



Between the Lines

Land of Oak & Iron Mapping Project Newsletter

October 2019

With two meetings in the month and additional independent meetings held by some teams good progress is being maintained. This edition features an article about one of our best loved trees, the oak, its uses and influence. We also take a look at triangulation, a key survey method for map makers before the days of satellite imagery.

Volunteer meetings October 2019

After the busy meetings when we were joined by representatives from the Gateshead Archive and the Mining Institute in Newcastle, we returned to developing our main mapping projects. The mills team continue to add detail to their already comprehensive database, and have found a great deal of useful information in an article entitled [Early Tyneside Industrialism: The lower Derwent and Blaydon Burn Valley 1550 -1700](#) by Eric Clavering & Alan Rounding. map. Waggonways team have almost completed plotting and verifying many of the routes described in the book *A Fighting Trade: Rail Transport in Tyne Coal 1600 - 1800*. At the Winlaton meeting the team was joined by a local expert who had particular knowledge about waggonways to the east of our area - details of which had been proving a little more elusive. Plotting of woodlands and roadways shown on Greenwood's maps is approaching completion and we have a list of local history and interest groups which we plan to show on the digital map.

Oaks in the Land of Oak & Iron

The oak is a dominant forest tree of the northern hemisphere; an ecosystem all of its own and a keystone species for many habitats; a tree of proverbial strength and character. In Britain *Quercus robur* (English or pedunculate oak) and *Quercus petraea* (sessile oak) dominate.

Oaks grow to a great age and size – specimens of over 1000 years old can be found in Britain. They support large numbers of insects and birds, form partnerships with other trees and ground flora and are known to be able to communicate using chemical warning signals of vaporised tannin, released into the air during severe insect infestations. The dense timber is highly valued for its strength and resilience; traditionally it was felled and sawn or split when still green and seasoned in place, becoming harder with age.

Buildings and ships of great size and sophistication relied heavily on oak for their construction. But it is not true to say that Britain's oak woods were cleared to make ships for the navy. As Admiral Collingwood reminded Northumbrian friends, the parts of oak trees most highly prized by shipbuilders were the bracket-like horizontal

branches (used for framing decks) that grew best on hedgerow trees with plenty of elbow room. In any case, felling trees does not disestablish woodlands; trees grow back. Farmers clearing land for arable are the principal culprits. The Derwent (meaning river where oaks are common) Valley is the most densely wooded area in the North-east, discounting conifer plantations, and that is a legacy of its importance to the early iron industry. Our largest wood, the 800-acre Chopwell Wood, once consisted primarily of oaks, but these were cut down as being 'unprofitable' in the 19th century, when the area was replanted with mainly larch. Many of the oaks have grown back.

Oak bark is highly prized for its tannins, used in curing leather. It was traditionally peeled from recently felled trees in June. Barrels used in fermenting wine, whisky and beer spawned a large, widespread industry from the medieval period. Oaks were often allowed to mature to about 100-150 years to produce fine timber; but large areas of oak woodland came under coppice management to allow regular cropping, every 20 years or so, of oak poles for construction. Any parts of an oak tree not used for timber went to make high quality charcoal, burned with very little air to drive off cellulose and impurities and leave a pure form of carbon. Until the introduction of coke in the 18th century, charcoal was essential to create the very high temperatures for smelting iron and steel.

Acorns, usually collected by jays, are buried in large numbers every autumn and germinate readily. Pigs were traditionally turned into oak woods in autumn to fatten them for winter slaughter, a practice called pannage.

Oaks have given our valley its name, they have contributed to the success of its industry and today they provide the character in local woodland for us to enjoy, celebrate and share.

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Triangulation in early map making

In our November 2018 newsletter we looked at the origin of the name, Ordnance Survey, and its early development. This time we look at some of the precursors to the survey and the methods used for setting out a framework for the early maps.

The Seven Years War (1756-1763) prompted calls for an accurate military map of the south coast of England amid fears of invasion by France. Existing maps lacked detail of the relief of the land. Understanding the rises and falls of the land was seen as particularly important in determining the areas most vulnerable to attack and where defensive positions would be most effectively sited. Maps at this time were usually created by traverse surveying, measuring from point to point, with angles and distances between a series of locations being plotted. The accuracy of such maps varied dependant on the skills of the surveyor and the cumulative effect of even small errors.

The idea of measurement by triangulation in map making had been described by Gemma Frisius, a Flemish mathematician, in mid-sixteenth century. The technique used an accurate physical measurement of a baseline with the angles (determined using a basic theodolite) from each end of the baseline to a distant (third) fixed point to one side of the baseline. Given the length of one side of a triangle and knowing these two angles allows the lengths of the remaining two sides to be calculated using the Sine Rule. Using one of these calculated sides as the base of a new triangle and measuring the angles between each end of this line to a new distant (fourth) fixed point, to one side of the new "baseline", allows the lengths of the remaining sides of this second triangle, to be calculated. This process is repeated and the relationships between a series of fixed points (which would become known as Trigonometrical points or "trig" points) builds up into a framework of the landscape.

By the end of the seventeenth century, triangulation had been used to measure the Paris Meridian, from Dunkirk, through Paris to the Spanish border near Perpignan. This meridian line would later be extended and forms the basis of the metre measure.

In 1783 the Head of the Paris Observatory, Cesar Francois Cassini de Thury proposed that, in order to advance astronomy, it would be interesting to measure the exact distance between the Paris and Greenwich observatories. Although the locations of these august institutions had been determined by astronomical measurements, this opportunity to align the measurements, prove the accuracy of measuring instruments and improve global navigation was welcomed. The project commenced early in the following year.

In 1784 measurement of the British baseline began. The site selected, Hounslow Heath, much of which is now covered by Heathrow Airport, had previously been identified as suitable. The 5 mile track of the baseline was cleared and levelled, then measured roughly using

100ft steel chains. A more accurate measurement using 20ft wooden rods was started, but problems with the wood, which warped and expanded, were soon encountered. The wooden rods were replaced with some made of glass which proved successful and the baseline measurement was completed in 75 days. The length was determined as 5.190 miles. The modern GPS-defined measurement of 5.185 miles shows that to be a remarkably accurate measurement made using simple methods and equipment.

To accurately measure angles between points the Great Theodolite was commissioned. With a diameter of 3ft, telescopes for sighting and micrometers for adjusting the position of the angular scale, this extraordinary instrument was capable of measurements of one arcsecond, or $1/3600^{\text{th}}$ of a degree. Three years after measurement of the baseline, the triangulation started.

Due to slow progress triangulation of the [cross-channel section](#) (two locations on the English Coast and four on the French) was completed before that between the Heath and the Kent coast. Some of these measurements required sightings of around 40 miles. Good agreement between measurements by both country's surveyors was found with a discrepancy of only 7ft across the width of the channel. Work then turned to completion of land-based measurements. To confirm the accuracy of the calculated distances it was necessary to create a second measured baseline in Kent. This time Romney Marsh, some 80 miles from the original baseline, was selected; the difference between the calculated length of the baseline, of 5.404 miles, and that physically measured, was just 4.5 inches.

Before the end of the century fears of invasion again intensified and focus returned to improving maps of the south coast. This was, however, the first stage of a wider project to produce a national survey. In 1791 the Hounslow baseline was remeasured and found to be within 4.6 inches of the earlier measurement. Equipped with a new, and improved, Great Theodolite measurements progressed through to the Sussex coast and by late 1794, 136 miles of the coast, from Fairlight Head in East Sussex to Portland in Dorset, had been triangulated.

Progress from trigonometric framework to a map that could be practically used by the military is a further chapter in this story which we hope to continue in the coming months.

Coming up in November:

Tuesday [12th November 2019](#) , The Winlaton Centre, North Street NE21 6BY (in Winlaton village)

Tuesday [19th November 2019](#) The Lodge, Laburnum Avenue, Blackhill, Consett, DH8 5TA

