The Sliabh Aughty Furnace Project

by Dr. Paul Rondalez

You would be excused for not associating the Sliabh Aughty mountains with heavy industry. In reality, however, the area was the scene for extensive iron mining and smelting activities for a century and a half. Between 1630, and very possibly twenty years earlier, and the 1770s the area from Tuamgraney, County Clare to Woodford, Co. Galway witnessed iron ore mining in at least nine localities and extensive ironworking plants in another nine (Fig. 1). Associated with these were charcoal-production stations, quarrying and carpentry activities and an elaborate transport network, as well as numerous other smaller industries. Although a lot of the remains connected to these industries have since disappeared a surprising amount are still preserved in the area.

Iron production in 17th- and 18th-century Ireland

Until the late sixteenth century, iron ore in Ireland was exclusively smelted in so-called bloomery furnaces.

These installations were generally clay-walled chimneys measuring about one to one and a half metres high with an internal diameter ranging between 30 and 60cm. In bloomery furnaces the heat was used to remove the oxygen from the iron oxides in the ore and to smelt the non-iron parts of the same, but the iron itself never became liquid. The products of these furnaces are called blooms and weighed from 20 to 40kg.[1]

Around the thirteenth century, in an area stretching from Sweden over Germany to Switzerland, an altogether different type of furnace appeared. Now the bellows are no longer blown by hand but driven by water-power, the furnaces themselves are substantially larger stone-built square structures (side lengths and heights between 4 to 5m) and the product is now liquid iron.

The furnaces themselves are invariably equipped with two large arches set in adjoining walls: one for the bellows ('blowing arch') and one for the removal of the iron and waste ('tapping arch') (Fig. 2).

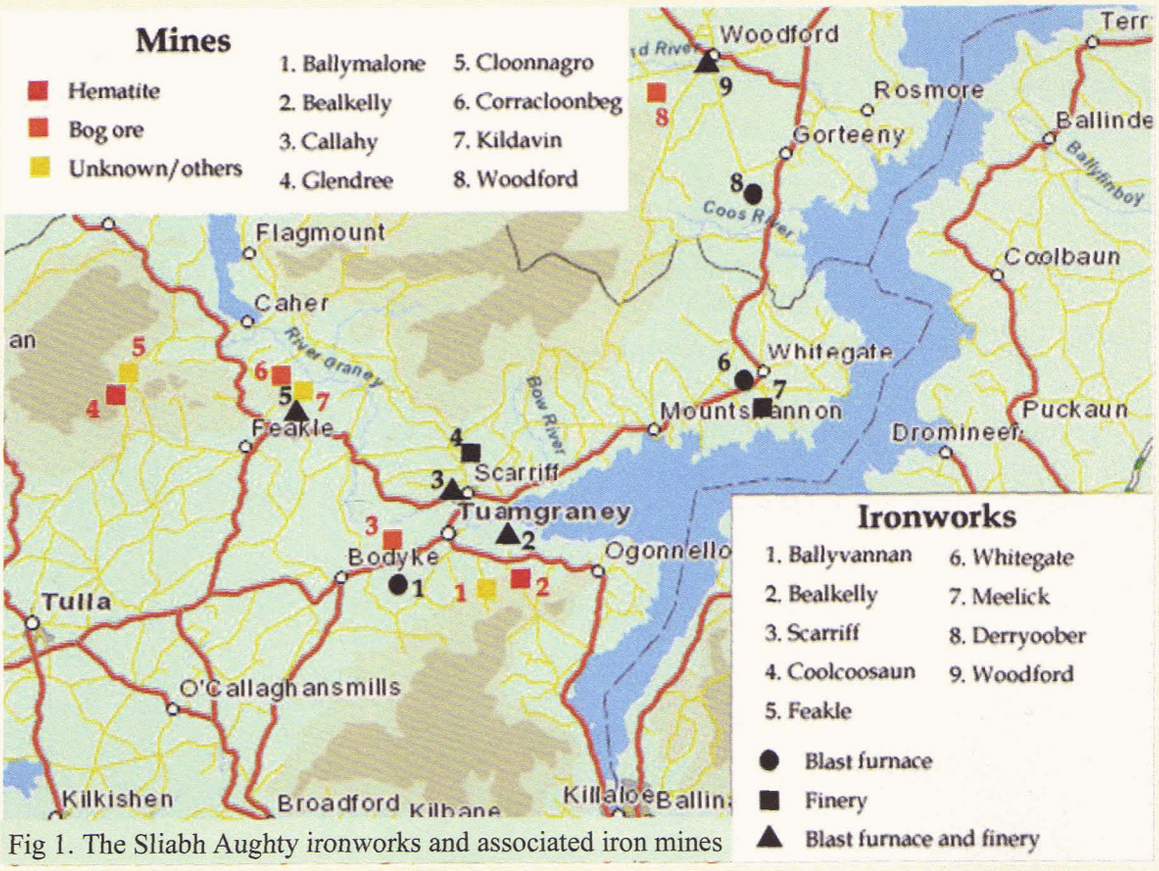

Fig 1. The Sliabh Aughty ironworks and associated iron mines

[1] There were also water-powered bloomeries which produced blooms weighing twice as much and more

The liquid state of the iron is not only due to a higher temperature as a result of the use of water -power, but also because of the use of more charcoal per fuel unit.

This liquid iron could be poured into a mould making cast iron objects. Because of their high carbon content, cast iron objects cannot be forged; they shatter upon being struck with a hammer. Alternatively, the iron could be cast into large bars of iron known as 'sows'.[2] These sows are then brought to a finery where the iron is re-melted in an oxidising environment to remove the excess carbon. After further operations at the chafery (re-newed reheating) and the hammer forge (shaping) so-called wrought iron is obtained which could then be further forged into a variety of shapes by the blacksmith.
The finery, chafery and hammer forge all utilised water-power and were frequently part of the same plant.

As the early blast-furnace was expensive to build, required highly specialised labour and had a high strategic value, it spread only very slowly outside of its original heartland. Only at the very end of the fifteenth century are the first installations of this kind built in England, in the south-eastern Weald counties of Kent and Sussex and run by French workers. Only when the woods in that area can no longer provide sufficient fuel for the furnaces, around the middle of the sixteenth century, did blast-furnaces spread further afield, into northern and central England and Wales.
This is the period when the Plantation of Ireland gets under way, and already in the 1560s we hear of proposals for establishing a blast-furnace in the area around Carrigaline, Co. Cork as part of the Kerrycurrihy Plantation of Sir Anthony St. Leger.[3]

It is unclear if this furnace was ever built and for the rest of the sixteenth century the sources mention only further proposals and unspecified ironworks working in Ireland, all in Counties Cork and Waterford. The earliest definite evidence of a blast-furnace in Ireland is the one built by Sir Thomas Norris in Mallow, Co. Cork which operated from 1583 to 1589.[4] In the beginning of the seventeenth century, during several decennia of relative calm, multiple blast-furnaces were built in Ireland. Among the most proliferous were the ventures of Sir Richard Boyle, First Earl of Cork, in Co. Waterford and by Sir Charles Coote's ironworks in County Laois and the ones built by both in Leitrim.[5]

Fig 2. Likely unfinished furnace at Derryoober, showing the blowing arch (left) and the tapping arch (right)

[2] From the late 18th century onwards these are known as 'pigs' of iron.
[3] BL, Cotton Titus B/XII f.10, (Rondelez 2014): 99
[4] Rondelez 2014: 108
[5] Rondelez In Press

Many of these furnaces were destroyed during the Civil Wars of the 1640s but already in the 1650s new ones were built and surviving ones brought into production again. This is the period when the long-lasting works at Enniscorthy, Co. Wexford were constructed.[1] In the 1660s and 70s, William Petty established a substantial iron-producing industry in County Kerry,[2] but it was especially in the 1680s that new plants were started up, many in areas with no previous recorded blast furnaces, such as Counties Cavan, Mayo and Galway. In the eighteenth century we have many references to blast-furnaces active all over Ireland, but the limited source material together with little research on the subject means that we cannot yet present a clear picture of the industry at that time. Many ironworks closed down around the middle of that century, with a handful continuing production up till about 1780. These then closed down due to lack of fuel and competition from abroad.

Previous research and the Furnace Project

Up until recently, the history of the Sliabh Aughty iron industry has received little attention. Geologist G. H. Kinahan, who generally had a strong interest in historical Irish mining and metal production, includes his observations, together with local knowledge, in various of his publications in the second half of the nineteenth century.[3] After this, it took over a century for the next author to pay attention to the Sliabh Aughty ironworks, in the form of an article on the activities in Woodford, Co. Galway by Ó Gormáin.[4]
A decade later historian Gerard Madden had collected enough material to publish an overview of the extant remains of furnaces with their known history.[5]

The current author became interested in seventeenth- and eighteenth-century Irish iron production when he embarked on a PhD thesis on Irish iron production in late medieval times at University College Cork.[6]

During the Feakle Festival of 2009, this author attended a talk by Gerard Madden after which a fruitful correspondence commenced. This led to the discovery of much previously unresearched sources relating to the Sliabh Aughty area and its ironworks, for example the invaluable Emmerton Papers comprising of the correspondence of two agents of John Emmerton, an English investor with interests in the ironworks at Woodford and Scariff, Co. Clare.[7]
During the same period, the upstanding remains of the furnaces were subjected to closer inspections and new discoveries in the field were made. In the Spring of 2014, the Historical Metallurgy Society came over to Ireland for its annual field trip and one day was spent visiting the Sliabh Aughty furnaces. At the end of the day, in the pub, it was agreed to organize a Furnace Festival later that year. This took place on the 20th and 21st of September at Mountshannon, Co. Clare and combined a series of talks with outdoor attractions. In 2015, a generous grant was received from the Heritage Council to compose Conservation Management Plans of the four upstanding furnace remains. These Plans will form the basis for further grant applications to commence the conservation of those remains.[8]

What is currently known and preserved of the Sliabh Aughty iron industry

There is a marked general imbalance between furnaces with good documentary evidence and those with upstanding remains. We know very little about the history of those furnaces with remains while the best documented are not preserved.
This need not to be a coincidence: furnaces with a long life span will be in a worse state at the end of their production life than an ironworks only functioning for a few years.
Also, the more successful works are more likely to have attracted the kind of people leaving archives and will also have attracted more court cases.
Of the four preserved furnace remains, we only have certain documentary evidence for one; the furnace in Whitegate, Co. Clare (Fig. 3).
The start date of the Whitegate works is unclear but the 1740s has been suggested.[9]

[1] Barnard 1985
[2] Barnard 1982
[3] Kinahan 1863, 1870; Kinahan et al. 1861
[4] Ó Gormáin 1986
[5] Madden 1997
[6] Rondelez 2014
[7] Nott. Arch., Emmerton Papers, DD/SY 156.1-80
[8] The Plans are now available for download on the Project Website (www.furnaceproject.org).
[9] Elliot 2004: 24. This information, however, does not appear to be contained in the quoted deeds

Fig 3. The passage way built into the back of the furnace at Whitegate, Co. Clare

The ironworks of Woodford and Ballinruane, Co. Galway were to be let in 1758.[10] These are described as consisting of one furnace and three forges (or fineries). This could either mean that the furnace at Woodford was out of use at that time or that only the Whitegate (Ballinruane) forge (finery) was included. Proposals were to be sent to Henry Croasdaile of Renn, Co. Laois or Samuel Benton in Woodford. The latter could have been the manager of the works. In 1760, the Whitegate (Ballenruane) ironworks were leased out for a term of 31 years at an annual rent of £65, together with the Woodford ironworks, to John Burke of Grallagh, Co. Galway.[11] The Ballenruane ones are specified as 'two severall Ironworks' and as such imply that both the furnace and finery were active. In the same deed it is specified that a coppice and underwood were growing on the lands between the Ballenruane ironworks and the river Shannon.

We have no direct evidence for any of the other three upstanding furnace remains: at Bealkelly, Co. Clare (Fig. 4), Derryoober, Co. Galway (See Fig. 2) or Ballyvannan, Co. Clare (Fig. 6). The last furnace might be the one referred to in 1610 as being run by Henry Tokefield 'upon the river Shenan [Shannon]'.[12] If this is indeed the case, then the Ballyvannan ironworks is not only the first-built of the Sliabh Aughty furnaces but its remains are the oldest upstanding ones in the country.

Fig 4. The furnace at Bealkelly, Co. Clare showing the tapping arch

The oldest furnace we have positive evidence for is the one built at Scariff in 1630.

We are relatively well informed about these ironworks because they were the subject of no less than four court cases in the Court of Chancery in England and are mentioned in the diary and other documents belonging to Richard Boyle, the first Earl of Cork.

The works included a furnace and finery and were financed by a group of London merchants headed by Joshua Foot and William Beeke. From the very start, much disagreement arose between landlord Brady and the London merchants, hence the later court cases.

The ironworks and lands were sold to the Earl of Cork in 1634, while the London merchants kept

[10] Stokes 1893

[11] NLI D. 23,185-23,215 Aliaga Kelly Papers (Croasdaile Papers) Not individually numbered, Croasdaile – Lambert Deed of 3 March 1760

[12] CSPI, James I, Vol. III: 928

on running them. Curiously little was found on the works in the Lismore Papers, the extensive archive of the Earl of Cork, for the subsequent period. Either before, or as a result of, the Civil wars of the 1640s, the Scariff venture was abandoned and by the mid-1640s Foshua Foote and William Beeke were among the main financial backers of the construction of the first iron-producing blast-furnace in the New World at Braintree outside of Boston, Massachusetts.
The person running these ironworks was Richard Leader who was *'formerly employed in Ireland about mynes.*

After the Civil Wars, while the Irish iron industry saw a quick recovery in several places, it would take until the 1680s before it took off again in the Sliabh Aughty area. This was initiated by Henry Waddington of Cloghstoken, Co. Galway who, after he purchased Woodford in the same county, constructed an ironworks there in 1681. The only evidence we have for this date is a unique cast iron bar preserved at Woodford and embossed with this date (Fig. 5).

Fig 5. iron bar at Woodford

The bar would have originally re-enforced one of the furnace arch roofs. Shortly after this, Henry Waddington also takes over and repairs the Scariff ironworks, then owned by Robert Boyle, the scientist-son of the First Earl of Cork.

We are very well informed about various aspects of both the Woodford and Scariff works as they were briefly, between 1692 and 1697, in the possession of John Emmerton of Thrumpton Hall, Nottingham and his family archive contains the correspondence of two of his agents involved in the ironworks (and silver mining).[13] Although these Emmerton Papers contain frustratingly little detail about the ironworks themselves, they contain fascinating information on the sale of the iron products, the politics of iron production in late seventeenth century and the ever-present horses needed to carry charcoal and iron ore to the furnace. These Emmerton Papers also contain some of the very scarce references to the iron smelting venture at Feakle, Co. Clare, operating at the same time, and make clear that the Woodford and Scariff ironworks come into the possession of the 'Montragh men' or the people running the ironworks at Mountrath, Co. Laois. The ownership of the Woodford works is further clarified by a court case from 1713 detailing the various interests in the works since Henry Waddington's time.[14]

Other than this court case, and the documents mentioning the Whitegate works around 1760 (see above), the eighteenth-century source material consists mostly of short snippets of data: the Scariff ironworks are up for sale at various times between 1712 and 1716, the sale of woods in 1757 mentioning Woodford ironworks and others.[15] Not only do three of the four upstanding furnace remains (Bealkelly, Whitegate and Derryoober) very likely or definitely belong to this period, the ironworks at Coolcoosaun in the townland of Tobernagat north of Scariff, Co. Clare probably do as well. In 1863, Kinahan describes the remains as an 'iron mill', a term he consistently uses for fineries.[16] If this is correct, we are still missing a furnace as none of the known ones could have feasibly fed this finery.

Fig. 6. The furnace at Ballyvannan, with only its vitrified interior remaining

[13] Nott. Arch., Emmerton Papers, DD/SY 156.1-80
[14] Colles 1789: 459-467
[15] *London Gazette* 20 Dec and 27 Dec 1712, 27 Dec 1715 and 27 Oct 1716; *Pue's Occurrences* 22 Feb 1757
[16] Kinahan 1863: 48. A single piece of slag found near where these remains would have stood is very possibly finery slag.

Both the furnaces and the fineries required huge amounts of charcoal and the low price of woods in this part of Ireland at that time, together with the occurrence of high-grade iron ores, were the main reasons the iron industry flourished here. But by the second half of the eighteenth century the trees were getting scarce and at the same time cheap iron was being imported from both England and Sweden.
The Sliabh Aughty iron industry was doomed. Lewis puts the end of the iron industry in the Sliabh Aughty area in the late 1770s with the closure of the Woodford ironworks.[17]

Further research, conservation and spreading the word

Although the documents mentioned are primarily used to reconstruct the history of the Sliabh Aughty ironworks, they often provide invaluable data on the bigger picture. The supply of fuel and ore has been mentioned above.
The documents rarely touch upon the iron mines supplying the ore, but many of these were recorded in the nineteenth century during the Geological Survey of Ireland (Fig. 7).
The decimation of the woods as a result of these furnaces is a very important topic as is the study of the people involved, from the owners and financiers who would have belonged to the upper classes of the day to the ironworkers themselves whose descendants are still living in the area. As such the available information will be used to reconstruct a picture, or pictures, of daily life west of the Shannon in the seventeenth and eighteenth centuries, a period that has been formative for what the area is today, not least as a consequence of the ironworks.

Apart from the written sources, an important part of the history of the ironworks still lies untouched under the sods. It is hoped that future archaeological investigations can be undertaken on the various sites which would allow us to gather unique information on the working of the furnaces, the material world of the people involved in the industry and securely date the construction of the different ironworks.
These archaeological excavations would also be ideal events during which people could visit the ongoing work and learn about these fascinating monuments.

Additionally, it is also hoped to provide access to the furnace remains, some of the mines and other associated sites.
We have further publications planned next to the current one and a second Furnace Festival is being considered.
As mentioned above, the recently completed Conservation Management Plans will be used to apply for funding to undertake urgent conservation work on the upstanding furnace remains. All this work is done by a growing group of volunteers who have assisted in site clearance work, surveying and historical research.

If you would be interested in further information about the project you can visit our website, our Facebook page or contact the author.[18]

Fig 7 An iron mine in Sliabh Aughty

[17] Lewis 1837 Vol. II: 724
[18] www.furnaceproject.org, https://www.facebook.com/FurnaceProject/ and prondelez@yahoo.com

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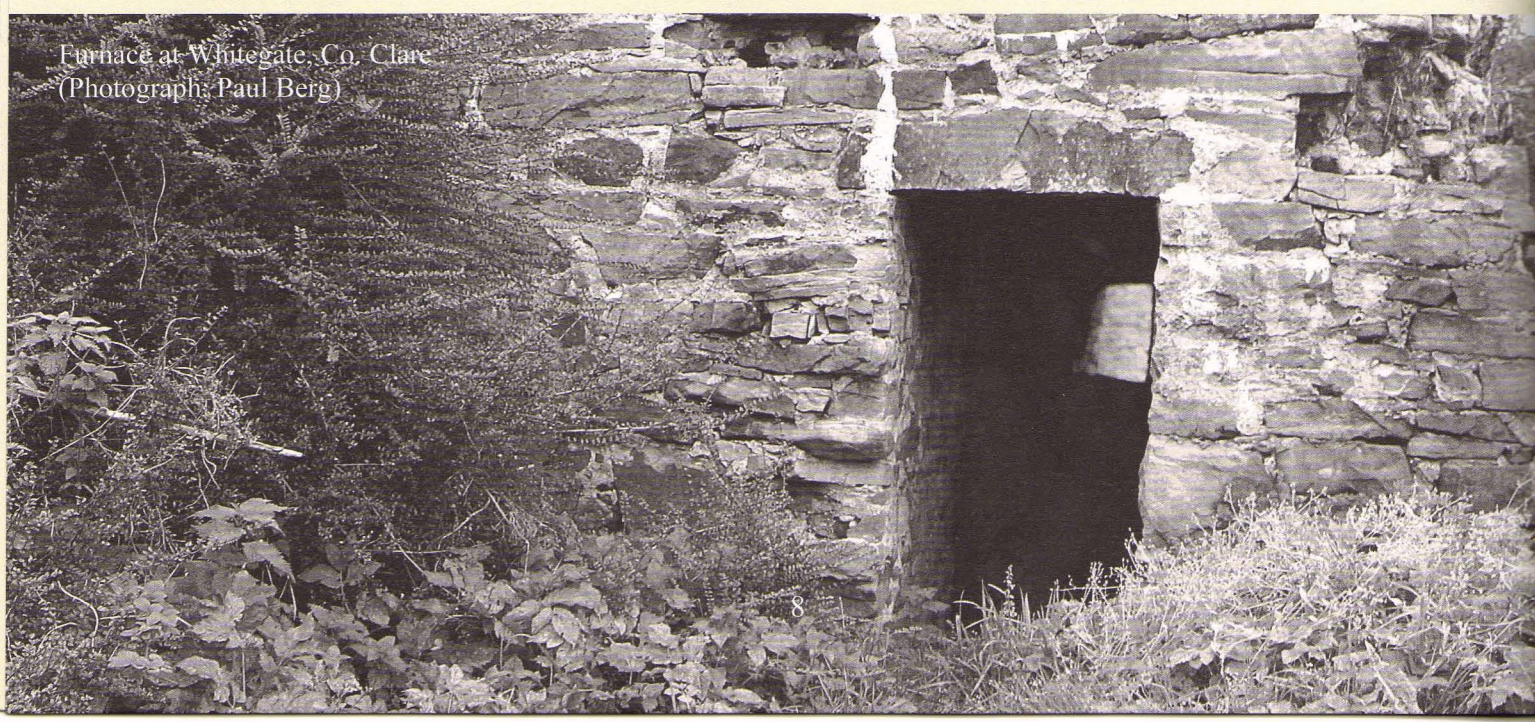

Furnace at Whitegate, Co. Clare (Photograph: Paul Berg)