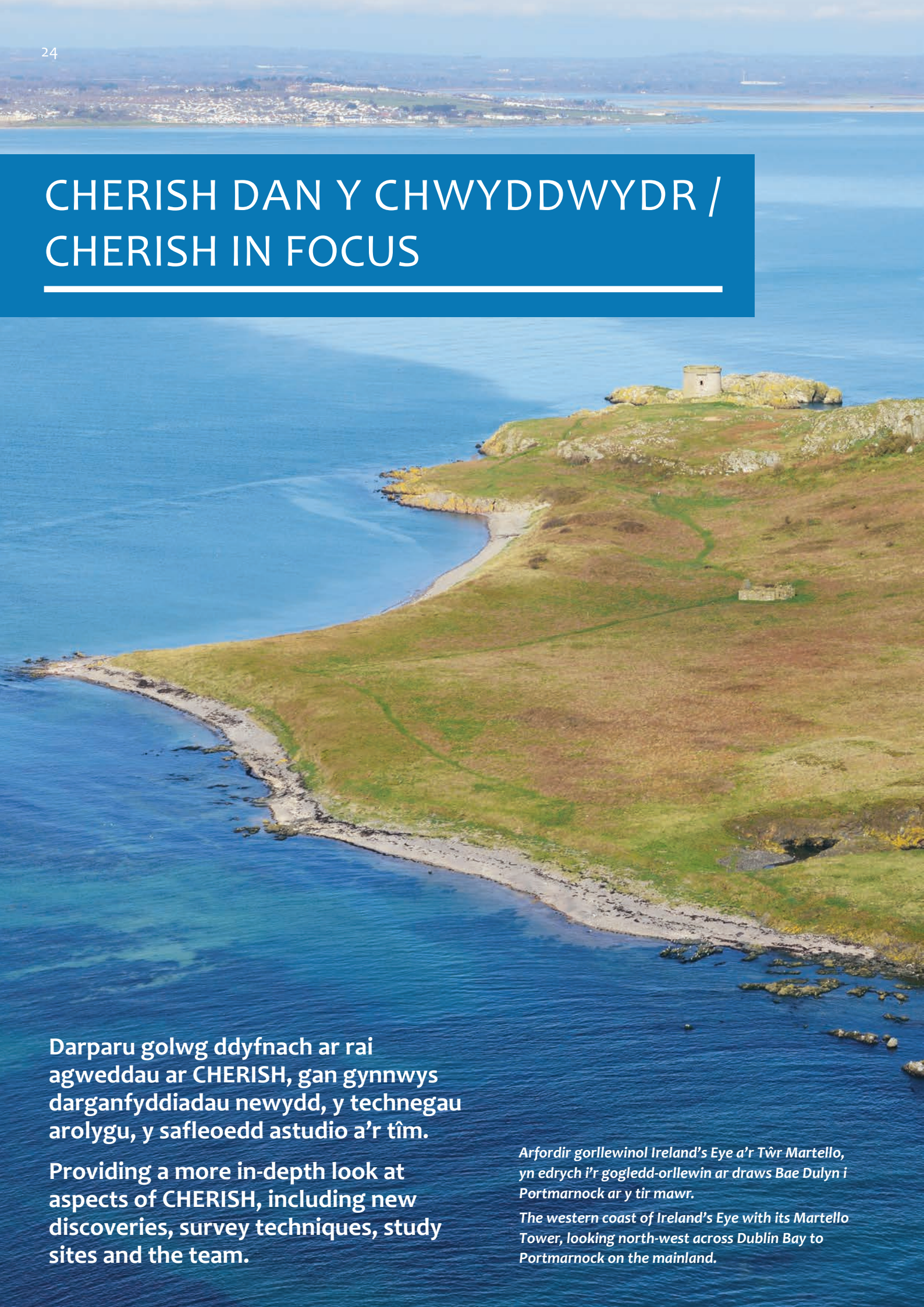
Ymddiriedolaeth Bywyd Gwyllt Iwerddon gyda CHERISH ar Draeth Killiney, Swydd Dulyn yn edrych ar effeithiau newid arfordirol.

The Irish Wildlife Trust with CHERISH on Killiney Beach, County Dublin looking at the impacts of coastal change.

Mae'r tîm hefyd wedi cynnal sawl sgwrs gyda'r nos i sirioli nosweithiau tywyll y gaeaf ac wedi siarad â grwpiau cymunedol a hanesyddol lleol yn ardaloedd y prosiect yng Nghymru. Bwriadwn gynnal llawer mwy o sgyrsiau a theithiau cerdded yn y dyfodol – gwelwch y manylion yng nghefn y newyddlen.

The team have also held several evening talks to brighten up the winter nights and have talked to local community and historical groups throughout the project areas in Wales. Many more talks and walks are planned for the future, so check out the dates for your diary section at the back of the newsletter.

CHERISH DAN Y CHWYDDWYDR / CHERISH IN FOCUS



Darparu golwg ddyfnach ar rai agweddau ar CHERISH, gan gynnwys darganfyddiadau newydd, y technegau arolygu, y safleoedd astudio a'r tîm.

Providing a more in-depth look at aspects of CHERISH, including new discoveries, survey techniques, study sites and the team.

Arfordir gorllewinol Ireland's Eye a'r Tŵr Martello, yn edrych i'r gogledd-orllewin ar draws Bae Dulyn i Portmarnock ar y tir mawr.

The western coast of Ireland's Eye with its Martello Tower, looking north-west across Dublin Bay to Portmarnock on the mainland.

A CHERISH STUDY SITE: IRELAND'S EYE / SAFLE ASTUDIO CHERISH: IRELAND'S EYE

Mae gan Ireland's Eye hanes hynod ddiddorol gan ei bod yn ffurfio rhan o'r gadwyn o ynysoedd ym Môr Iwerddon sydd wedi dylanwadu ar fasnach, patrymau symudiad arforol, a rhyngweithiadau o'r cyfnod cynhanesyddol hyd at yr oes fodern ym Mharth Môr Iwerddon. Heddiw, gellir gweld llawer o dystiolaeth o sut mae cymdeithasau'r gorffennol wedi rhyngweithio â'r ynys: ar ei safleoedd cynhanesyddol, mewn darganfyddiadau o'r cyfnod Rhufeinig, yn yr eglwysi cynnar, mewn adroddiadau cynnar ar anheddiadau mynachaidd a chyrchoedd y Llychlynwyr, yn y tyrau amddiffynnol a godwyd adeg Rhyfeloedd Napoleon, a hyd yn oed mewn straeon am lofruddiaethau. Mae Ireland's Eye oddi ar arfordir gogleddol Dulyn.

Ym mis Ionawr 2019, aeth y tîm CHERISH yno i gasglu mwy o wybodaeth archaeolegol am yr ynys a cheisio deall yn well sut mae newid hinsawdd yn effeithio arni. Mae Ireland's Eye yn wahanol i safleoedd eraill sy'n cael eu hastudio gan mai croniant yw'r brif broses arfordirol sydd ar waith ar ei harfordir gorllewinol. Proses lle mae gwaddodion yn tyfu neu'n cynyddu o ganlyniad i ddyddodi defnydd ychwanegol yw croniant. Arfordir caled sydd i'r gogledd, y de a'r dwyrain o'r ynys.

Mae'r *Dinnseanchus* yn dweud wrthym mai enw'r ynys yn wreiddiol oedd Inis-Ereann (ynys Eria); credir mai menyw oedd Eria. Wedyn newidiodd yr enw i Inis-mac-Nessan, enw sy'n deillio o dri mab Nessan, un o dywysogion teulu brenhinol Leinster. Daw'r enw presennol, 'Ireland's Eye', o ffurf wedi'i Seisnigeiddio o enw'r Llychlynwyr am Inis-Ereann, lle mae *ey* yn dynodi 'island'. Y dystiolaeth weladwy gynharaf o weithgarwch ar yr ynys yw'r caerau pentir sy'n gysylltiedig â'r Oes Haearn fel rheol. Cyn yr arolwg hwn, nid oedd ond un gaer bentir wedi'i chofnodi ar yr ynys a bydd y tîm yn diweddaru'r cofnod o safleoedd a henebion wrth ddod o hyd i safleoedd newydd. Mae darnau arian Rhufeinig wedi'u darganfod ar yr ynys hefyd. Daethpwyd o hyd i ddarn copr o gyfnod Magnentius (OC 350–353), y Trawsfeddiannwr o Gâl, o fathdy Amiens mae'n debyg, yn ystod aredig yng nghornel dde-ddwyreiniol yr ynys ym mis Mawrth 1868. Daethpwyd o hyd i ddarn copr o gyfnod Cystennin Fawr (OC 306–337), a

Ireland's Eye, off the north Dublin coast, has a fascinating story to tell as it forms part of the Irish Sea chain of islands that have influenced trade, maritime movement patterns, and interactions from prehistory through to modern times in the Irish Sea Zone. Today, much evidence of how past societies have interacted with the island can be seen in its prehistoric sites, Roman finds, early churches, historical accounts of monastic settlements and Viking raids, Napoleonic era defence towers, and even murder mysteries.

In January 2019, the CHERISH team visited Ireland's Eye in order to add to the current archaeological record for the island alongside developing an understanding of how this Island is being affected by climate change. Ireland's Eye differed from other case-study sites as it was noted that accretion was the main coastal process in action along the western coast. Accretion is a process whereby there is a growth or increase in sediments due to additional materials being deposited. A hard coastline dominates the north, south and east of the Island.

The *Dinnsennchus* tells us that originally the Island was known as Inis-Ereann (island of Eria), Eria is believed to have been a woman. Afterwards the island name changes to Inis-mac-Nessan, from the three sons of Nessan, a prince of the Royal family of Leinster. The present name 'Ireland's Eye' comes from an Anglicisation of the Viking name for Inis-Ereann, where *ey* denotes 'island'. The earliest evidence of activity visible on the Island takes the form of promontory forts, typically associated with the Iron Age. Prior to this survey, only one promontory fort was recorded on the island and the team will update the sites and monuments record with the newly identified sites. Potential contemporary activity is revealed in Roman coins found on the island. A copper coin of the Gallic Usurper Magnentius (AD 350–353), probably from the Amiens mint, was recovered during ploughing in March 1868 in the south-east corner of the island. A copper coin of Constantine the Great (AD 306–337), struck at the London mint *c*. AD 310, was found

Yn nesáu at Ireland's Eye mewn awyren o'r de ar dywydd llonydd iawn, Mawrth 2019.
Approaching Ireland's Eye from the south from the air in remarkably still conditions, March 2019.

fathwyd yn Llundain *c*. OC 310, ar ddiwedd y 1920au. Mae hyn yn dangos bod yna gysylltiadau rhwng Iwerddon Oes yr Haearn ac Ewrop Rufeinig.

Cododd tri mab Nessan (Dicholla, Munissa a Nadsluagh) eglwys ar yr ynys. Cyfeirir at yr eglwys fel Kilmacnessan neu Eglwys Sant Nessan, a dywedir i'r tri brawd sefydlu mynachlog yma yn y chweched ganrif. Ymddengys fod meibion Nessan yn ddynion sanctaidd, ac i'w heglwys gael ei sefydlu tua OC 570. Mae 'garlant Howth', llyfr efengylau goliwiedig, sydd bellach yng Ngholeg y Drindod Dulyn, yn gysylltiedig â'r fynachlog gynnar, gan awgrymu ei bod yn sefydliad cyfoethog. Mae Cochrane (1893) yn amau a gafodd yr eglwys ei sefydlu yn y chweched ganrif ond yn credu iddi gael ei chodi cyn 1235 pan drosglwyddwyd yr eglwys i'r tir mawr. Darganfuwyd eirch carreg ger yr eglwys yn ystod aredig ym 1868, sy'n awgrymu bod mynwent yn gysylltiedig â hi. Awgrymir i'r eglwys gorff-a-changell gael ei chodi yn y ddeuddegfed ganrif, gydag un fynedfa yn y mur gorllewinol. Ategir hyn gan nodweddion pensaernïol cyffelyb yn Eglwys St Michael le Pole a'r dystiolaeth ddogfennol sy'n awgrymu iddi gael ei hadeiladu cyn 1235. Nid oes unrhyw dystiolaeth weladwy o'r eglwys gyn-Normanaidd – dim croesfeini, lloc crwn nac olion pensaernïol. Cafodd yr eglwys ei hadfer yn sylweddol yn y bedwaredd ganrif ar bymtheg.

Mae *Annals of the Four Masters* yn nodi i'r ynys gael ei rhoi dan warchae gan Dramorwyr o Ddulyn yn OC 897 a'i hysbeilio yn OC 960. Mae'n disgrifio sut y sefydlodd y

on the island in the late 1920s. These coins offer evidence of Iron Age Ireland's interaction with Roman Europe.

The three sons of Nessan (Dicholla, Munissa and Nadsluagh) erected a church on the island. The church is referred to as Kilmacnessan or St Nessan's Church and the three brothers reputedly founded a monastery here in the sixth century. The sons of Nessan appear to have been holy men, and the date for their church's foundation appears to be about AD 570. The 'garland of Howth', an illuminated gospel-book, now in Trinity College Dublin, is associated with the early monastery and suggests it was a wealthy foundation. Cochrane (1893) debates a sixth century origin for the church but believes it dates before 1235 when the church was transferred to the mainland. Ploughing exposed stone coffins in close proximity to the church in 1868, indicating an associated cemetery. A twelfth century date is suggested for the nave-and-chancel church with a single entrance in the west wall. This is supported by architectural parallels with the Church of St Michael of Pole and the documentary evidence which dates it to pre-1235. There is no visible evidence of the pre-Norman foundation, no cross-slabs, circular enclosure or architectural fragments. The church was heavily restored in the nineteenth century.

The *Annals of the Four Masters* says the island was besieged by Foreigners from Dublin in AD 897 and plundered in 960. The *Annals of the Four Masters* details

Llychlynwyr wersyll ar yr ynys a roddwyd dan warchae gan y lluoedd Gwyddelig, a sut y cafodd y fynachlog ei hysbeilio gan lynges Lychlynnaidd wedyn. Adeiladwaith amlwg iawn arall, yn rhan ogledd-orllewinol yr ynys, yw'r Tŵr Martello. Cafodd ei godi ym 1805/06 fel rhan o'r amddiffynfeydd arfordirol yn Iwerddon adeg Rhyfeloedd Napoleon. Mae llawer o'r newidiadau gweladwy sy'n gysylltiedig â'r ynys yn deillio o'r gwaith adeiladu hwn, o'r harbwr yn y gogledd-orllewin i'r llwybrau a'r arwyddion ffordd.

Ym mis Mawrth 2019, ymunodd Rob o'r Rhaglen Ddarganfod â Toby o'r Comisiwn Brenhinol i wneud hediad lefel-isel dros Ireland's Eye er mwyn tynnu lluniau ar gyfer casgliad newydd o awyrluniau cydraniad-uchel o'r ynys (gweler 'Uchafbwyntiau' uchod). Bydd y tîm CHERISH yn parhau â'i waith maes cyffrous yma yn hanner olaf 2019. Yn ystod digwyddiad Wythnos Treftadaeth ar yr ynys ar 17 Awst bydd aelodau'r tîm yn ymuno â Clean Coasts i lanhau traeth a mynd ar daith archaeolegol a daearegol. Oherwydd y croniant sy'n digwydd ar ochr orllewinol yr ynys, mae defnyddiau gwastraff yn cael eu dyddodi yno yn ogystal â gwaddodion traeth.

Os hoffech fynychu'r digwyddiad hwn neu unrhyw ddigwyddiad CHERISH arall, cysylltwch ag **info@cherishproject.eu**

how in the late ninth century the Vikings made an encampment which was besieged by Irish forces. Moreover, in 960, a Viking fleet plundered the monastery. Another highly visible structure that dominates the north-west of the island is a Martello tower. It was established on the island in 1805/1806 as part of the Napoleonic era coastal defence system along the Irish coastline. Many of the visible alterations associated with the islands are a by-product of this construction work, from the harbour on the north-west of the island to the pathways and way markers.

In March 2019 Rob from the Discovery Programme joined Toby from the Royal Commission for low-level aerial reconnaissance over Ireland's Eye, obtaining a new collection of high-resolution aerial photographs of the island (see 'Highlights', above). The CHERISH team are looking forward to progressing their fieldwork on the island in the latter half of 2019. A Heritage week event on the island on the 17 August will see the CHERISH team join forces with Clean Coasts to undertake a beach clean alongside an archaeological and geological tour of the island. The accretion occurring on the west side of the island, means that not only beach sediments are being deposited on the coastline but also waste materials.

If you are interested in attending this event of any other CHERISH events, please contact **info@cherishproject.eu**

Yr eglwys ar Ireland's Eye.
The church on Ireland's Eye.

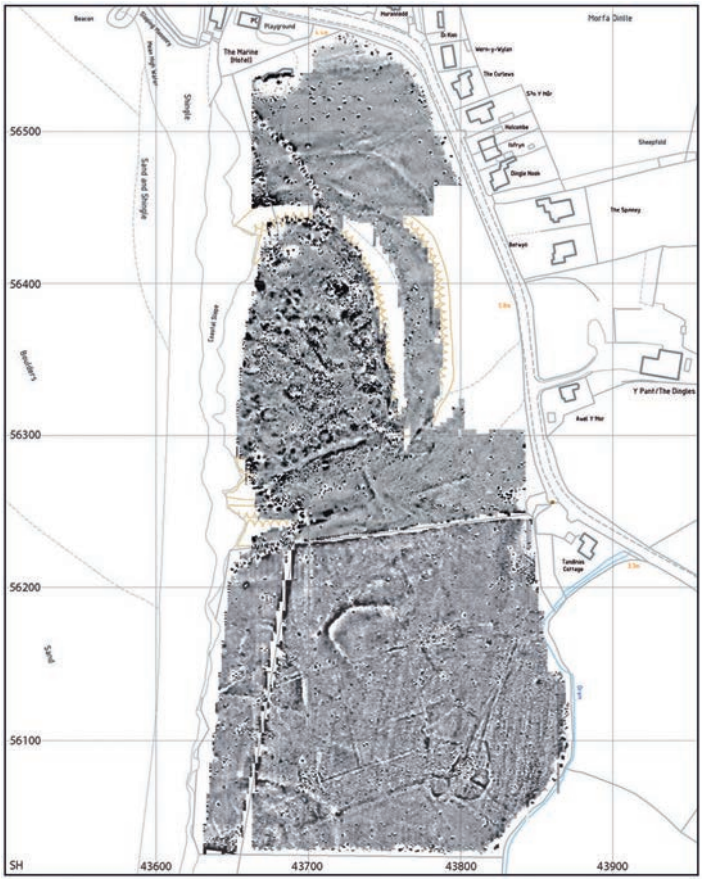
EIN DULL PECYN OFFER: TECHNEGAU AROLYGU – GEOFFISEG ARCHAEOLEGOL / OUR TOOL KIT APPROACH: SURVEY TECHNIQUES – ARCHAEOLOGICAL GEOPHYSICS

Pan feddyliwn am y safleoedd a henebion archaeolegol sy'n cael eu hastudio gennym ar y tir, dim ond hanner y stori yw'r hyn a welwch ar yr wyneb ar ffurf muriau a gwrthgloddiau. Mae gan lawer o henebion nodweddion sydd wedi'u claddu dan wyneb y pridd, megis sylfeini waliau a ffosydd, sy'n cynrychioli hyd a lled cyfan safle archaeolegol. Gallem gloddio popeth i ddarganfod yr holl nodweddion hyn ond byddai hynny'n gostus, a chan fod cloddio'n broses ddinistriol rhaid sicrhau nad yw'n cael ei ddefnyddio ond o dan amgylchiadau penodol.

Yr un fath â meddyg sy'n gallu defnyddio amrywiaeth o dechnolegau, fel pelydrau-X, sganwyr MRI neu uwchsain, i edrych i mewn i'n cyrff a chynnig diagnosis pan fyddwn yn sâl, gall archaeolegwyr ddefnyddio nifer o dechnegau arolygu geoffisegol i edrych o dan wyneb y pridd a darganfod archaeoleg gladdedig. Term cyffredinol yw

For many of the archaeological sites and monuments on land within the CHERISH project, what you see on the surface in the forms of walls and earthwork structures is only half the story. For many monuments there are buried features, including wall foundations and ditches, beneath the surface of the soil which represent the full extent of an archaeological site. To discover these features, we could excavate the complete monument, but this would be costly and, as excavation is a destructive process, we want to make sure that it is only used in specific circumstances.

Like a doctor who can use a range of technologies, such as X-Rays, MRI scanners or ultrasound, to peer inside us to diagnose our ailments, archaeologists can use a range of geophysical survey techniques to look beneath the surface of the soil and identify buried archaeology.



Plot graddlwyd o arolwg magnetometreg o Ddinas Dinlle, Gwynedd.

Grayscale plot of magnetometry survey of Dinas Dinlle, Gwynedd. Gwynedd Archaeological Trust for CHERISH Project, 2018.

Dehongliad o arolwg magnetometreg o Ddinas Dinlle, Gwynedd.

Interpretation of magnetometry survey of Dinas Dinlle, Gwynedd. Gwynedd Archaeological Trust for CHERISH Project, 2018.

arolygu geoffisegol sy'n cynnwys technegau nad ydynt yn fewnwthiol nac yn ddinistriol y gellir eu defnyddio i ganfod nodweddion sydd wedi'u claddu o dan yr wyneb a hynny heb gloddio.

Mae nifer o ddulliau ar gael i ni ar gyfer mesur amrywiadau yn y priodweddau ffisegol o dan yr wyneb ac adnabod nodweddion archaeolegol. Gan ddibynnu ar y math o arolwg sy'n cael ei wneud, gellir adnabod adeiladweithiau, olion gweithgarwch dynol neu arteffactau gan eu bod yn dychwelyd anomaleddau yn y data o'u cymharu â gwerthoedd cefndir y pridd amgylchynol. Gall archaeolegwyr ddefnyddio cyfres o dechnegau cydategol, y mae pob un ohonynt yn eu galluogi i fesur priodwedd wahanol o'r pridd ac adnabod nodweddion archaeolegol o bosibl. Tair o'r technegau a ddefnyddir yn y prosiect CHERISH yw:

Magnetometreg

Techneg geoffisegol oddefol yw magnetometreg (h.y. nid yw unrhyw egni'n cael ei yrru drwy'r pridd) ac mae'n dibynnu ar y ffaith bod gan rai mwynau, sydd i'w cael yn naturiol neu'n cael eu cynhyrchu o ganlyniad i weithgarwch dynol, briodweddau magnetig. Gall y gwahaniaeth hwn mewn magnetedd gael ei achosi gan nodweddion megis ffosydd wedi'u llenwi â silt, ardaloedd wedi'u llosgi neu aelwydydd, pyllau neu dyllau pyst wedi'u mewnlenwi, muriau, ac olion claddedig eraill. Mae magnetedd y nodweddion a gwrthrychau archaeolegol claddedig hyn yn fach iawn o'i gymharu â maes magnetig cefndirol naturiol y Ddaear ac mae'n achosi afluniadau lleoledig bach, neu anomaleddau, ym maes magnetig y Ddaear a all gael eu canfod gan ddyfeisiau sensitif o'r enw gradiomedrau magnetig.

Mae gradiomedrau magnetig yn amrywio o ran siâp a maint, ond mae gan y rhan fwyaf ohonynt ganfodydd ar ffurf tiwb sy'n mesur yr amrywiad yn y llofnod magnetig o dan y pridd o'i gymharu â'r amrywiad cefndirol naturiol a achosir gan y Ddaear. Caiff y dyfeisiau hyn eu 'cerdded' yn systematig ar draws yr ardal i'w harchwilio, gan logio'n barhaus fesuriadau ar gyfer unrhyw olion o dan yr wyneb, yn y gobaith o ddod o hyd i nodweddion archaeolegol claddedig. Gan fod magnetomedrau'n sensitif iawn i fetelau fferrus, rhaid i'r sawl sy'n eu gweithredu sicrhau nad ydynt yn cario unrhyw fetel a allai effeithio ar y canlyniadau.

Geophysical survey is a general term for a range of non-invasive or non-destructive techniques that can be used to detect features buried beneath the surface without digging.

A range of approaches exist using specialist equipment to measure variations in the physical properties below the surface and identify archaeological features. Depending on the type of survey being conducted, structural building elements, traces of human activity or artefacts can be identified as they return significant anomalies in the data from the background values of the surrounding soil. Archaeologists can use a series of complementary techniques each enabling the measurement of a different property of the soil and potentially identify archaeological features. Three of the techniques being used within the CHERISH project include:

Magnetometry

Magnetometry is a passive geophysical technique (i.e. no energy is passed through the soil) and relies on the fact that some minerals, either naturally occurring or produced as a result of human activity, may have magnetic properties. This difference in magnetism can be caused by features such as silted up ditches, burnt areas or hearths, in-filled pits or post holes, walls and other buried remains. The magnetism of these buried archaeological features and objects is very small compared to the natural background magnetic field of the Earth and cause small localised distortions, or anomalies, in the Earth's magnetic field and can be detected by a sensitive devices known as magnetic gradiometers.

Magnetic gradiometers come in different shapes and sizes, but most consist of a tube detector which measures the variation in magnetic signature below the soil from that of the natural background variation caused by the Earth. These devices are walked systematically across the area you wish to investigate, providing continuously logged measurements of any subsurface remains, with the hope of discovering buried archaeological features. As magnetometers are very sensitive to ferrous metals, operators must ensure that they have no metal on their bodies or clothing which could affect the results

Rob Shaw yn gweithredu gradiomedr magnetig synhwyrydd-dwbl Bartington ar safle archaeolegol. Mae angen i grid gael ei osod allan ymlaen llaw drwy GPS cyn defnyddio'r ddyfais hon i wneud arolwg.

Rob Shaw operating the twin sensor Bartington magnetic gradiometer onsite. This device requires a pre-set grid to be laid out by GPS before the survey can be carried out.

Llun o'n gradiomedr magnetig Sensys MXPDA newydd. Mae ganddo bum synhwyrydd wedi'u mowntio ar gert sy'n cynnwys GNSS ar gyfer lleoli'r darlleniadau.

our new Sensys MXPDA magnetic gradiometer which has 5 sensors mounted on a cart system with integrated GNSS for positioning of the readings.

Rydym ni'n defnyddio dau wahanol fath o fagnetomedr i ddarganfod nodweddion archaeolegol sydd wedi'u claddu. Y ddyfais gyntaf, sef yr un safonol ar gyfer llawer o arolygon geoffisegol archaeolegol, yw gradiomedr magnetig Bartington. Mae hwn yn edrych fel pâr o byst rygbi ac mae ganddo ddau synhwyrydd un metr oddi wrth ei gilydd. Bydd yr arolygwr yn cerdded yn systematig dros y safle o fewn gridiau, 20m sgwâr yn aml, gan gario'r ddyfais. Mae gan ein dyfais newydd, y Sensys MXPDA, bum synhwyrydd wedi'u gosod 50cm neu 25cm oddi wrth ei gilydd ar gert sy'n ymgorffori GNSS. Mae'r system Sensys yn ein galluogi i gasglu data'n llawer cyflymach a gallwn arolygu ardaloedd mwy o lawer yn ardaloedd y prosiect.

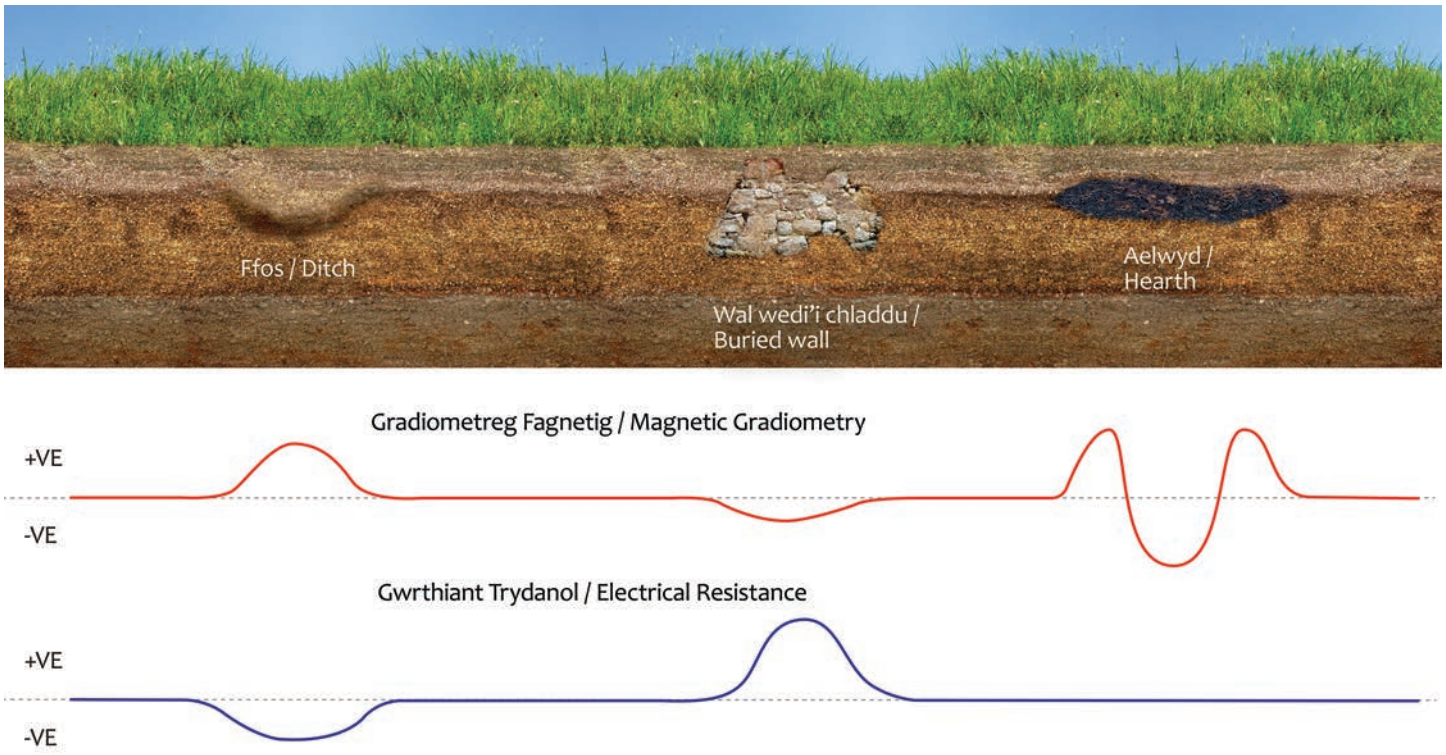
Arolygon Ardal Gwrthiant Trydanol

Techneg geoffisegol weithredol yw gwrthiant trydanol (mae cerrynt trydan yn cael ei yrru drwy'r pridd) ac mae'n dibynnu ar yr egwyddor bod gan nodweddion archaeolegol o dan yr wyneb briodweddau trydanol gwahanol i rai'r pridd amgylchynol. Mae'r dechneg yn mesur gwrthiant trydanol nodweddion claddedig i lif cerrynt trydan. Mae ardaloedd a all gynnwys mwy o ddŵr, megis pydewau, ffosydd a dyddodion organig, yn tueddu i ddangos gwrthiant trydanol is gan fod dŵr yn ddargludydd trydan da. Mewn cyferbyniad, mae sylfeini adeiladau a muriau, sydd wedi'u gwneud o ddefnyddiau

Within the project we are using two different magnetometer devices to find buried archaeological features. The first device which is the standard for many archaeological geophysical surveys is the Bartington magnetic gradiometer. This looks like a pair of rugby posts and consists of two sensors one metre apart which is walked by a surveyor across the archaeological site within systematically laid out grids, often 20m square. Our new device, the Sensys MXPDA, consist of five sensors which are mounted either 50cm or 25cm apart on a cart system with built in GNSS. The Sensys cart system allows for much faster data collection and for greater areas of survey to be carried out within the CHERISH project areas.

Electrical Resistance Area Survey

Electrical resistance is an active geophysical technique (electrical current is passed through the soil) and relies on the principle that subsurface archaeological features display different electrical properties to those of the surrounding soil. The technique measures the electrical resistance presented by buried features to the flow of an electrical current. Areas which can potentially contain more moisture, such as pits, ditches and organic deposits tend to display a lower electrical resistance as water is a good electrical conductor. In contrast, building foundations and walls, composed of more compacted



Toriad delfrydoledig drwy rai nodweddion archaeolegol claddedig gwahanol a'r ymateb anomaledd cysylltiedig yn y mesuriadau geoffisegol mewn arolygon gradiometreg magnetig a gwrthiant trydanol.

Idealised section through some different buried archaeological features and the respective anomaly response in the geophysical measurements in magnetic gradiometry and electrical resistance surveys.

llai mandyllog ac athraidd a mwy cywasgedig, yn cynnwys llai o leithder fel rheol na'r pridd o'u cwmpas a thueddant i ddangos gwrthiant trydanol uwch. Mae'r cyferbyniadau hyn, lle maent yn bodoli, yn ei gwneud hi'n bosibl i ni ganfod a mapio nodweddion archaeolegol na ellir eu gweld. Gan ddibynnu ar y dull gwrthiant trydanol a ddefnyddir, gellir adnabod nodweddion hyd at ddyfnder o ryw 0.5–1.0m.

Fel rheol defnyddir cyfres o bedwar mewnchwilydd (prôb) dur gwrthstaen wrth wneud arolygon gwrthiant trydanol. Mae dau o'r mewnchwilwyr hyn (mewnchwilydd o bell) wedi'u gosod ar ffrâm anhyblyg 50cm oddi wrth ei gilydd a bydd yr arolygwr yn cerdded â hon dros y safle o fewn gridiau fel y rhai a ddisgrifiwyd uchod. Cânt eu rhoi mewn cyffyrddiad â'r ddaear, gan gofnodi'r gwrthiant trydanol lleol yn y man hwnnw. Mae cebl yn cysylltu ail set o fewnchwilwyr dur (sefydlog) â'r ffrâm ac mae'r rhain yn darparu'r gwrthiant trydanol cyfeiriol neu gefndirol ar gyfer y safle. Er bod y dull hwn yn arafach na magnetometreg, mae'n ddefnyddiol ar gyfer adnabod gwaith maen a nodweddion carreg claddedig, ac felly bydd y ddau ddull yn cael eu defnyddio gyda'i gilydd weithiau.

less porous and permeable materials, normally have a lower moisture content than the surrounding soils and tend to show a higher electrical resistance. These contrasts, where they exist, enable subsurface archaeological features to be detected and mapped. Depending upon the electrical resistance method used, archaeology to a depth of around 0.5–1.0m can be identified.

Electrical resistance surveys are normally carried out using a series of four stainless steel probes which are inserted into the ground. Two of these probes (remote probe) are mounted on a rigid frame 50cm apart, and are systematically walked across the site using similar grids as described above and placed into contact with the ground, recording the local electrical resistance at that spot. A second set of steel probes (fixed) is connected to the frame through a trailing cable and provides the reference or background electrical resistance of the site. This method is somewhat slower than magnetometry but can complement this approach especially in the identification of buried masonry and stone features.

Radar Treiddio'r Ddaear (GPR)

Techneg annistrywiol yw radar treiddio'r ddaear. Caiff curiadau o egni electromagnetig ar ffurf tonnau radio amledd-uchel eu tanio i'r ddaear. Caiff y tonnau radio hyn, sy'n debyg i'r rheiny a ddefnyddir i ganfod awyrennau yn yr awyr, eu pylsio i wyneb y ddaear ar gyflymder uchel gan greu atsain sy'n cael ei hadlewyrchu'n ôl oddi ar wahanol nodweddion neu haenau, ac fe gânt eu canfod yn derfynol yn ôl ar yr wyneb gan dderbynnydd. Gan fod y tonnau GPR yn lledaenu drwy wahanol ddefnyddiau ar eu ffordd i lawr at wrthrychau claddedig, bydd eu cyflymder yn newid yn sylweddol gan ddibynnu ar briodweddau ffisegol a chemegol amrywiol y defnyddiau y teithiant drwyddynt. Caiff y tonnau adlewyrchedig eu casglu gan antena'r derbynnydd a'u troi'n radargram, neu ddelwedd o adeiledd y ddaear o dan yr wyneb. Ar ôl cymhwyso topograffi'r wyneb at y data, bydd y radargram yn datgelu natur a siâp y nodweddion sy'n gorwedd islaw.

Defnyddir GPR yn eang ym meysydd archaeoleg a geomorffoleg gan ei fod yn cynnig cydraniad gofodol

Ground Penetrating Radar (GPR)

GPR is a non-destructive technique that fires pulses of electromagnetic energy in the form of high-frequency radio waves into the ground. These radio waves, similar to those used to detect aeroplanes in the sky, are pulsed into the ground surface with a high velocity and the resulting echo is reflected back off different features or layer contacts and they are finally detected back on the surface by a receiver. As the GPR waves propagate though different materials on their way to buried objects their velocity will significantly change depending upon the variable physical and chemical properties of the materials though which the waves are travelling. The reflected waves are collected by the receiving antenna and converted into a radargram, or image of the subsurface structure. Once the surface topography is applied to the data, the radargram reveals the nature and shape of the features that lie beneath the ground (see page 17).

GPR is widely used in archaeology and geomorphology, with a high spatial resolution and a relatively fast

Charlie Bristow a Lucy Beck yn cymryd mesuriadau radar treiddio'r ddaear ar ymyl tafod Y Borth gyda chymorth y tîm CHERISH.
Charlie Bristow and Lucy Beck conducting ground penetrating radar measurements on the edge of the Borth spit with assistance from the CHERISH team.

uchel ac amser arolygu gweddol gyflym. Defnyddir meddalwedd gyfrifiadurol arbenigol i brosesu'r data a chynhyrchu mapiau a delweddau 3D manwl o'r adeileddau archaeolegol claddedig a'r adeileddau geomorffolegol.

Mae sawl dull arolygu geoffisegol arall, gan gynnwys dulliau Anwythiad Electromagnetig (EMI), Delweddu Gwrthedd Trydanol (ERI), ac Arolygu Derbynnedd Magnetig, y gellir eu defnyddio ar eu pennau eu hunain neu i gydategu arolygon Magnetometreg neu Ardal Gwrthiant Trydanol. Wrth ddewis y dull i'w ddefnyddio, rhaid i archaeolegwyr farnu pa dechnegau a fydd yn rhoi'r canlyniadau gorau ar sail yr archaeoleg gladdedig, y pridd/daeareg gefndir, a'r cyfarpar sydd ar gael iddynt.

Dehongli'r Canlyniadau

Ar ôl casglu'r data geoffisegol, caiff ei gyfuno a'i ddadansoddi gan yr archaeolegwyr a fydd yn chwilio am ardaloedd lle mae anomaleddau neu wahaniaethau yn y data i'w gweld. Yn sgil y gwaith dadansoddi, rhaid i'r archaeolegwyr ddehongli'r canlyniadau a gwneud penderfyniad ynghylch a yw'r nodwedd a ddarganfuwyd yn y wybodaeth geoffisegol yn wrthrych naturiol sy'n rhan o ddaeareg neu geomorffoleg y safle neu'n nodwedd archaeolegol a grëwyd gan weithgarwch dynol. Caiff y penderfyniadau hyn eu plotio ar fap fel nodweddion archaeolegol claddedig posibl a fydd yn arwain at ddealltwriaeth well o hyd a lled a nodweddion y safle.

Ar ôl i nodweddion archaeolegol posibl gael eu darganfod drwy ddefnyddio'r dulliau hyn, gellir cloddio mewn ardaloedd penodol i ddod â hwy i'r golwg. Yn yr un modd ag y byddai llawfeddyg yn defnyddio pelydrau-X neu sgan MRI ar gyfer llawfeddygaeth dwll-clo, gall archaeolegwyr agor ambell ffos ar safle sy'n caniatáu iddynt weld a deall y nodweddion archaeolegol sy'n achosi'r anomaledd geoffisegol, yn hytrach na chloddio'r safle cyfan.

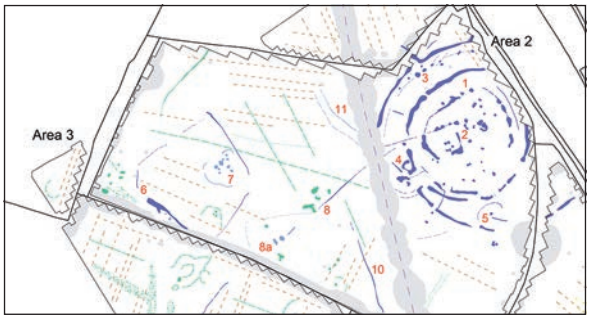
survey time. The data is processed with specialised computer software to generate accurate 3D maps and images of the buried archaeological structures and geomorphological structures

There are several other geophysical survey methods, including Electromagnetic Induction methods (EMI), Electrical Resistivity Imaging (ERI), and Magnetic Susceptibility Survey, which can be used independently or complement Magnetometry or Electrical Resistance Area surveys in identifying archaeological feature. When choosing which method to apply, archaeologists must judge what techniques will potentially yield the greatest results based on the buried archaeology, the background soil/geology, and what equipment they have at their disposal.

Interpreting the Results

Once we have collected geophysical data, it is then integrated and analysed by archaeologists looking for areas where anomalies or differences in the data exist. Following analysis, archaeologists must interpret the results and make a decision if they believe the feature identified in the geophysics to be a natural occurring object through geology or geomorphology, or it is an archaeological feature caused by human activity. The resulting decisions are plotted on map as potentially buried archaeological features which will lead to our greater understanding of the extents and features of a site.

Once potential archaeological features have been discovered through archaeological geophysics, these area can be exposed through targeted excavation. Like a surgeon would carry out keyhole surgery using an x-ray or MRI scan, archaeologists can insert targeted excavation trenches into sites which allow us to visibly see and understand the archaeological feature which is causing the geophysical anomaly, whilst not having to open up the whole site.



Dehongliad o arolwg magnetomedr o safle olion cnydau CHERISH yng Ngwynedd gan SUMO Services, Mawrth 2019.

Interpretation of magnetometer survey of CHERISH cropmark site in Gwynedd by SUMO Services March 2019.

CYFARFOD Â THÎM CHERISH / MEET THE CHERISH TEAM

Edward Pollard, Rhaglen Ddarganfod Iwerddon

Ymchwilydd archaeolegol ar y prosiect CHERISH sy'n gweithio i'r Rhaglen Ddarganfod yn Nulyn yw Ted.

Dilynais gwrs archaeoleg a daeareg ym Mhrifysgol Bryste, gan astudio Oes Ganol y Cerrig yng nghanolbarth Affrica a'r gwaddodion Carbonifferaidd o gwmpas Ballycastle yng Ngogledd Iwerddon. Yna dilynais gwrs arall ym Mhrifysgol Ulster ar archaeoleg arforol a geoffiseg ar hyd arfordir gogleddol Iwerddon. Meithrinais fy sgiliau ym maes archaeoleg arforol wrth ymchwilio i'r rhestr longddrylliadau ar ran yr Uned Archaeoleg Danddwr yn Nulyn a gweithio ar brosiectau masnachol gyda'r Archaeological Diving Company, sef cloddio cwch boncyff o'r Oes Efydd ym Môr Iwerddon, mannau croesi Afon Nore yn Kilkenny, a mynwent longddrylliadau yn Harbwr Waterford. Datblygais ddiddordeb yng Nghefnfor India, gan weithio ar amryfal brosiectau yng Ngorllewin Awstralia, Cairo, Oman, Tanzania a Kenya. Astudiais am PhD yn yr un maes, gan ymchwilio i dirwedd ddiwylliannol arforol yr arfordir Swahili, gan ganolbwyntio ar Safle Treftadaeth Byd Kilwa Kisiwani a Bagamoyo yn Tanzania. Fel archaeolegydd morol ym Mhrifysgol yr Ucheldiroedd a'r Ynysoedd ar Ynysoedd Erch, datblygais ymchwil i fannau glanio a phorthladdoedd yng ngogledd Môr Iwerydd a modiwlau mewn archaeoleg arforol. Fel Cyfarwyddwr Cynorthwyol y Sefydliad Prydeinig yn Nwyrain Affrica yn Nairobi, cefnogais ymchwil yn Affrica Is-Sahara ac estynnais fy maes gwaith archaeolegol arforol i borthladdoedd masnachu Swahili ym Mozambique. Rydw i'n parhau i ddatblygu prosiectau tebyg i CHERISH ar hyd arfordir Dwyrain Affrica gyda Phrifysgolion Dar es Salaam, Aberdeen, a Saint Andrews. Ar y prosiect CHERISH, fy ngwaith yw cynnal arolygon awyr, archaeolegol a geoffisegol o safleoedd bregus, enwedig caerau pentir,

Edward Pollard, Discovery Programme Ireland

Ted is an archaeological researcher on the CHERISH project based at the Discovery Programme in Dublin.

I studied archaeology and geology at the University of Bristol looking at the Middle Stone Age in central Africa and Carboniferous sediments around Ballycastle in Northern Ireland. This was followed by further study on maritime archaeology and marine geophysics along the north coast of Ireland at the University of Ulster. I developed my marine archaeological skills researching the shipwreck inventory for the Underwater Archaeology Unit in Dublin and on commercial projects with the Archaeological Diving Company excavating a Bronze Age logboat in the Irish Sea, crossing points of the River Nore in Kilkenny, and a shipwreck graveyard in Waterford Harbour. I developed an interest in the Indian Ocean, working on various projects in Western Australia, Cairo, Oman, Tanzania and Kenya. This interest was continued by a PhD on the maritime cultural landscape of the Swahili coast concentrating the World Heritage Site of Kilwa Kisiwani and Bagamoyo in Tanzania. As marine archaeologist at the University of the Highlands and Islands in Orkney, I developed research into landing places and ports with their links around the northern Atlantic along with developing modules in maritime archaeology. As Assistant Director of the British Institute in Eastern Africa in Nairobi I supported research around Sub-Saharan Africa and extended my maritime archaeological fieldwork to Swahili trading ports in Mozambique. I continue to develop projects similar to CHERISH along the East African coast with the Universities of Dar es Salaam, Aberdeen, and Saint Andrews. On the CHERISH project, I undertake

mannau glanio a llongddrylliadau. Byddaf yn cael pleser o archwilio'r arfordir, gan ddefnyddio cychod traddodiadol yn aml, ac mae gen i ddiddordeb mawr yn y bobl a arferai fyw yma a'u dulliau teithio.

Sarah Davies, Prifysgol Aberystwyth

Ar ôl cwblhau gradd israddedig mewn Daearyddiaeth ym Mhrifysgol Sheffield, dilynais raddau MRes a PhD ym Mhrifysgol Caeredin, gan raddio yn 2000. Rydw i'n Ddarllenydd yn Adran Daearyddiaeth a Gwyddorau Daear Prifysgol Aberystwyth, yr ymunais â hi yn 2002. Cymerais swydd Pennaeth Adran yn ddiweddar. Rydw i'n falch o gynrychioli un o'r adrannau hynaf a mwyaf o'r fath yn y DU, y mae ganddi arbenigedd a chyfleusterau o'r radd flaenaf ym maes ymchwil newid hinsawdd.

Mae fy ymchwil yn cynnwys datblygu archifau gwaddodol a hanesyddol ar gyfer ymchwilio i newid amgylcheddol a hinsoddol dros amrediad o raddfeydd amser. Canolbwynt fy ngwaith yw dangosyddion biolegol a chemegol mewn llaid o lynnoedd a chorsydd a byddaf yn cyfuno'r rhain â thystiolaeth ddogfennol ac archaeolegol i ailgreu amgylcheddau'r gorffennol. Bûm yn ffodus i weithio ar brosiectau mewn nifer o leoedd ar hyd a lled y byd, gan gynnwys Ethiopia, Patagonia a'r is-Antarctig. Gwyliau rheolaidd gyda'r teulu a theithiau ysgol i Ogledd Cymru a sbardunodd fy niddordeb mewn daearyddiaeth gyntaf, ac rydw i wrth fy modd yn gweithio i'r prosiect CHERISH sy'n dod â mi yn ôl i ymchwilio i'r tirweddau ysbrydoledig hyn yn nes at adref. Rydw i'n gweithio gyda chydweithwyr ym Mhrifysgol Aberystwyth i ddatblygu cofnodion o stormydd y gorffennol drwy astudio lagwnau, mawnogydd a thwyni tywod arfordirol. Bydd y gwaith hwn yn ein helpu i ddeall yn well natur ddynamig amgylcheddau arfordirol o amgylch Iwerddon a Chymru. Mae'n cynnig cyfle gwych i ni feithrin cysylltiadau cryfach rhwng ymchwilwyr academaidd a'r sector rheolaeth a pholisi amgylcheddol wrth i ni fynd i'r afael â'r her a wynebir gan ein cymunedau, amgylchedd a threftadaeth arfordirol o ganlyniad i newid hinsawdd.

archaeological, geophysical and aerial surveys of vulnerable sites, especially promontory forts, landing places and shipwrecks. I enjoy exploring the coasts often using traditional watercraft wondering who used to live here and how they travelled.

Sarah Davies, Aberystwyth University

Following an undergraduate degree in Geography at the University of Sheffield, I studied for an MRes and PhD at the University of Edinburgh, graduating in 2000. I am a Reader in the Department of Geography and Earth Sciences at Aberystwyth University, having joined the department in 2002. I have recently taken on the role of Head of the Department. I am proud to represent one of the oldest and largest such departments in the UK, with world-class expertise and facilities for climate change research.

My research involves developing sedimentary and historical archives to investigate environmental and climate change over a range of timescales. I focus on biological and chemical indicators in mud from lakes and bogs and integrate these with documentary and archaeological evidence to reconstruct past environments. I've been lucky to undertake projects in a variety of locations around the world, including Mexico, Ethiopia, Patagonia and the sub-Antarctic. It was regular family holidays and school trips to North Wales that first sparked my interest in geography, and I'm delighted to be part of the CHERISH project which brings me back to investigating these inspiring landscapes closer to home. I'm working with colleagues at Aberystwyth University to develop records of past storm activity from coastal lagoons, peat bogs and sand dunes, to help us understand more about the dynamic nature of the coastal environments around the Irish and Welsh coasts. It's a great opportunity for us to forge stronger links between academic researchers and the environmental management and policy sector to tackle the challenge that climate change poses to our coastal communities, environment and heritage.

FFEIL FFEITHIAU PUFFTY
PUFFTY'S FACT FILE

Bu Puffty-Hump, masgot CHERISH ac aelod o'r tîm, allan yn casglu ffeithiau a ffigurau diddorol am Newid Hinsawdd, Treftadaeth Arfordirol, a'n prosiect. A wyddech chi ...

CHERISH mascot and team member Puffty-Hump has been out in the field gathering some interesting facts and figures relating to Climate Change, Coastal Heritage and our project. Did you know ...

Puffty Hump, masgot CHERISH, yn helpu gyda'r ymchwiliadau ar wyneb y clogwyn yn Ninas Dinlle, Gwynedd.
CHERISH mascot Puffty Hump helping with the cliff face investigations at Dinas Dinlle, Gwynedd.

Puffty yn cael pàs ar hediad monitro dros Ddinas Dinlle, 21 Mehefin 2019.
Puffty hitching a ride on a baseline monitoring flight over Dinas Dinlle, 21 June 2019.

Nododd Giraldus Cambrensis (Gerallt Gymro), yn ei ddisgrifiad o 1171/2, i'r gwynt chwythu â chymaint o rym fel bod traethau De Cymru wedi'u dinoethi o dywod a bod glan y môr yn edrych fel celli mewn coedwig.

Twelfth-century writer Giraldus Cambrensis (Gerald of Wales), in his description of the winter of 1171/2, noted that 'the wind blew with such unprecedented violence that the shores of South Wales were completely denuded of sand ... the seashore took on the appearance of a forest grove ...'.

Algâu microsgopig â chragen wedi'i gwneud o silica yw diatomau. Maen nhw i'w cael ym mhob math o ddŵr, o byllau a tharddellau i'r cefnforoedd dyfnaf. Maen nhw'n werthfawr ar gyfer ailgreu newid amgylcheddol yn y gorffennol ond maen nhw hefyd yn hanfodol i ni i gyd gan fod hyd at 25% o ocsigen y Ddaear yn dod o ddiatomau drwy ffotosynthesis.

Diatoms are microscopic algae with a shell made of silica. They are found in all types of water, from ponds and springs to deep oceans. They are valuable for reconstructing past environmental change but essential for all of us, as up to 25% of the Earth's oxygen comes from diatoms through photosynthesis.

Buom yn defnyddio dyddio ymoleuedd fel rhan o'n hymchwiliad i glogwyni tywodlyd Dinas Dinlle eleni. Gall gronynnau o dywod storio pelydriad naturiol tra byddant wedi'u claddu yn y ddaear – tipyn bach fel batri. Yn y labordy, byddwn yn rhyddhau'r pelydriad ar ffurf golau, a thrwy fesur disgleirdeb y golau gallwn gyfrifo am ba hyd y bu'r gronynnau dan y ddaear.

We've been using luminescence dating for the sandy cliffs of Dinas Dinlle this year. Grains of sand can store natural radiation while they are buried in the ground – a bit like a battery. In the laboratory, we release the radiation as light, and by measuring the brightness of the light, we can work out how long the grains have been buried. This allows us to date sand deposits, but also pottery, flint and other archaeological artefacts.

Mae awyren Cessna 172 4-sedd, a ddefnyddiwyd yn ystod hediadau rhagchwilio CHERISH ac ar gyfer yr Ysgol Hedfan ym mis Mehefin, yn gallu criwsio ar 120 not (138 mya) am ryw 5–6 awr.

A 4-seater Cessna 172 aircraft, used during CHERISH aerial reconnaissance and for the Flying School in June, can cruise at 120 knots (138 mph) and has an endurance of 5–6 hours.

Bae Sain Ffraid, de Penfro, cartref i feddau cist erydol o'r Oesoedd Canol cynnar, eglwys blwyf ganoloesol, ac odyn galch o'r bedwaredd ganrif ar bymtheg.

St Bride's Bay, south Pembrokeshire, home to eroding early medieval cist graves, a medieval parish church and a nineteenth century limekiln.

DYDDIADAU AR GYFER EICH DYDDIADUR

Mae gennym nifer o ddigwyddiadau yn y dyddiadur eisoes ar gyfer gweddill 2019. Gallwch ein gweld ni yn:

- Cloddiad CHERISH, Diwrnod Agored i'r Cyhoedd, Dinas Dinlle, Gwynedd: 17 Awst 2019.
- Taith gerdded arfordirol CHERISH, gan gynnwys glanhau traeth ar y cyd â Clean Coasts, Ireland's Eye, Swydd Dulyn: 17 Awst 2019.
- Wythnos Treftadaeth, Iwerddon: 17–25 Awst 2019.
- Llong CHERISH, Diwrnod Agored ar yr RV Keary, Marina Dingle, Swydd Kerry: 24 Awst 2019.
- Yr Undeb Rhyngwladol ar gyfer Ymchwil Cwaternaidd INQUA, Dulyn: 25–31 Gorffennaf 2019.
- Cynhadledd Ryngwladol ar Archwilio Archaeolegol, Sligo, Iwerddon: 28 Awst–1 Medi 2019.
- CIPA – Y Pwyllgor Rhyngwladol Ffotogrametreg Bensaernïol, Avila, Sbaen: 1–5 Medi 2019.
- Sea Change – ICOMOS, Blackpool: 4–6 Medi 2019.
- Cynhadledd Flynyddol Cymdeithas Archaeolegwyr Ewrop, Bern: 5–7 Medi 2019.
- Tystiolaeth Amgylcheddol 2019 – Tystiolaeth Forol, Prifysgol Abertawe: 17–19 Medi 2019.
- Ymddiriedolaeth Bywyd Gwyllt Iwerddon, Green Talks, Dulyn: 1 Hydref 2019.
- Darlith CHERISH, Cymdeithas Addysg y Gweithwyr, Llanelli: 17 Hydref 2019.
- Sgwrs CHERISH, Grŵp Hanes Coastlands, Marloes, Sir Benfro: 13 Tachwedd 2019.

Ychwanegir mwy yn ystod y misoedd i ddod, felly cadwch lygad ar ein gwefan a sianeli cyfryngau cymdeithasol i gael y wybodaeth ddiweddaraf.

DATES FOR YOUR DIARY

We've got a number of events already in the diary for the remainder of 2019. You'll find us at:

- CHERISH Excavation Public Open Day, Dinas Dinlle, Gwynedd: 17 August 2019.
- CHERISH Coastal walk including a beach clean-up in conjunction with Clean Coasts, Ireland's Eye, County Dublin: 17 August 2019.
- Heritage Week, Ireland: 17–25 August 2019.
- CHERISH Vessel Open Day R V Keary, Dingle Marina, County Kerry: 24 August 2019.
- International Union for Quaternary Research INQUA, Dublin: 25–31 July 2019.
- International Conference on Archaeological Prospection, Sligo, Ireland: 28 August–1 September 2019.
- CIPA – International Committee of Architectural Photogrammetry, Avila, Spain: 1–5 September 2019.
- Sea Change – ICOMOS, Blackpool: 4–6 September 2019.
- European Association of Archaeologists Annual Conference, Bern: 5–7 September 2019.
- Environment Evidence 2019 – Marine Evidence, Swansea University: 17–19 September 2019.
- Irish Wildlife Trust Green Talks, Dublin: 1 October 2019.
- CHERISH Lecture, WEA Llanelli: 17 October 2019.
- CHERISH Talk, Coastlands History Group, Marloes, Pembrokeshire 13 November 2019.

More will be added in the coming months, so please keep an eye on our website and social media channels for the latest dates.

CHERISH

Newid Hinsawdd a Threftadaeth yr Arfordir
Climate Change and Coastal Heritage
Athrú Aeráide agus Oidhreacht Chultúrtha

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