

## Rediscovering invention

### Ailddarganfod dyfeisgarwch

an appreciation of historic innovation, construction techniques and materials  
gwerthfawrogiad o newyddbethau hanesyddol technegau adeiladu a deunyddiau

Mass concrete construction  
on the Plas Dinas estate  
Adeilad mâs-concritid  
ar ystad Plas Dinas



“The Historic Environment is all the physical evidence for past human activity, and its associations, that people can see, understand and feel in the present world. It is many-faceted, relying on an engagement with physical remains but also on emotional and aesthetic responses and on the power of memory, history and association.”

THIS DEFINITION OF the “historic environment” is taken from the English Heritage Viewpoint Consultation Document of June 2000. The recent *Review of the Historic Environment in Wales* (March 2003) prepared by the Welsh Assembly and Cadw suggested a similarly holistic approach.

Within a definition such as this, it is no surprise that people have radically different views about what the historic environment means to them. Most people would readily identify with the inherent heritage merit of a castle or a church owing to their age, their status, their external expression and use of certain materials and construction techniques that loosely speaking could be termed traditional.

However, these structures in reality form only a small percentage of our building stock in Wales. Most of the built environment we experience in our daily lives was constructed after 1780, and is the product of a dramatically changing and expanding society. Previously, building techniques had expressed the slow evolution of traditional needs and traditional crafts. The industrial age created new demands and possibilities.

The requirements of the industrial age changed the whole character of building. The scientific advances that made the industrial revolution possible extended the technical and structural possibilities of architectural form and design. The influence of machinery and improvements in transportation enlarged choice still further. This atmosphere of possibility, in the belief that society could improve, through better education, health and welfare reform had a profound impact on the population. Advances in the patented development of materials, and the

“Yr amgylchedd Hanesyddol yw'r unig dystiolaeth gorf- forol o weithgarwch dynol cynt, a'i gysylltiadau, y gall pobl heddiw weld, deall a theimlo. Mae'n amlweddog, yn dibynnu ar ymwneud ag olion corfforol, ond hefyd ar ymatebion emosiynol ac esthetig ac ar rym y cof, ar hanes a chysylltiadau.”

MAE'R DIFFINIAD HWN o'r “amgylchedd hanesyddol” yn dod o Viewpoint Consultation Document (Mehefin 2000) English Heritage. Mae'r *Adolygiad o Amgylchedd Hanesyddol Cymru* (Mawrth 2003) a gynhyrchwyd gan y Cynulliad Cenedlaethol a Cadw hefyd yn awgrymu agwedd gyfannol gyffelyb.

O fewn diffiniad o'r fath, does dim syndod fod gan bobl agweddau sylfaenol gwahanol ynglŷn ag ystyr yr amgylchedd hanesyddol. Fe fyddai'r rhelyw yn uniaethu yn hawdd gyda gwerth trefnadol cynhenid castell neu eglwys oherwydd eu hynafiaeth, eu statws, eu mynegiant allanol, a'u defnydd o rai deunyddiau a thechnegau adeiladu arbennig y gellir eu galw, fwy neu lai, yn draddodiadol.

Rhaid cofio fod yr adeiladau hyn yn ddim ond cyfran fechan o'n stoc o adeiladau yng Nghymru. Mae'r rhan fwyaf o'n hamgylchedd adeiledig y down ar ei draws yn ein bywyd bob dydd yn dyddio o'r cyfnod ar ôl 1780, ac yn gynnyrch cymdeithas oedd yn tyfu a newid yn rhyfed- dol. Cyn hynny, roedd technegau adeiladu yn fynegiant o esblygiad graddol anghenion a chrefftau traddodiadol. Gyda dyfodiad yr oes ddiwydiannol roedd yna ofynion a phosibiliadau newydd.

Fe weddnewidiwyd holl gymeriad adeiladu gan ofynion yr oes ddiwydiannol. Fe wnaeth y datblygiadau gwyd- donol a wnaeth y chwyldro diwydiannol yn bosib estyn posibiliadau strwythurol ffurf a dyluniad pensaernïol. Ehangwyd nhw ymhellach dan ddylanwad peiriannau a gwelliannau mewn trafndiaeth. Cafodd yr ymdeimlad fod popeth yn bosib, y gred y gallai cymdeithas gael ei gwella trwy addysg, iechyd a diwygiadau lles, fe gafodd hyn ddylanwad dwys ar y boblogaeth. Roedd y twf mewn datblygiadau patentedig mewn deunyddiau, a dyfeisio

invention of new machinery and manufacturing processes were commonplace.

In Mid Wales, the expansion of the railways, the economics of tourism, and the provision for a constant supply of fresh water to the Midlands resulted in an inheritance of building materials and construction methods normally associated with larger conurbations and urban centres. Examples of these distant influences that were assimilated into the “character” of local architectural tradition include decorative brickwork and terracotta details in centre of Rhayader, and the use of faience on the elevations of the Automobile Palace in Llandrindod Wells.

Newtown realised its potential as a centre of yarn and textile production as a result of the construction of the Montgomeryshire Canal (1819) and the arrival of the railway in the 1860s. Industrial buildings were constructed which combined material and structural advances with autocratic manufacturing efficiency and experiments in social planning. The Textile Museum building on Commercial Street combined six back-to-back houses on its lower two floors with open workrooms on the upper two floors. The looms stood between each of the casement windows. The vast brickwork and iron structure of the Royal Welsh Warehouse and Department Store for Sir Pryce Pryce-Jones (who was the pioneer of shopping by post from 1861) forms part of this picture, together with the neighbouring Agricultural Warehouse Building, which has the tallest domestic flue in Newtown.

Each of these examples is generally identifiable as being a building which holds or conveys what is termed “cultural significance”, but since late eighteenth-century, nineteenth-century and twentieth-century developments constitute the vast bulk of our building stock, many structures and landscapes are now perceived to be “ordinary”, and are overlooked or undervalued by the majority of the population. We have not given protection to many terraces, urban neighbourhoods or industrial sites because they are sometimes seen to represent the familiar and the average. Industrial sites, moreover, often possess uncomfortable associations with the exploitation of people or communities and the immediate landscape or environment. This disregard often leads to the biggest threat to our historic environment, which is ignorance on many levels, as buildings and sites are destroyed because no one understands their significance or appreciates their contribution to our heritage.

All too often, and for any number of reasons, historic evidence relating to the innovative use of materials and advances in construction techniques is not fully understood, and the cultural impact on an area is unrecognised. We should not take anything at face value, but ensure that there are clear procedures and guidelines in place that can be followed by anyone attempting to work on an historic building.

Not everyone admires the intrinsic technical value

peiriannau a phrosesau cynhyrchu newydd yn bethau cyffredin.

Yn y canolbarth, roedd twf y rheilffyrdd, economeg twristiaeth, a'r orfodaeth i gyflenwi dŵr croyw i'r Midlands, wedi golygu fod yna waddol o ddeunyddiau adeiladu a dulliau o godi adeiladau a gysylltir fel arfer gyda chytrefi a chanolfannau trefol mwy. Ymysg y dylanwadau o bell a gymhathwyd i “ymeriad” y traddodiad pensaernïol lleol mae gwaith bric addurnedig a manylion terracotta yng nghanol Rhaeadr Gwy, a'r defnydd o faience ar weddluniau'r Palas Ceir yn Llandrindod.

Llwyddodd y Drenewydd i gyrraedd ei photensial fel canolfan cynhyrchu edafedd a thecstilau o ganlyniad i greu Camlas Maldwyn (1819) a dyfodiad y rheilffordd yn y 1860au. Codwyd adeiladau diwydiannol oedd yn cymhathu datblygiadau o ran deunyddiau a strwythurau gydag effeithiolrwydd o ran cynhyrchu'n awtocrataidd ynghyd ag arbrofion mewn cynllunio cymdeithasol. Roedd yr Amgueddfa Tecstilau ar Commercial Street yn cyfuno chwech o dai cefn-wrth-gefn ar y ddau lawr isaf gyda gweithdai agored ar y ddau lawr uchaf. Roedd y gwyddiau wedi'u gosod rhwng pob un o'r ffenestri casement. Mae strwythur anferth bric a haearn y Royal Welsh Warehouse and Department Store ar gyfer Syr Pryce Pryce-Jones (arloeswr siopa post ers 1861) yn rhan o'r darlun, ynghyd â'r Adeilad Warws Amaethyddol gerllaw, sydd â'r corn simnai dalaf yn y Drenewydd.

Mae'n hawdd cydnabod fod pob un o'r enghreifftiau hyn yn adeilad sydd ag “arwyddocâd diwylliannol”, ond gan mai datblygiadau o ddiwedd y ddeunawfed ganrif, y bedwaredd-ar-bymtheg a'r ugeinfed yw y rhan fwyaf o ddigon o'n stoc o adeiladau, ystyrir llawer o'r strwythurau a thirweddau erbyn hyn yn rhai “cyffredin”, a anwybyddir neu a ddibrisir gan y rhan fwyaf o'r boblogaeth. Ychydig o warchod a fu ar derasau, cymdogaethau trefol neu safleoedd diwydiannol oherwydd ein bod yn meddwl amdanyn nhw fel pethau cyfarwydd a chymedrol. Yn ychwanegol, mae yna gysylltiadau annifyr ynglŷn â llawer o safleoedd diwydiannol yn tarddu o hanes am ymelwa ar draul pobl neu gymunedau a'r dirwedd ac amgylchedd yn lleol. Mae'r esgeuluso hwn yn aml yn arwain i'r bygythiad gwaethaf i'n hamgylchfyd hanesyddol, sef anwybodaeth o bob math wrth i adeiladau a safleoedd gael eu distrywio am nad oes neb yn sylweddoli eu harwyddocâd, nag yn gwerthfawrogi eu cyfraniad i'n treftadaeth.

Yn llawer rhy aml, ac am amryfal resymau, nid yw pobl yn deall yn iawn dystiolaeth hanesyddol ynglŷn â defnydd arloesol o ddeunyddiau a datblygiadau mewn techneg codi adeiladau, ac yn methu dirnad ei arwyddocâd diwylliannol. Ni ddylem dderbyn pethau oddi wrth eu hwynebwerth, ond yn hytrach sicrhau fod yna brosesau a chanllawiau eglur ar gael ar gyfer unrhyw un sydd am weithio ar adeilad hanesyddol.

Nid yw pawb yn edmygu gwerth technegol cynhenid na rhinweddau esthetig adeiladau a godwyd yn ystod y



▲  
**Gregynnog**  
 concrete  
 construction and  
 the country house  
 Adeilad concriid  
 a'r plasty

or aesthetic merit of buildings constructed during the industrial revolution and nineteenth century. Sometimes, indeed, they are not easy to admire. Contemporary commentators such as Pugin, Ruskin and William Morris, questioned to varying degrees the use of new materials, products and processes, most often thought of as being of low status, dishonest and temporary. Today we cannot afford to take such a subjective approach to the historic environment. The decisions we make will shape the potential of future generations to understand, appreciate and interpret this legacy.

Conservation bodies and organisations both nationally and internationally have made great strides to address the issues mentioned previously. Article 25 from the Burra Charter of ICOMOS Australia requires that:

a written statement of conservation policy must be professionally prepared, setting out the cultural significance, physical condition and proposed conservation process together with justification and supporting evidence, including photographs, drawings and all appropriate samples.

Similarly, the British Standards guide to the principles of historic building conservation advises that

In advance of any building operation, sufficient survey investigation, evaluation and recording should be undertaken to give reasonable confidence that the building, its development and historical importance are sufficiently understood, that nothing is likely to be inadvertently damaged or destroyed and work appropriately designed and specified.

We can follow these principles and thereby provide objective baseline data for any building, monument or landscape. Such informed and specific conservation policy statements are invaluable when interpreting and managing a place, building, or historic structure. They ensure that we are methodical in our approach and that we have clear objectives.

chwyldro diwydiannol a'r bedwaredd ganrif ar bymtheg. Weithiau, yn wir, mae'n anodd eu hedmygu. Roedd sylwebyddion cyfoes fel Pugin, Ruskin a William Morris yn amau i ryw raddau neu'i gilydd y defnydd o ddeunyddiau, cynhyrchion a phrosesau newydd, a ystyrir yn aml i fod o statws isel, yn annilys a byrhoedlog. Heddiw, allwn ni ddim fforddio bod mor oddrychol ein hagwedd tuag at yr amgylchedd hanesyddol. Ein dewisiadau ni fydd yn penderfynu gallu cenedlaethau'r dyfodol i ddeall, gwerthfawrogi a dehongli'r dreftadaeth hon.

Mae cyrff a chymdeithasau cadwraethol, yn genedlaethol ac yn rhyngwladol wedi cymryd camau breision i ymateb i'r cwestiynau a grybwyllwyd eisoes. Mae Erthygl 25 o Siarter Burra ICOMOS Awstralia yn mynnu:

datganiad ysgrifenedig o bolisi cadwraethol wedi'i baratoi yn broffesiynol, yn nodi arwyddocâd diwyl-liannol, cyflwr corfforo, a'r broses gadwraethol arfaethedig ynghyd â chyfiawnhad a thystiolaeth gefnogol, gan gynnwys ffotograffau, darluniau a phob enghraifft addas.

Yn yr un modd, mae'r cyfarwyddiadau i'r Safonau Prydeinig ar gyfer cadwraeth adeiladau hanesyddol yn cynghori fel hyn

Cyn unrhyw weithgarwch adeiladol, dylid ymgymryd ag arolwg, gwerthusiad a chofnodiad digonol er mwyn bod yn rhesymol hyderus y bydd yr adeilad, ei ddatblygiad a'i arwyddocâd hanesyddol, yn ddi-gon dealladwy, na fydd dim yn cael ei niweidio neu ei ddistrywio'n ddamweiniol, ac y bydd y gwaith wedi'i ddylunio'n addas a phenodol.

Gallwn ddilyn yr egwyddorion hyn ac felly baratoi gwybodaeth sylfaenol gwrthrychol am unrhyw adeilad, cofadail neu dirwedd. Bydd datganiadau o bolisi cadwraethol gwybodus a phenodol o'r fath yn amhrisiadwy wrth ddehongli a rheoli lle, adeilad neu strwythur hanesyddol. Maen nhw'n sicrhau ein bod yn drefnus ein hagwedd a bod ganddom amcanion pendant.

### **Adeiladau concriid yng nghanolbarth Cymru**

Yn 1873 bu Syr Edmund Buckley yn arbrofi gyda chodi ysgubor, adeiladau fferm a gardd furiog o fas-concriid ar ei ystad Plas Dinas yn Ninas Mawddwy. Fe wnaeth y defnydd arloesol hwn o goncriid greu cyfrwng ar gyfer codi muriau tai gwydr wedi'u cynhesu, a galluogi blodau, ffrwythau a llyisiau egsotig gael eu tyfu. Doedd hon ddim yn arbrawf unigryw – roedd y defnydd o mäs-concriid ar ystad y teulu Hanbury-Tracy yn Gregynnog, rhyw ddeugain milltir i ffwrdd i'r gorllewin o'r Drenwydd, braidd yn fwy blaengar o ran ei ddatblygiad a'i weithredu.

Ar yr wyneb, roedd defnyddio mäs-concriid fel prif gyfrwng adeiladu yn ymddangos yn od iawn mewn ardal mor wledig. Gellid disgwyl mai hen fedrau lleol cydnabyddedig a deunyddiau adeiladu gwerinol fyddai pobl yn eu dewis, yn hytrach na thechnoleg gweddol arbrofol newydd. Ond roedd cynnal ystadau mawr wedi mynd i

### Concrete buildings in mid Wales

In 1873 Sir Edmund Buckley experimented with the construction of a mass concrete granary, farm buildings and walled garden on his Plas Dinas estate at Dinas Mawddwy. This innovative use of concrete provided a medium which enabled the creation of heated greenhouse walls, providing a climate for tender and exotic flowers, fruit and vegetables. The experiment did not occur in isolation – the use of concrete on the estate of the Hanbury-Tracy family at Gregynog, some forty miles away to the west near Newtown, was slightly more advanced in its development and execution.

On first impressions, the application of mass concrete as a principle construction medium would appear to be a very strange choice in such a rural area. It would be expected that well-established regional skills and vernacular building materials would be preferred, and not be rejected in favour of relatively untried technology. However, the quality and availability of labour had become critical to the maintenance of large estates. From 1846, enlightened landlords and estate owners were encouraged by the newly formed Royal Agricultural Society to improve living conditions for their tenants and workers on the grounds of “health and morality”. Meanwhile, the living and welfare conditions of the Hanbury-Tracys’ tenant farmers and labourers had not really improved since the Chartist revolts.

Family and political ties meant that the Hanbury-Tracys were aware of the work of Joseph Tall, an entrepreneur and inventor who had built a pair of concrete cottages in 1866 at Bexley Heath, using his own patented formwork system. The initial concept had been presented to the Prince Consort following the Great Exhibition of 1851 as a means of providing cheap dwellings for labourers. The system was featured in the *Illustrated London News* and subsequently exhibited at the Paris Exposition. It became economical for use in Mid Wales as it was cheaper, owing to reduced transport costs, than building in brick. It is said that the patented system cost half the price of the equivalent thickness of brickwork, as only about one-twelfth of its mass needed to be imported, in the form of the recently invented Portland cement. Generally, the concrete used on the estate was a mixture of one part Portland cement to seven or eight parts river gravel, crushed brick and sand.

Using the patented slip-forming process, the Land Agent at Gregynog, W. Scott Owen, directed the design and construction of these structures, predominantly in the favoured Gothic Revival style of the time, but also utilising contemporary pattern books such as Loudon’s *Encyclopaedia of cottage, farm and villa architecture* (1833) or the architect Henry Roberts’ *Model homes for families* published in association with the Great Exhibition of 1851. The publicity generated for the patented system meant it became the focus of public curiosity, fuelling a

ddibynnu i raddau helaeth ar y gallu i gael gafael ar lafur o ansawdd da. O 1846 ymlaen, roedd tîrffeddiannwyr a pherchnogion ystadau goleuedig yn cael eu hannog gan y Gymdeithas Amaethyddol Frenhinol newydd i wella amodau byw eu tenantiaid a’u gweision ar sail “iechyd a moesoldeb”. Yn y cyfamser, doedd amodau byw a chyflwr lles ffermwyr tenant teulu Hanbury-Tracy ddim wedi gwella fawr ddim ers Terfysgoedd y Siartwyr.

Roedd clymau teuluol a gwleidyddol yn golygu fod yr Hanbury-Tracys yn ymwybodol o waith Joseph Tall, entrepreneur a dyfeisiwr, oedd wedi codi pâr o fythynnol concrid yn 1866 yn Bexley Heath gan ddefnyddio system estyllod yr oedd wedi ei phatentio ei hunan. Cyflwynwyd y cysyniad gwreiddiol i’r Tywysog Cydweddog ar ôl yr Arddangosfa Fawr yn 1851 fel dull o godi tai annedd rhad ar gyfer gweision. Nodwyd y system yn yr *Illustrated London News* a’i harddangos wedyn yn Arddangosfa Paris. Daeth yn ddigon economaidd i’w defnyddio yng nghanolbarth Cymru gan ei bod yn rhatach, oherwydd gostyngiad ym mhris trafniadaeth, na chodi tai bric. Dwedwyd fod y system oedd wedi’i phatentio yn costio hanner pris yr un trwch o fricwaith gan mai dim ond un rhan o ddeuddeg o’i gyfaint yr oedd rhaid ei fewnforio ar ffurf y sment Portland oedd newydd ei ddyfeisio. Yn gyffredinol, roedd y concrid a ddefnyddid ar yr ystad yn gymysgedd o un rhan o sment Portland i saith neu wyth o raeon o’r afon, a briciau wedi eu malu a thywod.

Gan ddefnyddio’r broses slip-ffurf oedd wedi’i phatentio, cyfarwyddodd Stiward Tir Gregynnog, W. Scott Owen, ddylunio a chodi’r strwythurau hyn, yn bennaf yn null Adferiad Gothig y cyfnod, ond gan ddefnyddio hefyd llyfrau patrwm cyfoes fel *An encyclopaedia of cottage, farm and villa architecture* (1833) gan Loudon, neu *Model homes for families* gan Henry Roberts a gyhoeddwyd i gyd-fynd â’r Arddangosfa Fawr yn 1851. Enynnodd yr holl gyhoeddusrwydd gafodd y dull patentedig chwilfrydedd y cyhoedd, a hybu’r diddordeb oedd wedi tyfu’n gyffredin mewn newyddbethau a gwerth mecaneiddio. Darluniwyd y gwaith mewn nifer helaeth o gyfnodolion a’i arddangos mewn arddangosfeydd rhyngwladol.

Yn nhai allan modelog Dolmelinau, ystad gerllaw Tregynon, gellir gweld yn glir lewyrch coch y gro o fric wedi’i falu. Yma ac ym mhob un o’r lleoliadau eraill yn Gregynog lle mae yna adeiladau a strwythurau màs-concrid, ma’r arwyneb sydd yn y golwg wedi eu cwblhau gyda “Scotts” o ansawdd da, sef rendrad o haen denau o sment fel amddiffyniad rhag y tywydd neu fel arwyneb mewnol “glanwaith” y gellid ei olchi. Arloeswyd mewn rhai adeiladau gyda phaneli to o goncrid dur rhag-gastiedig yn eistedd ar gyfres o drawstiau haearn-ti 75 x 75mm ar ganolau 720mm. Rodd y rhain ar grom ac wedi’u plygu i mewn i bennau’r mur *in situ* i dderbyn y trosglwyddiad llwyth. Wedyn, roedd llechi’n cael eu hysbigo’n uniongyrchol i mewn i’r arwyneb concrid heb ddefnyddio estyll. Addaswyd a datblygwyd a chymhwyswyd yr egwyddorion



▲  
**Dolmelinau estate** the red colouring comes from the crushed brick aggregate  
**Ystad Dolmelinau** daw'r llewyrch coch o'r gro o fri wedi'i falu

continuing general interest in innovation and the value of mechanisation. It was illustrated in any number of periodicals and displayed at international exhibitions.

At the model farmstead buildings of Dolmelinau, an estate property near Tregynon, the red glow of the crushed brick aggregate can still be seen quite clearly. Both here and in each of

the fourteen other locations at Gregynog where there are mass concrete buildings and structures, the exposed surfaces were finished with a fine "Scotts", a neat cement finish applied as a thin render either as weather protection or as a washable "hygienic" internal finish. Some buildings pioneered the use of early, unreinforced pre-cast concrete roof panels that sat on a series of 75 x 75mm iron tee rafters at 720mm centres. These were curved and bent into the *in-situ* wall heads for load transfer. Slates were then spiked directly into the concrete surface without the use of battens. These basic principles were also adapted, developed and applied to the integrated and often ingenious detailing of window surrounds, chimneys, porches and staircases.

Despite their present listed status, many of these unique Mid Wales buildings have reached a critical period in their history. The scourge of proliferating house extensions, double glazing, and demands for improved insulation values, together with the application of impermeable paint finishes, have all taken their toll. Moreover, the cleansing policy that followed the foot and mouth epidemic of 2001 washed away the friable external protective coat exposing the concrete core. Their current condition stands in contrast to the original design aspirations of the material experiment: well-ventilated, hygienic, low-maintenance and spacious structures. They remain a standing record of nineteenth-century social and technical endeavour and retain historical and cultural significance for us today, at the local, national and international levels.

### Understanding materials

If we are to protect the integrity of our historic environment we need to understand the nature of materials and the reasons for their use in particular times and places.

In addition to the exemplified previously discussed a case in point is the use of patented cements in the late Georgian/Regency period. A great number of mixes were developed during this period, the better known and more resilient being Parker's "Roman" cement, which made Nash's architecture possible; and Keene's cement or "Parian" cement. We often see stucco not being replaced on a like for like basis, but substituted for much harder, less

sylfaenol hyn ar gyfer y manylion integredig a dyfeisgar (yn amlach na pheidio) mewn fframiau ffenestri, simneiau, pyrth a grisiau.

Er gwaethaf eu statws rhestredig heddiw, mae llawer o'r adeiladau unigryw hyn yn y canolbarth wedi cyrraedd cyfnod argyfyngus yn eu hanes. Mae traul y cynnydd diddiwedd mewn ystadau tai, ffenestri dwbl, a'r galw am well inswleiddio, ynghyd â'r defnydd o baent anhydraid, i'w weld yn amlwg. Yn ogystal, fe wnaeth y gwaith glanhau yn dilyn yr epidemig o glwy'r traed a'r genau yn 2001 flingo'r cotiau bregus amddiffynnol allanol gan adael y bywyn congrid yn noeth. Mae eu cyflwr presennol yn dra gwahanol i obeithion y dyluniadau gwreiddiol corfforol: awyriad effeithiol, glanweithdra, strwythurau eang hawdd eu cynnal. Maen nhw'n dal yn gofnod o ymdrechion cymdeithasol a thechnegol y bedwaredd ganrif ar bymtheg, ac yn parhau i fod ag arwyddocâd hanesyddol a diwylliannol i ni heddiw, yn lleol, cenedlaethol a rhyngwladol.

### Deall deunyddiau

Os ydym am amddiffyn dilysrwydd ein hamgylchedd hanesyddol rhaid inni ddeall natur y deunyddiau a'r rhesymau dros eu defnyddio ar adegau ac mewn llefydd arbennig.

Yn ogystal â'r enghreifftiau a drafodwyd eisoes, un achos perthnasol yw'r defnydd o smentiau patentedig yn rhan olaf y cyfnod Sioraidd/Rhaglywiaethol. Datblygwyd nifer helaeth yn ystod y cyfnod, gyda sment "Rhufeinig" Parker yn fwyaf enwog a gwydn, sef yr un a alluogodd Nash i gyflawni ei gynlluniau pensaernïol; a sment Keene neu "Parian". Fe welwn ni yn aml stucco nid yn cael ei gyfnwio id am ei debyg, ond am ddeunyddiau eraill caletach a llai priodol. Pe bai hi ond er mwyn cadw cofnod manwl o'r cymysgeddau hyn fel tystiolaeth o'u datblygiad technegol, fe ddylen ni ymwrthod â phob erydu arnyn nhw – ac yn y diwedd eu diflaniad. Gellir gwneud dadl gyffelyb dros gadw castiadau ac addurniadau Carreg Coade; yn anaml yr adferir y rhain mewn dull dilys.

Dylem hefyd sicrhau pan yn ymgymryd ag unrhyw waith ar adeiladau neu strwythurau hanesyddol na ddylid fyth farnu pethau yn ôl eu hwynebwerth. Ystyriwch achos Erddig, ger Wrecsam, lle mae gan nifer o ystafelloedd, yn cynnwys Capel, Lolfa ac Ystafell Fwyta, nenfydau y gellid yn hawdd fod wedi eu cwblhau mewn plastr neu bapur addurn. Y gwir yw iddyn nhw gael eu hadeiladu o baneli o sinc cywasgedig neu aloi tun. Efallai mai nod y gwaith hwn o ddechrau'r ugeinfed ganrif oedd amddiffyn rhag tân, ac mae'n debyg o fod yn gorchuddio dyluniad blaenorol o'r nenfwd. Oherwydd yr haenau o arwybodaeth hanesyddol a'r dewis anarferol o ddeunyddiau, mae'n rhaid dilyn y confensiynau a'r egwyddorion caeth a ddisgrifiwyd yn gynt.

Rwyf wedi trafod yn benodol ddeunyddiau sy'n ehangu'r diffiniad o'r hyn a ddisgrifir gan lawer o bobl yn

appropriate alternatives. If only to retain a precise record of these mixes as evidence of their technical development, we should resist their erosion – and ultimately their total disappearance. A similar case can be argued for preserving Coade Stone castings and ornamentation; if damaged this is rarely replaced in an authentic manner.

We should also ensure that when undertaking any work to historical buildings or structures nothing should be taken at face value. Take the case of Erddig, near Wrexham, where a number of rooms including the Chapel, Saloon and Dining Room all have ceilings that on first impressions look as though they have a plastered and/or decorative paper finish. In reality they were all constructed of pressed zinc or tin alloy panels. This early twentieth-century installation was possibly a measure to resist the spread of fire, and probably conceals an earlier ceiling design. Because of the layering of historical information and this unusual choice of materials, it is always necessary to follow the strict conventions and principles described earlier.

I have looked particularly at materials that broaden the definition of what many people understand as “traditional”. I could equally have included early innovation in the manufacture and detailing of iron and steel, glass, joinery, mosaic surface finishes and any number of other decorative techniques. The process by which these should be approached as constituent parts of the historic environment should remain consistent each time. As the Viewpoint Consultation Document makes clear, understanding the conservation issues surrounding anything in the historic environment requires:

- the identification and evaluation of its significance to us from many perspectives, not forgetting that future generations may well take a different view
- the measurement of its fragility or vulnerability to human or natural action
- decisions of what to keep, modify or lose, conserving what is important for us to hand on to future generations
- feeding back of the results of this process to a new understanding of our cultural heritage

If we take these guidelines on board, the study and repair or adaptation of historic buildings may be undertaken with more confidence, whether it is a corrugated iron dwelling, constructed as a result of the railways being brought through Mid Wales by David Davies, or a folly built of concrete in the form of Palladio’s S. Giorgio Maggiore in Venice, even though in reality it may be located in a caravan park near Machynlleth! ☺

‘draddodiadol’. Gallwn hefyd fod wedi cynnwys arloesi cynnar wrth gynhyrchu ac addurno arwynebau haearn a dur, gwydr, gwaith coed a mosäig, a nifer o dechnegau addurno eraill. Rhaid bod yn gyson bob amser wrth ystyried y rhain fel rhannau cyfansoddol o’r amgylchedd hanesyddol. Fel mae Viewpoint Consultation Document yn esbonio’n eglur, er mwyn deall y cwestiynau ynglŷn â chadwraeth unrhyw beth yn yr amgylchedd hanesyddol rhaid:

- cydnabod a gwerthuso ei arwyddocâd i ni o amryw o safbwyntiau, heb anghofio y bydd pobl yn y dyfodol yn gweld pethau yn wahanol
- mesur ei fregusrwydd neu wendid wrth i bobl ymyrryd
- penderfynu beth sydd i’w arbed, addasu neu golli, gan gadw i’r oesoedd a ddél yr hyn sy’n bwysig i ni
- defnyddio canlyniadau’r broses hon i gyfrannu at ddealltwriaeth o’n treftadaeth ddiwylliannol.

Os derbyniwn ni’r canllawiau hyn, gellir ymgymryd yn fwy hyderus ag astudio a thrwsio neu addasu adeiladau hanesyddol, p’run ai cartref o gwt sinc, wedi’i godi o ganlyniad i ddyfodiad y rheilffyrdd i’r canolbarth trwy David Davies, neu ryw ffwlbrî congrid ar ffurf Sant Giorgio Maggiore Palladio yn Fenis, er mai mewn parc carafanau ger Machynlleth y mae wedi’i leoli! ☺



▲  
Corrugated iron used as a building material  
Haearn rhyhog wedi ei ddefnyddio fel deunydd adeiladu

## Using traditional materials to repair historic buildings

### Defnyddio deunyddiau traddodiadol i drwsio adeiladau hanesyddol

TIM RATCLIFFE ASSOCIATES is a company that specialises in a hands-on approach to the conservation projects it deals with, and believes that it is important to understand the materials and skills involved in good conservation.

In many cases an inexperienced specifier would not end up with the finished product he thought that he would get. As a result more harm than good may be done on a property through this work. As an example: lime mortar jointing allows walls to breathe, and dampness within it is able to be released through the jointing by evaporation. If such jointing is repaired with ordinary cement mortar the internal damp will be trapped. This can lead to the joints blowing in frosty weather, and to spalling of the face of the bricks; the dampness can pass back to the inside surface of a non-cavity wall causing mildew and damage to the internal wall covering such a wallpaper and panelling.

Further damage can be done to internal timber members such a skirting, joists, and floorboards, that may progress to the production of wet and dry rot spores. Then there may be beetle infestation. Thermal efficiency will of course be reduced.

Generally, despite what one reads in the papers, there is in fact very little rising damp in walls. The signs of dampness are generally a result of other factors such as roof leaks that allow rainwater to penetrate thorough the walls below, or blocked gutters or down pipes enabling rainwater to saturate the walls below the blockage. The outside ground level may be found to be above the existing wall damp proof course, again allowing rainwater to penetrate through the wall.

The problem is greater where there is no cavity within the wall, which usually is the case in historic buildings. An interesting statistic produced by English Heritage is that 85 percent of the value of the grants that it awards is used to put right incorrect construction in the twentieth century. Modern construction techniques imply that one needs to keep moisture out. However we should be letting the whole wall breathe. We are generally not in favour of cavity fill as a cavity allows the moisture within the internal skin to evaporate to the outside. However,



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CWMNI SY'N ARBENIGO mewn agwedd ymarferol i brosiectau cadwraethol yw Partneriaeth Tim Radcliffe, ac un sy'n credu ei bod hi'n bwysig deall natur y deunyddiau a medrau sy'n cael eu defnyddio mewn cadwraeth dda.

Mewn llawer o achosion ni fyddai rhagnodwr di-brofiad yn cael y cynnyrch terfynol yr oedd wedi ei ddisgwyl. Fel canlyniad, fe wneid mwy o niwed nag o ddaioni i adeilad trwy ei waith. Fel enghraifft: mae uniadu mortar calch yn caniatáu i furiau anadlu, ac i unrhyw leithder tu mewn iddo ddianc trwy'r uniadu trwy anweddiad. Os caiff y fath uniadu ei drwsio gyda sment mortar cyffredin bydd y lleithder mewnol yn cael ei gaethiwo. Gall

hyn arwain at uniadau'n chwalu mewn tywydd barugog, ac asglodi wyneb y briciau; gall y lleithder dreiddio'n ôl i wyneb mewnol mur di-geudod gan achosi llwydni, a niwed i orchudd y mur mewnol o bapur wal neu baneli.

Gall niwed pellach gael ei wneud i aelodau pren mewnol megis sgertin, distiau ac estyll, a all fynd yn ei flaen nes creu sborau pydredd gwlyb a sych. Wedyn fe all chwilog feddiannu'r lle. Ac fe leiheir effeithiolrwydd y gyfundrefn dwymo.

Yn gyffredinol, er gwaethaf yr hyn ddarllenwn ni yn y papurau, does yna fawr o leithder codi mewn muriau. Mae'r arwyddion o leithder fel arfer wedi'u hachosi gan ffactorau eraill megis toeau sy'n gollwng gan adael i law drochi'r muriau islaw'r dagfa. Efallai fod lefel y tir tu allan yn uwch na'r cwrs lleithder sydd yna, a hynny eto yn caniatáu i'r glaw hydreiddio trwy'r mur.

Mae'r broblem yn fwy pan nad oes yna geudod o fewn y mur, sef y sefyllfa arferol mewn adeiladau hanesyddol. Ystadegyn diddorol sydd gan Treftadaeth Lloegr yw fod 85 percent o werth y grantiau a roddir ganddi yn mynd at drwsio a newid adeiladau a godwyd yn anghywir yn yr ugeinfed ganrif. Mae technegau adeiladu modern yn disgwyl bod rhaid cadw lleithder allan. Ond fe ddylen ni adael i'r holl fur anadlu. Yn gyffredinol, dydyn ni ddim o blaid llenwi'r ceudod mewn mur gan ei fod yn caniatáu i'r lleithder tu mewn i'r mur mewnol anweddu i'r tu allan. Er hynny, mae llenwi'r ceudod yn gwella'r inswleiddio thermol. Beth sydd bwysicaf, gwell tymheredd neu leihad mewn problemau lleithder? Rhaid wrth asesiad unigol

fill does give the benefit of improved thermal insulation. What is for the best, improved thermal temperatures or a reduction in damp problems? An individual assessment is required before proceeding with cavity fill.

Care is needed with chemical or paint exterior wall treatments. Descriptions on tins may elide over some of the downsides of their application.

Treatment may stop rainwater penetrating the exterior surface of a wall, but most such products do not allow the moisture to be released from within it, despite what the manufacturers say. There have been a number of scientific tests to prove that this system does not work in all cases. The historic use of lime-wash has proven benefits, and it represents a nice exterior decoration which allows moisture to be released from within the walling. It is important however that the material is produced by an experienced lime manufacturer and mixed and applied on site by an experienced craftsman.☺☺



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cyn mynd ymlaen i lenwi geudod.

Rhaid hefyd nod yn ofalus gyda thriniaethau cemegol neu baent i furiau allanol. Gall disgrifiad ar dun fetu nodi rhai o sgil-ffeithiau gwael eu defnyddio.

Fe all triniaeth atal glaw rhag treiddio trwy arwyneb allanol y mur, ond mae'r rhan fwyaf o'r cynhyrchion

hyn yn atal y lleithder i gael ei ryddhau o'r tu mewn iddo, er gwaethaf yr hyn ddywed y cynhyrchwyr. Cafwyd nifer o brofion gwyddonol ddangosodd nad yw'r system yn gweithio ym mhob achos. Mae'r defnydd hanesyddol o olchiad gwyngalch wedi bod yn werthfawr, ac mae'n addurn allanol braf sy'n caniatáu i leithder gael ei ryddhau o du fewn i'r muriau. Er hynny, mae'n bwysig fod y deunydd wedi dod oddi wrth gynhyrchwr gwyngalch profiadol ac yn cael ei gymysgu a'i osod yn ei le gan grefftwr profiadol.☺☺