



# NEWSLETTER

NUMBER 46

MARCH 2010

Iontaobhas Oidhreachta Mianadóireachta na hÉireann

Mining Heritage Trust of Ireland

## MHTI PROGRAMME OF EVENTS 2010

(**Bold print** indicates finalised programmes; further details will be sent to members of events in ordinary print; *italics* indicates non-MHTI activities)

**MHTI AGM – Allihies, Co Cork**

**Field trip (perhaps underground) on the Sat 17th April, with AGM in late afternoon (to be held in Allihies Mining Museum, at 6pm). Dinner afterwards in O'Neils.**

**18<sup>th</sup> April Sunday – probable visit to local bronze age mines**

**Further details to follow shortly**

**Friday 14<sup>th</sup> May – Abbeystown Mine, Co. Sligo**

**Saturday 15<sup>th</sup> March – Connaught coalfield – Kilronan Mountain (including Arigna Mining Experience), Slieve Anierin and Bencroy**

**Sunday 16<sup>th</sup> March – Arigna – Altagowlan Mountain, Creevelea, Lackagh Hills**

**Holding on to your history – MHTI archives and records**

**Date postponed until November**

This meeting will be an opportunity to explore the archival collections MHTI has, and a chance to determine their future. **More details to follow**

*NAMHO 2010 4-6 June, South Gloucester. See page 8 inside for more details*

**September 2010 Date TBC on a Tuesday or Friday. Boulby Potash Mine, UK**

**16-17 October 2010 Co. Down fieldtrip led by Alastair Lings**

## EDITORIAL

This newsletter comes with a membership renewal form if you have not already sent your 2010 subs. It is really important that we receive subscriptions as quickly as possible, in order to ensure that we have certainty over members and their insurance requirements for attending meetings and fieldtrips. Please could you check your own needs for membership and insurance (do you already pay BCA insurance directly or through another mining heritage group you belong to?) and return the form with payment as soon as possible.

Your 2009 Journal is in production and will follow in the next couple of weeks.  
Matthew Parkes

**Contact Matthew Parkes for information 087-122 1967 or [mparkes@museum.ie](mailto:mparkes@museum.ie)**

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**WWW.MHTI.COM**

## MEMBERSHIP SUBSCRIPTIONS

Please note that if you have not already paid for 2010, a copy of your invoice is included here, with a plea for prompt payment. Managing the insurance scheme we are part of requires clarity over who our members actually are. Late payment means extra layers of administration and costs which we do not pass directly on to you the member. However, your rapid return of payment and membership instructions will be much appreciated. Individuals who are not paid up members will not be able to participate in MHTI visits and trips. If in doubt as to your own status, please make contact. And apologies to anyone whose payment crosses with delivery of this newsletter and invoice.

## The Dorothea Slate Quarry Cornish Pumping Engine

Des Cowman reported in Newsletter 45 on the MHTI visit to North Wales in September 2009. I would like to add some information about the engine at Dorothea. Kenneth Brown visited the engine in 1951 when it was still working and some of the data he recorded then and information from the Gwynedd County Records Office has been passed on to me via Harold Morris of the Welsh Mines Society. The engine house dates from 1904; the boilers were fired for the first time on 28th April 1906, but pumping 'for real' did not commence until 14th May. The old pumps were stopped on 30th May, but due to various problems with the pump plungers of the new 2-stage pumps, it was 21st August 1906 before all was well and pumping was trouble-free. Kenneth Brown gave the cylinder diameter as 68 inches, with a stroke of about 10 feet, operating at 6 strokes/minute; the engine only pumped during the working days of the quarry and was stopped for about half an hour at midday to allow the water to rise in the sump.

The Cornish cycle steam engine is a non-rotative engine with a large high-pressure cylinder doing work only on the downstroke. It has three valves : the steam (or inlet) valve, the exhaust valve, and the equilibrium valve. Cornish cycle engines were efficient, using steam expansively and always admitting steam from the boiler at the same end of the cylinder, a thermodynamically sound principle which the Cornish engine has in common with the much later uni-flow engine and the steam turbine. Although employing Lancashire boilers which "commonly had boiler pressures of from 160 to 200 psi" (Ewing,1926), the steam pressure at Dorothea was a modest 40 psi, which seems low. By way of comparison, steam locomotives built in 1906 typically had a boiler pressure of 160 psi. Kenneth Brown stated that the engine worked into a vacuum of 25" mercury, and I believe that he reported cut-off (ie when the steam inlet valve closes) at two-thirds of the stroke. However, Watkins' generic description of the Cornish Steam Cycle (Watkins, 1978) states "At about one third of the stroke, the steam

*valve closes...."*. Perhaps a reader can shed light on this apparent ambiguity - did two thirds of the stroke refer to the proportion already completed, or to be completed?

An 1863 paper read at the Institution of Civil Engineers in London, reviewing Cornish engine performance, only adds to the uncertainty by saying "*Formerly, the practice of working expansively was carried to a greater extent than it is now. The use of high [pressure] steam, cut off at an early part of the stroke, was carried further than was compatible with safety, involving repeated breakages of the main-end, the piston rod, and other principal parts of the engine; enginemmen showed that a low expansion, and a more gradual starting of the ponderous machinery, though giving a lower duty was nevertheless cheaper and safer in the end.*" Can any reader say whether this is in any sense a meaningful statement?



*The Beam and Pump Rod on the outside of the Engine House*



*Cylinder Head and Valves*

At Dorothea, the cylinder is connected to one end of a fabricated beam, the outdoor end of which carries the 14" square pump rod (reputed to weigh 65 tons) which descended into the 155-yard deep shaft. With a 68" cylinder at 40 psi (plus a vacuum "worth" another 12 psi) the Dorothea piston would exert a pull of about 84 tons at the beginning of the downstroke. This would appear to be adequate to get the beam and the pump rods on the move. It would be up to the skill of the

engineman to adjust the cut-off point so that the downward stroke was completed with the decreasing steam pressure on top of the piston allowing the ascending pump rod to decelerate and to become at rest just as the full stroke was completed, avoiding at all costs the beam coming into heavy contact with the catch-stops.



*The Cataract for the Steam and Exhaust Valves*



*One of the two Lancashire boilers*

The equilibrium valve, when opened, connects the top of the cylinder to the bottom, thereby equalising the pressure above and below the piston. It is opened after the downstroke has been completed, with a small time delay which the engineman can adjust by means of the equilibrium valve's cataract. The weight of the pump rods causes them to descend, pumping taking place and the piston upstrokes. The equilibrium valve is closed when most of the upstroke has been completed and when closed traps above the piston steam which is then compressed as the upstroke is completed under the weight of the pump rods; the rising piston is cushioned at the end of its upstroke - and this compression will assist in keeping the upper end of the cylinder hot. The Dorothea engine has a second cataract which controls the opening of both the steam and exhaust valves. The setting of this cataract determines the duration of the pause or dwell before the next downward (power) stroke commences.

According to the web site (penmorfa, 2009), which contains some splendid photographs, 600 gallons of

water per minute were raised. This would require 91 horse power ( $600 \text{ gallons} \times 10 \text{ lb/gallon} \times 500 \text{ feet} = 3,000,000 \text{ ft lb per minute}$ , divide by 33,000 to get horse power); this is a theoretical figure allowing nothing for losses. Another calculation, based on a 65 ton weight falling through 10 feet, 6 times a minute gives ( $65 \times 2240 \times 10 \times 6$ ) ft lb/minute, or about 265 horse power, implying the pumping side had an efficiency of about one-third.

At the time of Kenneth Brown's visit, the electric pumps which were to render the Cornish engine redundant were being installed, and Lindsay states "*In 1955 the engine was replaced by a 60 hp Beresford 8 inch centrifugal pump*" (Lindsay, 1974). (Others give 1951 as the change-over year.) If the steam engine worked a 10 hour day to keep the workings dry, then the electric pump would, it seems, have to work at least 15 hours a day - presumably not a problem if it ran unattended and its operation was automated using a sump level switch or similar device.

Finally, a note on the theoretical Rankine cycle efficiency of the Dorothea engine cylinder. Steam Tables enable the efficiency to be worked out as 19.6%, which compares very favourably with mid-20th Century steam locomotives (21%) and even with late-20th Century 900,000 horse power steam turbines (44%), having boiler pressures of 250 psi and 2,350 psi respectively.

The Dorothea engine was one the last Cornish designed beam engines built by Holmans in Cornwall. The engine is probably unique and is very well preserved. Most of the engine work is still in-situ (except for some of the valve gear and tappet rods which have been removed for safe keeping). The Dorothea engine is scheduled by CADW as a national monument (CN165). The engine house and quarry are also listed in the county records. The quarry site has had a number of owners in recent years and several plans have been proposed for the site. Most of these plans involve some form a leisure/recreational facilities and a dive centre (but the plans to date do not include any restoration work on the engine house or the engine). The flooded pits are some of the deepest non-marine dives in Europe, but have also been the site of a number of dive fatalities.

It is understood that the CADW and Welsh Assembly are sympathetic to conservation of the engine and the engine but that any progress on conservation is hampered by the ownership of the site. Recently NAMHO (National Association of Mining History Organisations) has become aware of the situation at Dorothea and is trying to facilitate the conservation of the site through representation to the local and national authorities. In the meanwhile the site is very venerable to vandalism. Just after the MHTI visit in autumn 2009 there was a break-in at the engine house and some windows were damaged when two large bolts were thrown out from the top floor of the engine house. It



would be a great loss to mining heritage if further damage was done.

The MHTI is grateful to Dr. Gwynfor Jones for showing us the Dorothea engine house on our visit last year.

John Hopkinson 9th January 2010

#### **Editor's Note**

Please do contact John with any comments or corrections; he is only too aware that not everything on the www is necessarily true, and has not been back to primary sources for the purposes of this contribution.

#### **References :**

Ewing, J A "The Steam Engine" 4th Ed. Cambridge University Press 1926.

Lindsay, Jean "A History of the North Wales Slate Industry" David and Charles 1974.

Morsehead, W "On the Duty of the Cornish Pumping Engine" Proc Inst CE **XXIII** 1863.

penmorfa,2009

[www.penmorfa.com/Slate/beamengine.html](http://www.penmorfa.com/Slate/beamengine.html)  
(at 28/09/2009)

Watkins, George "The Steam Engine in Industry" Moorland Publishing 1978.

Steam Tables are available for non-commercial purposes at [www.x-eng.com](http://www.x-eng.com)

Abbreviation used : psi pounds per square inch

## **Coal Mining in Castlecomer A way of life for so many for so long by Firoda National School**

For a long time now we have had mention of the Firoda National School website on coalmining in Castlecomer, in association with information about Seamus Walsh's excellent book *In the Shadow of the Mines*. Back in 2001 Firoda national School also published a print version of their massive project, in a colourful paperback book edited by Martin Fogarty, their teacher. It has only recently come to my attention and I think it deserves a mention here in the newsletter to alert people to its existence.

Whilst the information contained is largely a printed version of their website reading is always easier in a real book in your hands. Of course many people do not have easy access or comfort with the internet and this will serve them well, along with libraries and relevant archives.

Topics covered in the book include the full spectrum of topics related to coal mining in the Castlecomer area, including the history, the different types of mining over the centuries, the individual pits at Deerpark, Skehana and Firoda etc. Technical aspects of how coal was extracted, how the miners worked, the tools and equipment are all covered. There is plenty of social history of the community, the role of women back in

the miners' homes, and individual miners' tales of working conditions and stories.

Our own Seamus Walsh features prominently and he of course was as unstinting with his help in this project as he always is. His story as told to the schoolchildren is a particularly articulate evocation of life and times among a collection of interviews with former miners. Michael Conry obviously helped too regarding the Culm crushers scattered around the area. Other sections cover the forges, carters and associated industry around the mining.

A visit to Larry Power's pit in Glenmullen Woods by every child in the school obviously made a big impression – "it was the experience of our lives." A favourite section of mine was the story of Bells Heap – a 350 feet high heap of slack, spoil and coal and its eventual fate. The section covering rats underground also makes for a fun read.

The book is liberally laced with pictures of the children at work on the project and historical images of the many sites and features described. Contemporary documents are included as images too, with many transcriptions of newspaper articles, official reports and letters throughout the book. There are 24 pages of colour images in the centre which include many class photos.

If one wanted to criticize this, you could pick out a fair scatter of spellings and typos. You could argue that the information is rather randomly organized, with a degree of repetition along with other distractions. However, once you remember that this is the result of a school project by the pupils of a whole Primary School, led by a highly motivated and committed Principal and his small staff, then these minor details become irrelevant and one can only admire the amount of work that has gone into this project and the enthusiasm and pride it has inspired. It is definitely a worthwhile addition to the sparse record of coal mining in Ireland and should sit comfortably on your bookshelf alongside *In the Shadow of the Mines* by Seamus Walsh.

If you wish to check out the website see <http://www.iol.ie/~mfogarty/book.htm>. If you wish to get hold of a copy of the book, then you can contact Martin Fogarty at Firoda National School, Castlecomer, Co Kilkenny (Tel: 087-2222113). The book costs a reasonable 20 euro including P&P (or \$21). *Review by Matthew Parkes.*

## **5<sup>th</sup> International Symposium on Archaeological Mining History**

Like every year, our yearbook will be presented at the 5th International Symposium on archaeological Mining History in May 2010.

**LIMITED EDITION—The IES yearbook is printed**

on demand for the participants of the International Symposium. This means there will be no or little copies available afterwards. As we experienced that there is a great demand for copies with people who are not able to attend the symposium it is now possible to order additional copies in advance.

Order your (additional) copy now at: [publicatiebureau.ies@gmail.com](mailto:publicatiebureau.ies@gmail.com) before 01.04.2010

Price: EUR 44,95 (excl. EUR 10,- P&P)

Attention! This offer only counts for additional copies. Participants of the symposium will receive their copy during the book presentation in Freiberg. Additional copies ordered by participant can also be collected at the book presentation without paying for P&P.

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### ABBEYTOWN MINE VISIT FRIDAY 14<sup>th</sup> MAY

John Kelly is to lead an underground visit to Abbeytown Mine, Co. Sligo, by special arrangement with the Quarry operator Frank Harrington and his staff. The mine is normally closed entirely and is being opened up especially for us. Limited to 8 places. Must have BCA underground insurance through MHTI or another group. If you want to see a taste of what the mine is like see the paper by John Kelly in MHTI Journal 7.

To book your place send an email to [mparkes@museum.ie](mailto:mparkes@museum.ie) or phone 087-122 1967

### Connaught Coalfield Visit Saturday 15 – Sunday 16 May 2010

This fieldtrip will examine coal mining and related sites around Lough Allen. Legend has it that the Tuatha De Danaan landed on Slieve Anieran (Sliabh An Iarainn = the iron mountain), discovered iron and set to work making weapons. In the 15<sup>th</sup> century iron was worked in Drumshanbo, using charcoal to smelt the ore. By 1621 Sir Charles Coote employed 3000 workers at his smelting works at Arigna, Ballinamore, Creevelea and Garrison.

Gradually the supply of timber for charcoal production was exhausted and the iron works shut. Coal was discovered west of Lough Allen in 1765, and in 1788 the pioneering O'Reilly Brothers used it to smelt iron. The works at Arigna eventually shut in 1838, but coal mining continued to supply domestic, municipal and industrial requirements.

In 1920 the 4 mile Arigna Extension Railway was completed, linking the mines to the Cavan & Leitrim Railway. Coal was supplied to cement factories at Limerick and Drogheda.

In 1958 the Electricity Supply Board opened the Arigna Power Station, which used up to 55000 tons of coal annually, 65-85% of local production. This strong local demand for coal reduced the need for the railway, which closed in 1959. When the power station stopped work in 1990, the coal mines shut. It is estimated that 29 million tonnes of coal remain unmined. In 2003 a show mine and purpose-built visitor centre was opened: the Arigna Mining Experience ([www.arignaminingexperience.ie](http://www.arignaminingexperience.ie)).

#### Coordinator

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#### Programme

##### Saturday 15<sup>th</sup> May

Meet at 10:00 for coffee at the Arigna Mining Experience, G921142, Discovery sheet 26. Tour the show mine (at your own expense) then we visit mines on Kilonan Mountain-Carrane Hill, Slieve Anieran and Bencroy.

##### Sunday 16<sup>th</sup> May

Same meeting time and place. Mines on Corry Hill and on the Lackagh Hills. Creevelea Furnace (G909293). On one day, Denis Flynn has kindly offered to show us a 1930s coal cutter he is restoring.

#### Equipment

Members are requested to bring warm clothing, waterproofs and hillwalking boots or wellies. If going underground (subject to permission being granted), helmets, electric lamps, crawling (knee) pads and oversuit are recommended.

#### Bibliography

- Cole, G.A.J. 1922. Memoir and map of localities of minerals of economic importance and metalliferous mines in Ireland. Memoir of the Geological Survey of Ireland. The Stationery Office, Dublin. 155pp. (Reprinted by the Mining Heritage Society of Ireland in 1998) (Iron: p77 & 78. Creevelea Furnace: p.xviii and xxviii in the MHSI reprint).
- EastWest Mapping (compiler), 1999. The miner's way & historical trail: guide book with detailed 1:50,000 scale maps. EastWest Mapping, Enniscorthy. 36pp.
- Flanagan, P.J. 1966. Mining in Cavan. Breifne Vol 3 (No. 9), p100-107.
- Griffith, R.J. 1818. Geological and mining survey of the Connaught coal district in Ireland. The Dublin Society, Dublin. 107pp. \*





*Old adit, Gubnaveagh, Bencroy Mine*



*Weighbridge & aerial ropeway, Kilonan Mountain*



*Hopper, Gubnaveagh, Bencroy Mine*



*Winch gear, Gubbarudda*



*Incline, Greaghnageeragh, Irish Mines*

Johnston, N. 2003. *The Irish narrow gauge in colour*. Colourpoint Books, Newtownards. 108pp. (Arigna Extension Railway: p55-56. Mine railways: p57-59)

Kane, R. 1845. *The industrial resources of Ireland* (2<sup>nd</sup> edn). Hodges & Smith, Dublin. 438pp. (Reprinted by the Irish University Press, 1971). (Coal: p16-25. Iron: p 122-124, p 133-136, p144-148 and p157-158) \*

Layden, D., 2008. *A life's catch*. Original writing Ltd, Dublin. 302pp. (The Arigna industrial revolution from 1600s to the present: p113-154)

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MacDermot, C.V., Long, C.B., & Harney, S.J. 1996. *A geological description of Sligo, Leitrim, and adjoining areas of Cavan, Fermanagh, Mayo and Roscommon, to accompany the bedrock geology 1:100 000 scale map series sheet 7, Sligo-Leitrim*, with contributions by K. Claringbold, D. Daly, R. Meechan and G. Stanley. Geological Survey of Ireland. 99pp. (Earth resources: p24-28)

McArdle, P. 1992. *Irish coalfields - technical developments in the 1980s*. p341-358 in Bowden, A.A., Earls, G., O'Connor, P.G. &

Pyne, J. (eds) 1992. The Irish minerals industry 1980-1990. Irish Association for Economic Geology. 436pp. (Connaught Coalfield: p351-355)

McParlan, J. 1802. Statistical survey of the county of Leitrim. The Dublin Society, Dublin. 382pp. (Minerals: p11-17) \*

Rigney, P. 2002. Report on the Arigna coalmines 1942. Breifne Vol 9 (No. 38), p509-516.

Rigney, P. 2004. Arigna coalmines and the emergency. Breifne Vol 10 (No. 40), p290-

Weld, I. 1832. Statistical survey of the county of Roscommon. Royal Dublin Society, Dublin. 710pp. (Collieries and ironworks: p33-77. Arigna Coal & Iron Company: appendix p.i-xxvii) \*

Wynne, P., 2005. Remembering the Aughacashel mines. p30-35 in Harvey, B., and Kennedy, S., 2005. Mountain Echoes: Sliabh an Iarainn's Story. 169pp.

Publications marked \* are available to download at <http://books.google.com>

#### Accommodation in Drumshanbo

Berry's B&B, High Street. Nine rooms. 071 964 1070, mobile: 087 742 5907. [magscamp@hotmail.com](mailto:magscamp@hotmail.com). (Special rate for MHTI members 32.50 euro/single occupancy/night)

Belle Vue B&B, Church Street. Four rooms. 35 euro/single/night. 071 964 1800, mobiles: 086 378 5902 / 086 845 3132.

c/o Bernadette McKeon, Carrick Road. 071 964 1106. 45 euro/single/night.

c/o Betty McManus, High Street. 071 964 1128. Approx 35euro/single/night.

c/o Mairin Heron, Fraoch Ban, Corlough, (1 mile north of Drumshanbo). 071 964 1260, mobile 087 636 0446. [mh@fraochban.com](mailto:mh@fraochban.com). (45 euro/single/night).

The Yellow Ducati B&B, Carraig-na-mBreac. 087 777 4857. [taradeire@libero.it](mailto:taradeire@libero.it). 35 euro/single/night.

Maguires Cottages (self catering), Acres Lough. 071964 1033. Mobile: 087 137 9570.

#### Nearby accommodation

Miners Cottage (self catering). Contact the Arigna Mining Experience, 071 964 6466. Sleeps 5 (max). 150 euro for the weekend.

## Research Framework for the Archaeology of the Extractive Industries (Mining and Quarrying)

NAMHO (the National Association of Mining History Organisations) has begun a project, part funded by English Heritage over the next two years, to develop a Research Framework for the Archaeology of the Extractive Industries (Mining and Quarrying). As part

of the first stage of that project NAMHO will be holding a series of seminar/workshops across England; the first of which will be held at the Tamar Valley Centre, in Gunnislake, on 20 February.

On 10 April there will be a second seminar at Snibston Discovery Park in Leicestershire and the third will be at Carnforth Railway Station in Lancashire on 25 April.

The purpose of the seminars is to discuss the current state of knowledge for mining and quarrying archaeology in England. There will be three presentations on aspects of the archaeology over the course of the day with ample time for discussion and contributions from the floor. Would those interested in attending please contact the Project Director - Dr Peter Cloughton - by e-mail [P.F.Cloughton@exeter.ac.uk](mailto:P.F.Cloughton@exeter.ac.uk) or by 'phone 01437 532578.

## Andrew Strachan and Ballycorus Mine – an enquiry

I would appreciate it if any of your readers could confirm if the **Ballycorus Lead Mines** were owned at some stage by **Andrew Strachan** (c.1828-1884) or other members of his family. The earliest basis of this belief that I know of can be traced back to a letter written by a Church of Ireland rector in 1972. In it, he states, 'The son of the metallurgist of the mines, a man called **Dr. Vernon Roberts**, contacted me about six years ago and asked me whether I was related to the Strachans who owned the Lead mines.'

Andrew was a son of **James Strachan** (c.1794-1848), who it was believed was born in Kirkcaldy, Scotland. A Lead Milling operation carried out by the Strachan Brothers was based in Cross Lane, off Loftus Lane, Dublin up to about 1885. The family of James and his wife, Margaret were resident in Loftus Lane from at least 1823 (Chapelizod Parish records). It was believed that James's wife was Irish but nothing further is known about her or their marriage. I am descended from Andrew's sister, Alice Margaret, who married Robert Broadbent (1827-1890). It is possible that the latter may also have had an interest in the Mining Company of Ireland.

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## Ian Forbes retires

Ian Forbes has retired from managing Killhope – North of England Lead Mining Museum after 26 years. Some members will know him from MHTI's involvement with MINET and Europamines, and some trips. Ian was a stalwart of those networks.

Thanks to Don Borthwick for this news.  
Best wishes to Ian for a happy retirement.



Mining Heritage Trust of Ireland / Iontaobhas Oidhreacht Mianadóireachta 36  
Dame Street, Dublin 2

## Notice of Annual General Meeting

**Notice is hereby given that an Annual General Meeting of the Mining Heritage Trust of Ireland Ltd. will be held at Allihies Mining Museum, Allihies, Co. Cork on Saturday 17th April 2010 at 17.00**

### Agenda

1. **To receive the accounts of the Mining Heritage Trust of Ireland Ltd. for 2009**
2. **To appoint auditors**
3. **To elect directors**

**Signed,**

**Nigel Monaghan,  
Company Secretary**

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**MINING HERITAGE TRUST OF IRELAND Ltd.**

Proxy Form

I/We....., of ..... in the County of ..... being a member/members of the above named Company, hereby appoint ..... or failing him of..... as my/our proxy to vote for me/us on my/our behalf at the Annual General Meeting of the Company to be held on 17<sup>th</sup> April 2010 and at any adjournment thereof.

Signed .....

Dated .....

This form must be with the Secretary (Mr Nigel Monaghan, National Museum of Ireland, Merrion Street, Dublin 2) at least 48 hours before the AGM (17th April 2010). Proxies do not need to be members of MHTI.

**Directors:** D. Cowman, M. Critchley (UK), M. Carragher, B. Jones (NZ), N. Monaghan, M. Parkes (UK), S. Walsh., A. Lings (UK) Registered in Ireland. No. 340387. **Registered Office:** 36 Dame Street, Dublin 2, Ireland.