IX

Early Tyneside Industrialism
The lower Derwent and Blaydon Burn Valleys 1550–1700

Eric Clavering and Alan Rounding

IN their very detailed account of Whickham before 1730[1] David Levine and Keith Wrightson showed that the parish had become thoroughly industrialized before the Civil War; indeed coal production was such that it demanded a labour force equivalent to 94% of the known adult male population of the parish.[2] We wish to enquire here whether Whickham is a special case or whether their description may fit industrialization elsewhere on Tyneside. For this purpose we propose to look at an adjacent but overlapping area to the west, some six square miles lying between two watersheds, those of the Blaydon Burn to the west and the River Derwent to the east, in depth very roughly three miles, from the Tyne as far as Reely Mires in Ryton and Blackamoor Hill in Whickham, an area meriting study since its industrial history has long been obfuscated by topological *insouciance* on the part of economic and industrial historians insufficiently familiar with the Ordnance Survey.[3] Examination of these valleys shows two main dissimilarities from the picture Levine and Wrightson have given us. One is that coalmining is not the sole industry; undoubtedly dominant, its expansion is nevertheless accompanied after the mid-16th century by the growth of metallurgy. The other is the relative absence west of the Derwent of the internecine warfare characteristic of the Whickham coalowners.

Accounts of Tyne coal in the early 17th century have leaned heavily on Whickham data found in the endless lawsuits; there is far less documentation of this kind for the rest of the coalfield.[4] What is more, most of these cases arose from two quite small areas of Whickham, one of them only half of a square mile in extent. The geological structure of the three coal parishes, Whickham, Gateshead, and Ryton at least in its eastern part Winlaton, is strikingly similar. All three are upland massifs reaching 450 feet or more, rising abruptly from a northern frontage on the Tyne, and sharply defined on their east and west flanks by valleys, the Team between Gateshead and Whickham, the more considerable Derwent between Whickham and Ryton, and the Blaydon Burn separating Winlaton from the west of the latter parish. Why then belligerance east of the Derwent, concord west of it?

The variable was ownership of land and coal. Among likeminded owners there was little conflict: new men brought dispute. Before the Dissolutions the coal lands on the Tyne had largely belonged to the Church, and such as did not were in large estates of landed families, Neville (Winlaton), Lumley (Axwell-cum-Swalwell across the Derwent), Gascoigne (Ravensworth) and Hedley (Saltwellside across the Team in Gateshead). The coal trade was then dominated by James Lawson, who was necessarily a tenant of the Church in several estates; when these were seized and privatized he bought them, in defence of his industrial investment if for no other reason. In consequence in Elizabeth's reign the most important group in the rising export trade in coal might well be called the Lawsonians, families who held their coal through Lawson.

It was to a partnership of these, among them the determined recusant merchant Richard Hodgson, a Neville retainer and husband of one Lawson daughter, along with her son-in-law the coalowner William Selby, that on the eve of his rising in 1569 Westmorland sold Winlaton manor. The lesser neighbouring manor of Stella across the Blaydon Burn, long

worked by Lawson who held a pre-Dissolution 99-year lease from his sister the prioress, was sold in 1600 to a Tempest. On the eastern bank of the Derwent the principal landowner was Lord Lumley. Until the death of Elizabeth, then, by far the greater part of what lay between the watersheds belonged to four families of the Neville connexion, Tempest, Hodgson, Selby and Lumley. To the south, where extraction was not yet economic, lay more estates of like-minded families, other Tempests, the Hardings and the Blakistons, giving an area of unusual homogeneity of ownership.

To the west and particularly to the east matters stood otherwise. Here about half of the coal belonged to the Bishop of Durham, obliging entrepreneurs to pay for concessions, always called "leases". The most valuable, in Gateshead and Whickham, was eventually transferred to Newcastle Council as the "Grand Lease", but in less important Ryton it remained in his hands as the so-called "Stella Grand Lease".[5] It was east of the Derwent that great changes in ownership took place. In Gateshead monastic coal passed to Lawsonian merchants, the Riddells. On the Team early in the new century first Ravensworth, and then the lands between it and the Tyne, passed from the old gentry to the ambitious merchant Liddells, unrelated to the Catholic-leaning Lawson world and new to coal, and this destabilized the structure of the trade.

The last decade of Elizabeth had seen the Grand Lease too, intended to profit the old merchant oligarchy of Newcastle, passing to new men because of sale and inheritance of shares and parts of shares in it, and because state intervention facilitated the rise on the Council of a largely Puritan opposition group. In a second round of sub-leasing in the 1610s the Whickham Grand Lease coal was allotted to four partnerships, in which Puritans were prominent and the only old family was Tempest. Whickham became the cockpit of the trade because the interfaces of these companies with Whickham villagers, with earlier lessees and with their Liddell neighbours, brought endemic conflict; the flood of legal disputes arose from frontier flare-ups.[6] Members of the Grand Lease consortium were partners in Stella Grand Lease too, but Ryton saw no such litigation.

1 Coal before 1625: i Winlaton

One would expect then that the peace reigning west of the Derwent would have favoured Winlaton coalowners. There were however countervailing factors, of which the first was geology[7]. The coal seams of Tyneside dip towards the north east. A first consequence is that upstream there was more exposed coal workable by opencast and therefore exhausted earlier. The wide lowlying Blaydon and Derwent Haughs by the river were one such area; they seem to have been the first exploited, very likely in much the same way as peat was extracted around Norwich, but so early as to have left no record other than marshland. There was a similarly exposed crown on the top of Winlaton Hill, and it must be from here that coal was sent for lime-burning at Windsor Castle in 1367. This deposit may have held half a million tons, but even this amount could well be quarried in a century. The only evidence of its extraction, old workings and corves found in roadbuilding in the 1930s, was destroyed and cannot now be dated, a common fate of artefacts of Tyne coal archaeology.

A second consequence of the NE tilt is that, once underground working was begun—reluctantly, since it left half the coal to support the roof—coal was best attacked "from the dip", its lowest point, usually its NE corner. Working towards the rise allowed accumulating water to flow down to be dealt with by existing drainage. A great advantage of large coal estates was that wide areas could thus be methodically cleared. Where there were numbers of adjacent small properties, unless much of the coal was sacrificed to serve as a barrier those up the rise drowned their neighbours of the dip, a common cause of burdensome litigation in the early 17th century, notably in Whickham. In Winlaton this advantage of extent was well understood; despite two divisions of the lands among the lords of the manor the coal was not shared out and was always

worked as a single "Winlaton .Colliery". Unfortunately their good sense was frustrated by geological faulting; the hill was split in two by a west-east fault, and the northern half had further fractured into four blocks which had sunk irregularly, allowing only limited working from the dip.

The breaking of the strata had also reduced considerably the extent of the coal crown as compared with those of the Whickham hilltops across the Derwent, bringing early shaft mining. In 1425 already there were two pits leased, no doubt sunk to the Hutton seam on the western side of the hilltop NW of the church and N of the principal fault.[8] Their output should not be underestimated; to judge by the mining techniques found about that time in Leicestershire it may have been as high as 2000 tons a year each.[9] Even at this rate of extraction the seam within this block may not have lasted longer than some fifty years.

When in 1551, Cuthbert Blunt, a Lawson son-in-law, with Richard Hodgson and others, took a 30-year lease from the Earl, the coal worked lay mainly S of the great fault, in the next sector, on Snookhill in the Westfield W and SW of the church, and in upper Lands SE of it.[10] This is the first known systematic development of a colliery on Tyneside, as opposed to the multiple small enterprises which appear to have been usual until then. A large area of the Ruler was drained by an adit, the Watergate in Garesfield Lane lying at about 330 feet. We do not know where this underground watercourse ran, but whereas in Westfield it must have drained much of the next seam too, in Lands because of the dip of the seams to the E only the top seam would be cleared, an illustration of Winlaton's geological problems.

This colliery's winding-up accounts for 1582[11] show that the principal partner had been Lawson's daughter Barbara Blunt-Scrivener, the earliest known of a notable breed of Newcastle businesswomen. She ran her own concern, and while most Winlaton coal went to Blaydon Staiths, she had a river port of her own on the Derwent. It was not, as has been said, at the river's mouth; keels at that time were brought up to the limit of navigation, here Swalwell Ford. Her staiths lay across the river on the Swalwell side, but still within Winlaton manor. Total output for 1581 was given as 23,602 fothers, over 100 wainloads a day, making 7,867 Newcastle chaldrons, some 20,800 tons. Calculations of this kind however foster an illusion of precision, and quantities below will be given in *Tens* (of chaldrons actually exported), the measure used by the trade. There was also unspecified production elsewhere in Winlaton, and Blaydon Staiths exported in all 804T (tens). It seems possible that in this colliery's heyday output may have approached the 1,000T mark; the Tyne's entire export must then have been of the order of 4,000T.[12]

William Selby did not come into his own until the reluctant departure of his aunt Barbara which elicited these figures. Unfortunately the ensuing peace in Winlaton has left us little data for the years 1582–1625. In the later 1580s Selby would need to make new sinkings to maintain Winlaton's share of the trade; a likely target would be the three seams in the Horsecrofts on the N face of the hill. However a map of about 1600 shows instead pits apparently on Blaydon Haugh, with others on the Derwent. In 1603 the new Company of Hostmen made its first distribution of vend quotas, based no doubt on average sales for past years; members with an interest in the Winlaton lordship were given in all 1,500T, out of a Tyne export now of over 9,000T.[13] However all had coal outside of the manor; William Selby for instance had pits in Whickham Grand Lease, and the Winlaton figure is likely to have been 1,000T–1,200T; the colliery appears to have maintained its former production, but its share of a fast-expanding trade had been halved.

Selby, the most important coalowner of his day, who as MP had negotiated the acquisition of the Grand Lease, had handed over his business to his son George in 1605. Sir George, first and foremost a politician, was without the share in the Lease, but remained a great owner, for his Thornley cousin Nicholas Tempest sought and worked coal for him in Elswick and perhaps Benwell. In Winlaton he sub-let it, an unprofitable policy usually avoided, though in two cases the agreed rents per ten were in fact

higher than the profit most owners declared; such small entrepreneurs are unlikely to have done other than complete the exhaustion of the easier upper coal.[14] To judge by Selby and Hodgson Vend quotas, Winlaton colliery maintained an output of 1,200T; by 1622 there seems to have been a major redevelopment of possibly self-draining seams at the foot of the N or E faces of the hill, overlooking the Tyne or the Derwent, and in 1627 exports probably reached 1,500T, but this increase now gave little over 10% of the ever-growing Tyne total. In the 1620s Winlaton was being left behind by the first colliery to install rail transport, Whickham Grand Lease, and was losing second place to Stella Grand Lease. As the total of recoverable coal in the two upper seams on the north face of Winlaton Hill was probably less than 40,000T, of which by the time of Sir George's death in 1625 the greater part must have been extracted, Winlaton's relative decline was inevitable.[15]

2 Coal before 1625: ii West and East of Winlaton

The Whickham Grand Lease is relatively well documented, and in the Derwent valley a broad wedge of it divided the freeholds of Axwell and Swalwell. This included the copyhold northern half of Axwell and the Bishop's Mill, which gave the Grand Lessees staiths on the river immediately below those of Barbara Blunt. In the acquisition of the Grand Lease William Selby's partner had been Sir Henry Anderson (unrelated to Robert), who for the most part left matters concerning the coal trade to his associate Henry Chapman. In consequence a group formed around the latter which, often by marriage into his circle, acquired an interest in the Grand Lease, such as the rising aldermen William Greenwell and James Clavering. In the last two decades of the 16th century the group had pits on Sir George Selby's Peal Flat overlooking Swalwell, in Grand Lease copyhold, north and east of Dunston Hill, the scene of Whickham coal disputes, and in Axwell Morrisfield. The latter allowed free drainage; a Grand Lease watercourse running to Swalwell Bank may date from this time, but on Peal Flat water must have been raised to the surface, no doubt by the gin of Ginn Close on Market Lane. Peal Flat is not heard of after 1610, but we know that the Morrisfield continued in production till the 1650s and was not entirely exhausted in 1712.[16]

Of the two other collieries flanking Winlaton, the freeholds of Stella and Axwell-cum-Swalwell, not much is known. In 1603 Nicholas Tempest of Stella held a vend quota of 250T, and that is likely to represent the output of the outcropping seams. An unparalleled leap to 900T two years later, a quantity impossible to extract from this middling estate, marks the emergence of Sir Nicholas and his son Thomas among the Grand Lessees and active all along the Tyne, for they had acquired a full share in the Grand Lease, possibly Selby's.

Axwell freehold offered free drainage and so the colliery was worked very early; the first known Whickham coal lease, of half Axwell coalmine, is of 1320. However Axwell-cum-Swalwell coal then undergoes a long silence. On the eve of the 1569 rising Sir John Lumley followed Westmorland's example and put his coal property into safe hands. In 1599 it was leased to William Jenison, a Hostman from a strongly Catholic family with many coal interests, and Timothy Draper, not known to have financed any other colliery; output seems to have begun at not less than 500T and may have reached 700T. Though old free-drainage pits in Axwell had been reopened in 1609 they were abandoned as unprofitable a year later, so this must have come from Swalwell, next to the earlier workings on Peal Flat. Any seam there would require draining, and would end abruptly at the main W–E fault. In 1617 the Lumley estate was lost by mortgage; either through drowning of for lack of coal the colliery's output by then may have been only 100T, and by 1622 it had disappeared.[17]

South of Axwell lay two more gentry coal estates. Its immediate neighbour, Hollinside, along with its prolongation to the east the Riding Field, in all some 640 acres, belonged to the Hardings. South of these, Blakiston lands formed a broad though non-continuous belt

across Whickham parish from the Derwent to Ravensworth, with coal of enormous potential importance but too far from the river for early development. Most of this lay on Marley Hill east of the Derwent watershed and outside of our area; what lies within is present-day Gibside, then called West Gibside, far less in extent than East Gibside, east of Byermoor Lane, an important distinction; West Gibside in fact held less coal than the Hardings' much smaller estate. Both Blakistons and Hardings were non-freemen, barred from the Hostmen's Company; though they could work their coal they could not vend it.

The Hardings however were in the front line, sharing boundaries with coal-hungry entrepreneurs, so that their Riding Field became virtually an extension of Whickham Grand Lease. Already by 1606 Grand Lessees had acquired part of the easily accessible hilltop coal and had two pits there, extracting about 200T a year, and in 1623 half of the Riding Field was conceded to one of them, John Clavering, at a rent which suggests an output of 500T; by 1625 the Harding estate had become a major colliery, but out of the hands of its owners.

The Blakistons were altogether different; their policy in industry was to seek professional partners. Cadets of East Durham squires related to the Neville connexion, they acquired the estates in the 1540s by marriage and at once set about becoming active industrialists, putting younger sons into iron or coal. As their own coal was then too distant to be exploited for the export trade, at its rise in the 1570s they acquired from the Bishop a long lease of a High Main outcrop in Gellsfield, an offcut from the future Whickham Grand Lease, and in 1617 a younger son achieved admission to the Hostmen. By then West Gibside coal had long been exploited for local use; in 1608 there were "colemynes as well opened as not opened" in Snipes Dene. This deep cleft facilitated free drainage of upper seams; a millpond below it, used in the 18th century for a papermill, must have worked a coalmill for lower ones, but we do not know when.[18]

By 1625 then coalmining in the Derwent area had developed to the point of requiring great capital investment. The escalation of technical costs in the industry had been made manifest since 1617 by the vast and adventurous new Whickham Grand Lease Colliery. In Winlaton matters were aggravated by the exhaustion of easily-worked seams by early exploitation, and by uncertainties and high risks arising from the difficult geology. East of the Derwent however, particularly in the Riding Field, there was easily-got coal whose main cost was transport, a prize which brought an invasion of Newcastle merchant capital.

3 Industry before 1625

If we set aside activities arising from the land, such as the milling of corn or the fulling of woollens, not coal but lead is our area's oldest industry. The great North Pennine orefield, from Allendale to Baldersdale, forms an arc of between 12 and 24 miles radius centring on our area, and from earliest times its output was necessarily exported through the nearest navigable water, found at Blaydon or Swalwell. From Blanchland on the upper Derwent ran a ridgeway, the "Ledehepes Way", through Hedley Fell and Leadgate, already used by the 1150s to demarcate the northern boundary of Chopwell. The Bail Hill beside it, with four others on Derwent, Wear and Tees delimit this ancient industry. Because of its weight lead ore was smelted near the mine, but refining where fuel was cheaper might be called for; Teesdale ores were often rich in silver. Output varied greatly over the years; in the 1420s it was high in Weardale, whose road to its staiths at Swalwell led through another Leadgate near modern Consett, but by 1510 the Tyne's annual export of lead was in all little over 30 tons. Under Elizabeth rising demand brought new sources. From 1567 to 1593 upwards of 100 tons of "Newcastle lead" came from the Bowes family's Lunedale ore smelted on the Tees at Mickleton and carried by a new bridge over the Wear at Stanhope. So lead refining in Blaydon, and possibly in Swalwell too, is likely to have had a long but only intermittent existence.[19]

To exploit Cumbrian copper the Company of the Mines Royal brought Daniel Höch-

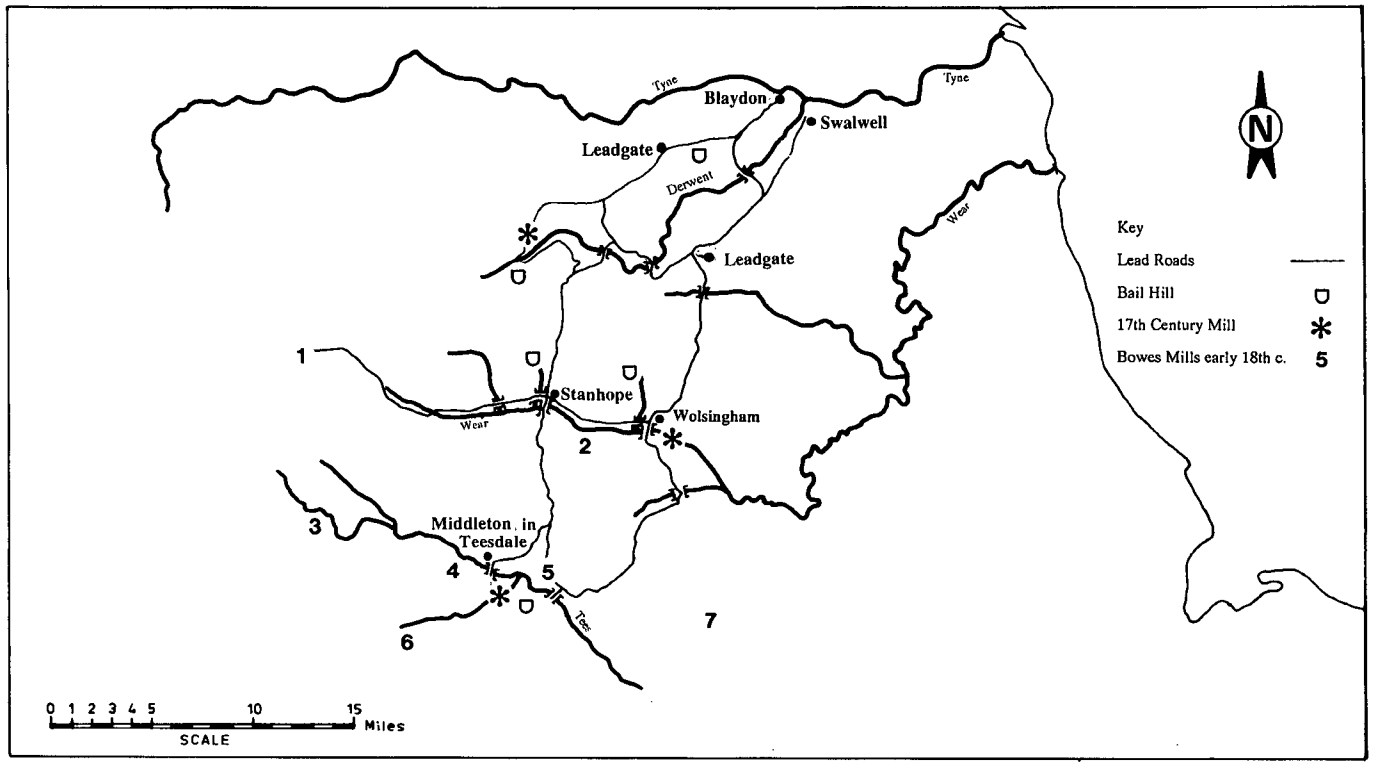

Fig. 1. The Early North Pennine Lead Industry
Medieval smelting is shown by Bail Hills near Winlaton, Blanchland, Stanhope, Wolsingham (Baal Hill) and Mickleton.

The lead roads are demarcated by a survey of bridges made in 1615 by Durham Justices. They listed bridges over the Derwent at Lintzford, Eddisford and Allensford; over burns at Knitsley, Rookhope, Stanhope and Wolsingham; over the Wear at Stanhope and Wolsingham; over Bedburn Beck; and over the Tees at Middleton and Egglestone [SS 199 93/35].

The Bowes family in the early 18th century had lead mills at:

1 Nenthead, 2 Bollinghope, 3 Isabella-Meah, 4 Holwick, 5 Egglestone, 6 Wemmergill, and 7 Staindrop [DRO D/St/ B2/1–31,105,135].

stetter (Hechstetter) from Augsburg to Keswick in 1564, where he installed smelters and coppersmiths, and produced lead too. For the next 70 years this gave Newcastle an export of the metal similar to that of lead half a century earlier, increasingly as "battery", hammered copperware, reaching 70 tons in 5 to 10 cwt loads in the winter of 1620. Hechstetter's devout children married Puritan Nicholsons, and his successors were both brothers-in-law of the Grand Lessee James Clavering; Keswick output was shipped to London in Tyne colliers by merchants of his Puritan circle, the Customs duties covered by James and later his son John. It must then have gone not to Blaydon but to the Grand Lessees' wharf at Swalwell. The closure of the Hechstetter enterprise in 1633 may have been caused by cost of overland transport as well as by shortage of ore.[20]

Iron, which in general was produced in much the same quantities as lead, must too have been in early production, but again on no great scale. Much of the Tyne demand, which included ships' anchors and, as early as 1492, the two "great chains" of a Whickham colliery, is likely to have been met locally; there are however no records of iron working. But around 1510 for every ton of lead exported at least two of iron were brought into the Tyne. Only 14% was from elsewhere in England; 60% came from French Channel ports, which also took by far the greater part of the lead. Some of this import may have been specialized ware from the Somme, but most was raw iron, and even ore, needed to make up for local insufficiency in both quantity and quality. By the mid-16th century it was reckoned England produced only half the iron it needed. The national boom in output which followed has been well studied in the SE but not in the NE.[21]

Ironfounding on any scale will reveal its existence in valley bottoms, for it needed water to power bloomeries and, as output grew, blast furnaces and rolling and slitting mills. Water power had long been used on the Derwent, where within our area four ancient cornmills are known, all manorial. These were Winlaton Mill, sharing the same millpool as Gibside on the opposite bank of the Derwent (both attested in 1362), Hollinside Mill on the Clock Burn (attested 1518), and the Bishop's Whickham Mill in Swalwell, on a millrace more than half a mile in length from Damhead on the Derwent. At one time too a weir in tidal waters below Swalwell had served perhaps a fishery; it must have been broken in 1551 to permit the passage of keels for Cuthbert Blunt, and later for his widow Barbara. Technically, all these were weirs, of a kind common in the north, an underwater foundation of heavy stones surmounted by a "hedge" of brushwood or "rice" reeds attached to stakes.

The first recorded Derwent ironworks is of 1545, when Richard Hodgson of Byermoor, the freehold dividing West from East Gibside, had a furnace for which the first of the Blakiston owners, Roger, provided "rammel", loppings from the extensive woods. However a cryptic subscription to the deed, "500 oakes sould by Roger Merlay", seems to date to the 1520s the inception of this first furnace. (Had it been in Byermoor it would have been a simple bloomery.) Hodgson appears to have been working the first documented non-rural mill on the river, a Gibside ironmill and furnace, with rights to ore from the entire Blakiston domain. It had existed for some time by 1553, when Roger Blakiston and Hodgson were able to buy out two partners, one of them Roger's father William, owning between them a "full thrid pte of all the said yrne mynes and yrne mylne". The Blakistons had not only ore and charcoal for founding, but coal, at this distance from the Tyne more profitably used for forging than for export; they had initiated a sound policy of co-opting a metallurgist to exploit their resources on the spot. By 1550 they had an integrated industry; industrial growth gave the markets to hand in pits, shipyards, and the anchorsmiths of Gateshead.[22]

This forge of the 1550s may have been abandoned by the end of the century, but shortly before his death in 1608 William Blakiston gave leave to Edward Talbot to build a forge and furnace in the Mylne Field and to make watercourses "to and fro the said forges and furnisses", implying that those of the 1550s were still operative, but no authority for a dam,

perhaps because the water supply may have come from the Leapmill Burn, outside Blakiston lands. The forge but not the furnace is shown on a plan of 1633, 700 yards E by N of the burn's confluence with the Derwent. Talbot, installed in Bothal Castle by marriage to the Ogle heiress, was the brother of the ironmaster 7th Earl of Shrewsbury, who died in 1616. In the mid-1580s "there can be no question that the Shrewsbury enterprises opened a new era in ... Yorkshire Iron". In January 1614 Talbot expanded his undertaking by obtaining leave of Selby, Hodgson and Anderson, lords of Winlaton, to build on the lower Derwent in Swalwell where they owned both banks "One Damme or weare for water for a water Mylne for Iron werkes ... in the Lopp of Windlington," evidently already in existence. His dam appears on a plan of the 1730s, as "Old Dam", downstream of the Bishop's Mill "High Dam" at Damhead. It lay immediately above Swalwell Ford, and probably survived until the building of a roadbridge in the late 1770s; it served Holme Mill in Swalwell, close to the Bishop's mill but independent of it. A century later this Holme Mill in The Square was to attract Ambrose Crowley to Swalwell to serve as centrepiece of his Iron Works there.[23]

As the original deed is now in the Blakiston archives, Sir William Blakiston [d. 1641] must have taken over the new ironworks after Talbot's death in 1617, if indeed he had not been his partner from the beginning. The works remained in production until the eve of the Civil War, for in 1643 Holme Mill was "recently burnt", a common outcome of thatched roofs and wattle and daub chimneys. It was iron which first enriched the Blakistons; in the next century, when Blakiston heirs were great coalowners, it was said of William's son Sir Ralph [1589–1651, baronet 1642] that it was in his time "that the family raised themselves by those works in the Infancy of the Coale". This industrialism of iron followed by coal is manifest in a Gibside village around Snipes Dene, removed later by George Bowes but shown in 1712 as of the size of Swalwell.[24]

In the light of Swalwell ironworks it is not unreasonable to expect some lesser industrial development on Blaydon Burn, and as will be seen there may have been lead smelting there but it is undocumented. In 1632 there were on the burn four mills. One, in Stella, may already have been a coal mill, as may another in Winlaton; it is possible then that a third served some trade.[25] What is certain is that by the reign of James our area had become so industrialized that a great part of its available waterpower was already in use.

4 Coal of the Area 1625–1660

A double accession in Winlaton manor, of Sir William (William Selby II) to his brother George and of Robert Hodgson, brought to the colliery an increase of quota in 1627, taking the total well over 1,500T, 11% of Tyne exports. New capacity seems to have been provided about this time on the Blaydon Burn in the Horsecrofts, demanding investment in pumping and in the Tyne's third waggonway. A year later two deaths recorded in a pit at Blaydon show that the northern slopes of the hill too were in production. All this is likely to have been the work of the aging Sir William's son William Selby III; in the following decade the greatest redevelopment Winlaton ever saw, perhaps in 1635, was his work.[26]

The strategic plan he embarked on was of impressive scale. The Ship Money 1636 assessment of a taxable income for Winlaton Colliery of £2,200 (and three years later Selby lawyers were to claim an annual £2,400) implies a total vend of at least 2,000T, a near doubling of Sir George's figure, making the colliery the second biggest on Tyneside. Such an output demanded an attack on the last sector of Winlaton Hill, its Derwent face, in what is now Axwell Park. The higher seams were small in extent but the Brockwell seam underlay much of the manor. Its crop lay near the 50 foot contour, where pits of about 1600 seem to have been. It could be worked from the dip in the NE corner of the present Park, and somewhere here Selby provided a waterpit. To power its mill he diverted one stream into a trench cut along the foot of the slope and collecting the entire run-off; for tailrace he used a second falling into the Der-

went at "Selby's Ford". These works later became the ornamental lake.[27]

To handle the output the keelberths at Swalwell were increased to ten, enough for 1,000T or more. An enterprise of this order required an investment of several thousand pounds; the capital seems to have been raised by William III in his own name and within the Selby circle. His work was no sooner completed than, at the beginning of the leading season in May 1636, at a race meeting on Whickham Fell, he was killed in a duel, leaving £11,000 in debts.[28]

Not long after, probably in 1638, the new colliery was drowned, possibly by the release of pent-up waters in old workings north of the fault. Extra power was needed for more waterwheels to drain the coal, and to obtain it Sir William diverted water from the Derwent by reshaping the dam at Winlaton Mill, and led it into his son's watercourse and a much bigger millpond, the fishpond of the later lake. In 1629 the Puritan Grand Lessee John Clavering had bought Axwell-cum-Swalwell; seeing his Axwell cornmill dependent on the Damhead weir stopped by Winlaton Colliery's abstraction of water, Clavering began a six-year legal battle in 1639 by suing Selby and Hodgson.[29]

Selby admitted having ordered "engines", not stating number or place, but offered two principal lines of defence. The first was public interest; without the use of the water he would lose the coal, bringing shortage to the London market, loss of revenue to the Crown, and unemployment to the poor, all true, but of little weight in Chancery. The other was that the whole of the water in the Derwent belonged to Winlaton; this was true below Damhead, where both banks were in the lordship, but not above, where half belonged to Axwell. He might have taken water below Damhead without query; that instead he risked inevitable lawsuits argues a very great need for power.[30]

But Chancery was no longer the arbiter. In 1643 the forces of the King drove John Clavering and the Puritans out of Newcastle; the town was recovered, and in 1645 his son James was an active member of the Parliamentary County Committee which was to sequester royalist Selby and recusant Hodgson. James settled the matter by an agreement which gave Winlaton full use of the Derwent until the closure of the colliery, and himself afterwards in compensation free occupation of Holme Mill as "a going cornmill", and of Winlaton's right bank of the Derwent. In fact the agreement was unneeded; the First Civil War was ruinous to the Selbys, and eventually James was able to buy outright mill, land, and the ten keelrooms.[31]

The cornmill was but a pretext. Swalwell coal too would have to be drained to be worked, and for that Clavering needed waterpower. There was not enough for both collieries, and to use it in turn for the coal of either bank was a reasonable compromise. Winlaton Colliery seems to have been abandoned around 1654, a year or two prematurely. In 1651, after sequestration, the lease was taken by one of Lt-Gen Hazelrig's officers along with two local entrepreneurs, but they were soon in difficulties, since the colliery produced coal too small for the London market and a Dutch blockade closed outlets abroad. Maintaining the colliery was ruining them, and in 1655 they petitioned to be released from the accord. The mention of "engines" in their lease should have warned them.[32]

Mining continued elsewhere in the manor; some had been noted at Shibden in 1643 and a shaft was sunk at Stampley Moss on the south side of the hill in 1648. But a general move of the whole coalfield away from the Tyne had begun, and there was never again a Winlaton Colliery of the scale of that of William Selby III, nor intensive working anywhere on Winlaton Hill. Despite geological difficulties two centuries had seen this mountain of coal almost wrought out.[33]

Whickham's far greater resources lasted longer. Nothing is known at this time of Axwell, but in 1629 John Clavering had added to his Riding Field lease, where he was in partnership with Henry Maddison, the greatest coalowner of the time, a share of the Hardings' Hollinside coal. The whole area was dewatered by an adit in Clockburn Lane; by the 1630s, with Chapman's Fawdon Field nearby, it was producing over 1,000T, of which these Grand Lessees had upwards of 800T.

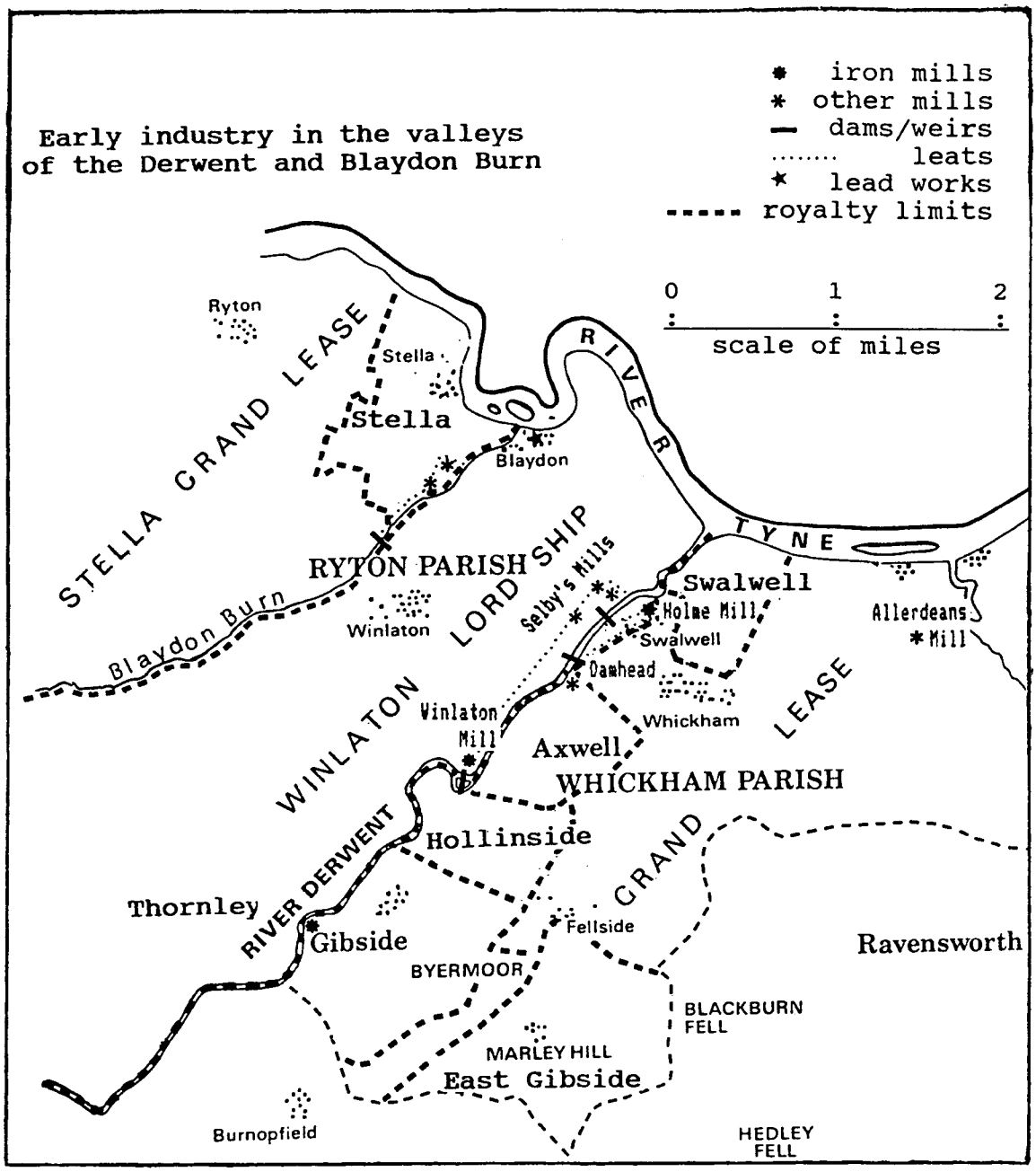
Early industry in the valleys
of the Derwent and Blaydon Burn
iron mills
other mills
dams/weirs
leats
lead works
royalty limits
0 1 2
scale of miles
Ryton
Stella
Stella
Blaydon
STELLA GRAND LEASE
RIVER
TYNE
RYTON PARISH
LORD SHIP
Selby's Mills
Swalwell
Holme Mill
Swalwell
Allerdeans Mill
Blaydon Burn
Winlaton
Damhead
Whickham
WINLATON
Winlaton Mill
Axwell
WHICKHAM PARISH
LEASE
Hollinside
RIVER DERWENT
GRAND
Thornley
Gibside
Fellside
Ravensworth
BYERMOOR
BLACKBURN FELL
MARLEY HILL
East Gibside
Burnopfield
HEDLEY FELL

Fig. 2

5 Coal 1660–1700

The second life of the Holme Mill as a corn-mill, if it had any, was short; it was converted into a Swalwell coalmill at an unknown date, but probably around 1660. Just to the north there had been, according to a plan of *c.*1712, "mynd drifts" which had by then been built over, so that this colliery had then been long abandoned, perhaps for twenty years or more. These drifts can only have been the exhausted Brockwell seam workings of Sir James Clavering; on his death in 1702 Holme Mill was at once let for another ironworks.[34]

The keelrooms were of great strategic value to their new owner, serving not only Swalwell and Axwell but also an arc of Clavering's other widespread collieries, in Hollinside, on Long Hill, in distant Blackburn, and on Lobley Hill. Because his wains were dispersed along several radial roads they did not render the surface impassable, and he saved the expense of building waggonways. It was this that soon made Swalwell a river port second in importance only to Dunston.

With the Restoration the last of the Selbys and Francis Anderson, the third lord, sank rapidly, and Clavering was able to buy much of the lands of both between 1661 and 1673. He did not however buy the coal, having more and better in Whickham, and as in 1669 he paid the fee to empark what was thenceforth Axwell Park we can be sure mining there had ended, though he gave leases to small undertakers to work out the surrounding area. In 1675 the Selby half of Winlaton coal was acquired by Sir William Blackett, a merchant and Hostman enriched under the Commonwealth; management was no doubt in the hands of his third son, also Sir William, a very notable coalowner. That the sale was "with all Mills Engines" may mean that some of the 1639 equipment was still at work, but equally the reference may be to the east bank of the Blaydon Burn at Brockwell, where there are shafts probably dating from around 1670 together with a millrace and mill. In 1669 the Blacketts had also acquired much of the Hodgson share of the coal, and so effectively ended the empire William Selby I had negotiated 113 years before. Blackett was now working in Brockwell, some 2 miles from Blaydon, and dependant on the Winlaton or Brockwell waggonway, part of William Selby's grand scheme.[35]

The west side of Blaydon Burn had seen nothing comparable to the drama of Winlaton, and so we lack data for Stella. By 1636 its output had been in excess of 650T, the peak of this middling colliery; later production declined here as it did east of the burn, and by the early 18th century the vend was of the order of 200T, and had disappeared by the 1720s. A view of Stella made in 1712 gives us a good notion of the stages of development of seventeenth century mining.

The upper seam had been drained by an adit opening farther down the burn. For the extraction of the next seam it was necessary to raise water to this level, and this was done by a mill, one of those appearing on the plan of 1633, though we cannot be sure it was already used for coal; it was to survive down to 1895 with changing functions as the Path Head Mill. A 350-yard leat gave enough fall for a second long-surviving "Low Mill", of date unknown. Water was raised from the next seam to the one above for the first mill to deal with. For a third seam 14 yards lower, the Five Quarter, the Low Mill was paired with a Chain Mill, a favourite device of the post-Civil War era. But this must have proved inadequate, for the Low Mill had been converted to a "bob gin", a beam engine working twin sets of pumps lifting to the free drainage level. These last sophisticated devices are not documented before 1705, but in 1712 the whole system was described as worn out and long abandoned.[36]

East of the Derwent however the abundant coal of the Harding estates was not exhausted and continued to be exploited by the leading Hostmen partnerships of the day. By 1692 the now aged Sir James Clavering gave way to a partnership of the heirs of his own Puritan circle, who had given Hollinside a belated waggonway. The Riding Field, worked by the Maddison successor Lionel Vane with a token Harding partner, may have had one as early as 1684, serving also Fawdon Field, also still in

production; Byermoor beyond still awaited full development.[37]

But apart from south Whickham, within our area the extraction of coal had by 1700 ceased to be the all-important industry; it still continued on a moderate scale, but it was declining. Dr Hatcher's claim of an output of 20,000 tons each for both a "Winlaton" and a "Blaydon" Colliery, in all 1,200–1,500T, is mistaken. Though Blackett was a founder member of the 1700 Coal Office cartel, in its Vend that year neither appeared. In Coal Office Regulations from 1708 to 1725 the lordship in varying guises held a quota of a constant 800T, but if this was fulfilled it came increasingly from the southern limit of our area. Similarly his "well over 40,000 tons" for "mines close to Derwent staithes at the estuary of the River Derwent" is quite misleading; staiths at Swalwell (not Derwenthaugh) were handling in excess of 1,500T, but of this 1,000T came from over the far border of the parish more than two miles away, from Blackburn Fell and from Tanfield Moor, and much of the rest from Byermoor, almost as far. What mattered now in the Derwent–Blaydon Burn area was the transport of coal by road and rail, the wayleaves both called for, its storage and transhipment at the river ports and the keels this employed. Blaydon Staiths remained as the terminus of an extended Brockwell Way, and just as Swalwell, by road and rail, served a wide area of Whickham, staiths at Stella now handled the output of distant collieries in Ryton and Chopwell, brought by two major wagonways[38]

6 The Return of Industry

In the 1630s an expansion of ironmaking at Gibside and Swalwell can be seen in a doubling of the number of smiths among enrolments of new freemen of Newcastle, and this source suggests continued growth under the Commonwealth. However as no new smelting works are known the tripling of smith numbers by the 1680s must have had for cause Swedish imports to supplement and improve the local product, an outcome of the opening of the Baltic to the new "Eastland" trade. Despite this, iron remained the least dynamic of the Tyne's industries; at the beginning of the 17th century smiths represented 10% of new freemen but had declined to 7% at the end. In contrast shipbuilding, the fastest-growing trade, had kept pace with the increase in coal production; by the 1670s one new freeman in three earned his living from transport by water, building craft or else sailing them. In short Newcastle energy and profits went into ships, and, whenever an opening offered, into coal; iron was starved. Once the Blakistons abandoned iron for coal there was no family of weight to play a role in the industry like that of the Blacketts in lead.

Copper, whose ores were much scarcer, was even less attractive; neither the Hechstetters nor later access to excellent Swedish copper created a Tyne brass or bronze industry. Disinvestment was widespread, helped by Swedish and Dutch policy, so that by the 1670s for lack of materials of sufficient quality English technology lagged behind northern European practice. Ships's hulls could not be given satisfactory protective sheathing, nor could collieries replace cumbersome ragpump drainage by the brass-barrelled lift-and-force pumps long in use abroad.[39] In the 1680s and 1690s an incipient metallurgical revolution reached Tyneside from the south, with outside capital and expertise.

Its harbinger, curiously but significantly, was Samuel Pepys. Long ousted from the Navy Office and out of work, in January 1682 Pepys had been consulted on failures in the lead sheathing ships then used; in May, along with Sir George Legge, general of the ordnance, Sir Christopher Musgrave his lieutenant, and Sir George Fletcher, he obtained freedom to trade in Newcastle.[40] Fletcher was a Cumbrian who owned veins of copper and haematite as well as coal, and his daughters had married owners of Stella Grand Lease Colliery. The greatest non-Tyne coalowner, Sir Ralph Delaval, seems to have been involved; he, Pepys and Fletcher all had links with Lady Margaret Blackett, whose step-sons were in lead. The "business" Fletcher wrote of is not known; it might well have been copper-based industry, for Musgrave too

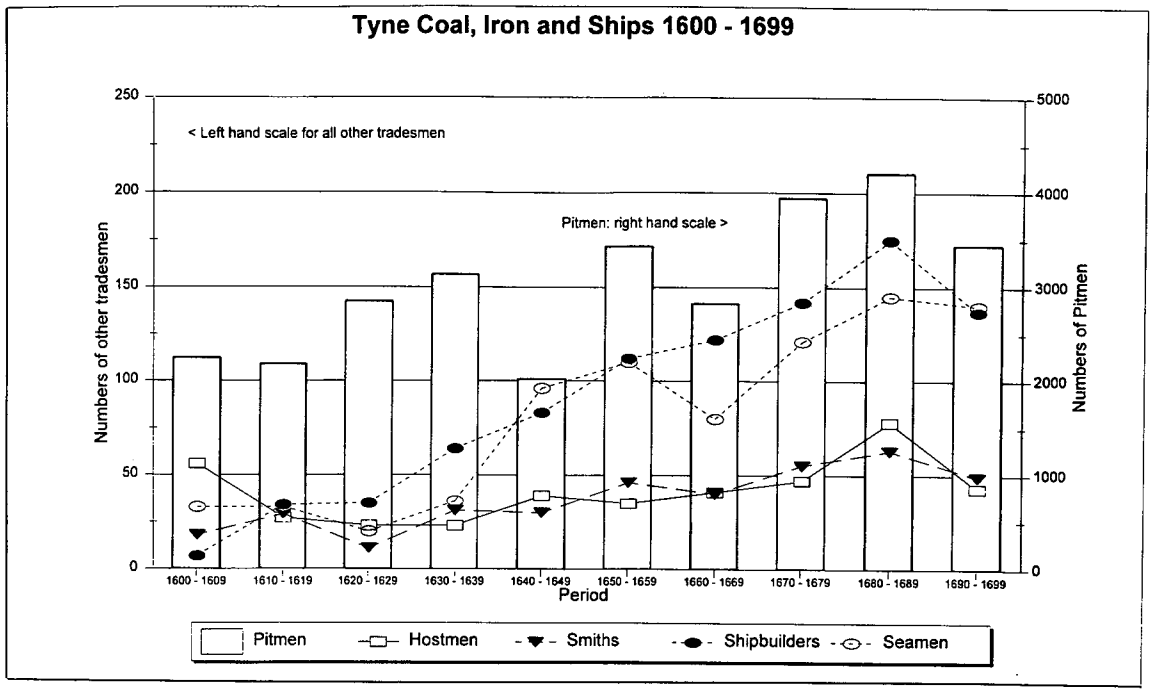

Fig. 3 Tyne Coal, Iron and Ships 1600–1699
Pitmen represents the maximum number of men needed to produce the Tyne's coal exports [Note 2, and JH 488–492 averaged decade by decade]. It may be that only two-thirds of these numbers were needed [Note 2].
Hostmen were often established freemen from other guilds [SS 105].
Other trades: New admissions to Newcastle Freeman by guild membership [Newcastle upon Tyne Records Committee vol III]. Early freemen were masters, but in the 1630s freedom was granted to non-employers in wool (tailors), leather (cordwainers), shipbuilding (shipwrights) and navigation (common mariners), with a consequent leap in membership.
No similar democratisation is known in the iron trade; smiths were all end-users, and none of the known Derwent ironworkers seem to be among them. Entry to the Company of Hostmen was restrictive, and smiths seem to have been equally conservative.

owned ore-bearing land, and soon afterwards their Le Fleming neighbours were to project a reopening of the old Hechstetter workings at Keswick. Nothing came of this foray, for that summer Pepys found work with Legge in Tangiers. A new brass industry was indeed launched at the end of the decade, but new orefields and new men took it to Bristol and the Midlands.[41]

Pepys however had thought that sheathing demanded better nails, and the same year the Midlands nailmaker Ambrose Crowley brought in Liège specialists and set up ironworks at the mouth of the Wear. Here there was iron ore three miles up the river, but waterpower was limited, all timber had to be brought from afar, and anti-papism drove away his foreigners. He would have been better served on the more tolerant Derwent, both for wood and waterwheels, but these last may have been still in use for coalmills.

Later, in 1691, Crowley was able to lease Winlaton Mill, and this gave him "the whole river" to power his notable conversion of the

site to an ironmill. His arrival stimulated at last local investment in iron; in 1702 on Sir James Clavering's death the Newcastle merchant Edward Harrison leased for ironworking the old Holme Mill in Swalwell, where the colliery had been closed and was soon built over. Harrison already occupied the adjacent Bishop's Mill, and together the two hydraulic engines provided a sizable energy source, but other Harrisons were in more profitable coal and shipping, and he soon pulled out. Crowley then leased Swalwell works, perhaps to forestall competition. However he secured the naval contracts Pepys' presence had foreshadowed, and soon greatly expanded the Swalwell site; his rationalization of it included the first known works railway.[42]

Lead in the area is more continuously documented than iron. Around 1630 Sir Thomas Tempest effectively diverted the old lead way by laying down a bridleway for traffic through his own land, from Ryton Woodside to Path Head and Blaydon, charging 4d a fother; his diversion has remained "the Lead Road" ever since. By 1688, when William Blackett II refused to pay toll on freight, lead was being carried by rail on the Chopwell Waggonway, and probably had been since the opening of the railway in 1658 or 1661. Much of this mineral traffic continued no doubt to come from higher up the Derwent, but the Tees was of increasing importance, and by 1709 lead was reaching the railhead from Langdon Beck in Upper Teesdale. Bowes output from a wide arc centring on Middleton-in-Teesdale travelled by lead roads through Stanhope and Wolsingham to meet at the second Leadgate, and after 1726 continued by rail on the Tanfield Way, which diverted it to Dunston.[43]

Blaydon had waterpower and coal, but it was transport which had made it a lead centre; lead working makes nothing like the demands for power of the iron industry, and coal is not known to have been used successfully for smelting it before the 1690s. It was a search for industrial capacity, similar to Crowley's, which brought the London Lead Company to the Tyne at some time between 1692 and 1696; indeed one of its partners was from the family in which Crowley had served his apprenticeship. The firm had its origins in a "Company for the Smelting downe Lead with Pittcoale and Seacoale"; it opened its Ryton foundry for Aldstone Moor in Blaydon, and between 1696 and 1704, when there were six furnaces operating, its chemist Edward Wright perfected both the coal-fired reverberatory furnace, which allowed mass production of lead, and the method of extracting silver from the lead called cupellation.[44] It is noteworthy that the head smelter Thomas Pattinson, a local man, bears a name found in Hechstetter pay sheets. When in 1706, seeking waterpower and coal of its own, the Quaker Company moved its operations to the orefield in Allendale, Sir William Blackett, now specialized increasingly in lead, bought and continued the Blaydon works.

7 Faith, Family, and Finance

This industrialization of the Derwent valley cannot be treated as merely a matter of economics. There is too longstanding an association of belief with failure, too striking a correlation between litigiousness and success. Recusant Hodgsons and Hardings, royalist Selbys and Andersons went under; Puritan Claverings and Whig Blacketts took their place and their property. Ancient stereotypes of the Whig, Nonconformist and Catholic traditions were supposed to justify or at least explain this. Yet as industrialists the losers were scarcely deficient, nor the victors demonstrably more adept. Recusant Richard Hodgson was highly successful as a merchant, recusant Nicholas Tempest of Flatworth notable as a coalowner, and much of the early coal trade was Catholic-orientated. Crowley and the Lead Company were diligent, innovative, and thoughtful of their workforce. But Christopher Elmer kept impeccable accounts for Winlaton colliery, William Selby III built one of the first railways for it, its partners made bequests to "the poore colyers", Richard Hodgson leaving 6s 8d to every keelman he employed; it may be more than an accident of recording that the parish registers of Whickham show 59 industrial deaths in 21½ yrs, those of Winlaton 4 in 33,

perhaps 14 per million tons raised against $1\frac{1}{4}$, 11 times as many.[45]

Indeed Winlaton in the 1550s had much in common with Quaker Coalbrookdale two centuries later; it was no less bound by ties of family and religion. The partners Blunt and Hodgson were brothers-in-law; another, John Killinghall, was an impoverished old Neville retainer ejected from the chantry he had retired to, and now funded by Hodgson. The viewer was a Hedley, a family long Neville officers in Winlaton; so too was Hodgson's apprentice, who married his daughter. Elmer, the second viewer, was cousin to a partner; another Elmer was an overman. A Wilkinson of Blunt descent was bookkeeper; he became staithsman. Yet there were limits to family solidarity; when the lease ran out in 1582 William Selby who held half the manor, though married to Hodgson's stepdaughter ejected Killinghall and the Cooke heirs and, after a legal tussle, his aunt Barbara.[46] Coal was a business not to be mixed with sentiment or confused with friendship.

For, other than the Hodgsons, no coal family was consistently true to the old faith, and despite his Catholic wife and recusant descendants Selby was a Protestant; the Bishop of Durham braved a storm to preach at his funeral. His elder son, Sir George, "of the religion the King is, whatsoever that may be", took part in the arrest of seminary priests and later became an Arminian. The second son, Sir William (II), married a recusant Widdrington but remained cannily Protestant, yet in 1641 when attitudes polarized he refused the protestation.[47] His son William III was a recusant—few of those with Widdrington mothers were not, and he had a Widdrington too for wife—and so never a Hostman, but the output of his colliery could be vended in the name of his father, who was. Post-war Selbys were all recusant.

The Tempests of Stella, usually considered Catholic, underwent a parallel evolution. The first baronet, Nicholas 1553–1626, had a recusant Lambton wife, but a Puritan mother; though suspect to the Bishop of Durham he was declared a Protestant by the Archbishop of York. All his daughters were recusant, and all his sons Protestant, his successor Thomas marrying a Protestant wife. Sir Nicholas' grandson Richard followed his parents, but, a sign of the times, two younger brothers married recusants, one a Swinburne of Capheaton. Sir Richard served in the Civil War and Stella was sequestrated for his delinquency, with the consequence that his infant heir Thomas was brought up with great care as a Protestant, but to no avail; he married the last of the Winlaton Hodgsons, which brought him and his heirs a share of that manor, and unremitting recusancy.[48]

The Blakistons had a similar history. They too saw the Carolean hardening of Catholicism common in the northern gentry; William I, d. 1608, and William II, d. 1641, like Tempest both married recusant Lambtons, but it was the latter's son Ralph, d. 1651, the first baronet, who was the family's first male recusant, followed by his son William III. Ralph and William III were sequestered and narrowly escaped expropriation as malignants; however the family lapsed from Catholicism with the accession in 1691 of William's brother Francis.

"Catholic impoverishment" then can no more explain the supplanting of the Winlaton lords than supposed incompatibility between industrialism and Rome, for faithful Hodgsons, footdragging Selbys and imperviously Protestant Andersons alike gave way to invaders, whereas the Tempests held on to their share, as well as to Stella, despite their new recusancy. Enough however is known of the financial affairs of these families to glimpse the forces at work.[49]

The Hodgsons, "a family remarkable throughout the penal times for their fidelity to the Faith", were alone in suffering for it, severely affected not just by recusancy fines but by the costs of maintaining Hebburn Hall as a fortress of Catholicism. They had coal outside of Winlaton, notably on the Ouseburn, and they seem to have raised much of the costs out of revenue; they cannot have contracted widespread debts, for they were the least-sued of recusants. If they were reduced to selling Hebburn in 1658 to Robert Ellison, the key Puritan

merchant, despite Winlaton Colliery's problems they held on to the coal, and were slowly recovering their position when the male line ended.

The Selbys' disaster had not been initiated by William III's drowned colliery; surprisingly, nearly half of William's indebtedness was covered by a £5,000 sale of estate timber, a measure of landowning's importance to industrialists.[50] The cause was the longstanding symbiosis between Tyne trade and northern gentry. Nearly half of all Newcastle's Merchant Adventurers were drawn from the ranks of this gentry, and returned to them when they could. The Selbys had taken to landowning in Northumberland at Bolam and Shortflatt, and the six daughters of Sir George had married into a fine cross-section of landed families, preferably those with coal, reabsorbing the family into gentry politics and ambitions, encumbering its property with complex settlements, and expensively contesting the succession of Sir William (II). Crucially, his recusant sister Jane had married a North Yorkshire landowner, Sir William Wray.

What Wray wanted was coal, and he deployed an extraordinary activity in acquiring it and attempting to break into the trade. When Sir William Selby claimed that to clear his son's debts he must sell his share in Winlaton Colliery and could not do so unless the buyer could be guaranteed entry to the Company of Hostmen, an oft-cited example of the tyranny of that guild, it can not have been with a sale on the open market in mind and the unthinkable admission of the highest bidder. His brother-in-law was a likely buyer—if he could obtain the Hostman privileges whose lack prevented him profiting from the coal he had already acquired. Selby too was involved financially with the Lawsonian Riddells of Gateshead, in difficulties because their colliery had been wrecked by the Scots and because marriage into the Northumberland gentry had brought them too into recusancy. The Riddells were similarly entangled with their indebted Protestant neighbours, the coalowning Brandlings of Felling; and the Brandlings were in partnership with Wray.[51]

Caught up in an inextricable maze of gentry family dealings Selby was overextended, probably without knowing it. He had been sued by his nieces over his brother's legacy, but in his world such cases were a common charge on large estates whose income continued to accrue. The sudden loss of Winlaton colliery, and John Clavering's subsequent stranglehold on it, closed the books. He had sold his Northumberland estates but still died in debt, and his heirs, not helped by sequestration, never recovered. Yet the effect of the colliery disaster should not be underestimated, for the third and Protestant Winlaton partner, Robert Anderson III, uninvolved in the matters above, nevertheless also died in debt, for a sum of £4,686, proportionate to his colliery share.[52]

The Stella Tempests reveal the nature of the Selby disaster. Like the equally successful Blakistons also never sued for debt, their unions too were with the recusant gentry, but until the Restoration at no point did the network of either family connect with that of the Selbys; neither entered partnerships in coal. The Tempests had also married into the City, and their postwar debts, made, unusually, in the Thames valley, were manageable. Their property was to survive intact even the rebellion in 1715 of its Widdrington successor.[53]

By that time the Selbys had lost all, the Andersons were much reduced, and the Hodgsons had retained enough to merge with the Tempests. In all this there is no correlation between failure and faith, though there is a close one with propinquity to John Clavering. What mattered was the family and the connexion, the network of intermarried families which channelled unifying beliefs and served as catchment areas for capital but, as in Selby's case, often at a price in group solidarity. Clavering's Puritan connexion, off-stage in this account, was close-knit, well-funded, and specialized in coal, a major cause of his success.

There is a similar contrast between two lesser families, the Tempests of Thornley and the Hardings. Thornley produced two entrepreneur Hostmen who were nevertheless recusants, and one of them, Nicholas of Flatworth, rose to be a considerable figure in the trade.

The recusant Hardings owned rich deposits but lacked capital to work them. In the key years 1608–1617 sequestration opened the door to the Grand Lessees. In an attempt to counterbalance these dangerous tenants Richard Harding in 1621 granted fractional leases to his Blakiston neighbour, to a Gateshead coalowner, both married to recusants, to a recusant Hartlepool landowner, and to Thomas Crome, a Hostman of Catholic sympathies. But as his coal could reach the Tyne only through the Grand Lease commons or through Axwell no one could outbid the Puritan owners. Harding's numerous leases merely led to inevitable suits in London Chancery by Clavering, Henry Maddison, and others.[54] Where the new Whickham coalowners mined they sued.

8 Conclusions

The key to economic development on Tyneside was the landed estate. There was an old and universal conviction that the most efficient economic units were such estates, rendered durable by entailment, semi-autarkic and owing much to the monastic model; the profits of Newcastle trade had long been banked in them. This was the outcome of experience; from James Lawson onwards coalowners had begun as model free-market entrepreneurs, bargaining for access to coal, buying in services and materials, and knew the insecurity and inefficiency of mining this way. A well-run estate offered long-term planning, supplies of timber, fodder, and manpower. An estate too had strategic value. Had Winlaton included the right bank above Damhead as well as below, the Selbys would have recovered from their colliery disaster. Wayleave piracy soon became decisive in limiting access to coal; by the later 17th century Tyne output was dominated by Hostmen estate-owners. Above all it was a financial cushion, but only if large enough. That of the Hardings was too small to afford both recusancy and investment in mining; Blakistons survived sequestration for both recusancy and malignancy. Within limits, alliance multiplied the effectiveness of landowning, and marriage networks were the ultimate units of northern society. The Selbys however illustrated their dangers, which grew with size.

It is possible to recount the history of the early industrialization of Tyneside without reference to the landed and merchant families, and vice-versa, but not to understand either in this way. Newcastle profits welled up like a magma, took form in estates and structure in alliances, and new ones ground against the old like tectonic plates. Volcanoes of litigation on Derwent and Clock Burn marked the westwards progress of Clavering's group, and eventually both Selbys and Hardings were subducted; on the east side of Whickham the clash of Grand Lessees and the pugnacious Ravensworth baronet Thomas II Liddell brought similar pyrotechnics.

The progress of metallurgy waited on this process. Behind Michael Flinn's short-sighted view that "until the end of the seventeenth century the only industrial activity in the [Derwent] valley was coalmining"[55] lay a misapprehension of the nature of the north-eastern economy. The Tyne was not a colonial provider of a primary raw material, nor was its industry driven by providential strangers bearing technological gifts. The motor was Newcastle trade, and industrialization was the outcome of using its profits to exploit the landed resources tradesmen acquired. So far as can be seen industry grew as fast as markets expanded, constrained in general neither by insufficient technology nor lack of capital. If post-Restoration iron seems to have been a victim of the success of the interrelated coal and shipborne trades, its growth was certainly delayed by shortage of hydraulic energy, and by manmade difficulties of access to it.

The industrialization of Winlaton was clearly as early as that of Whickham. Despite the social traumas described by Levine and Wrightson, in neither area was there any sign of cultural rejection of this painful process; on either side of every political, religious and class divide Tyneside was modernizing in outlook. By the early seventeenth century it was an efficient and innovative society. It was not an inventive one; neither the railway nor the reverbatory furnace were of its conception. But

Nottingham in the early 1600s had failed to master the economics of the former, and Bristol in 1678 had been unable to construct the latter. The purpose of engineering is to make ideas function, and it was in Whickham in 1621 and in Winlaton between 1691 and 1704 that these inventions were set to useful work.[56] Like Edward Wright of the Blaydon Lead Works, Ambrose Crowley was a man who had so far failed to realize his concept of a large-scale integrated ironworks, and sought on Tyneside the conditions for success, an industrialized population and established industrial installations. The full power of the Derwent was available to him because for the first time in eight decades it was unoccupied, and it was so only because collieries had moved elsewhere. By 1700 the Derwent had become at least as industrialized as the 18th century Severn, but the society was a very different one. Industrial development in the north had come from networks of families, often from an old gentry, notable for its urge to concentrate property, and for its altogether unQuakerlike pugnacity.

NOTES

Coal Trade Measures

Translating coalfield measures into tons is problematic since coal was never weighed. However the basic unit, the Newcastle chaldron, was intended to represent 53 cwt (2.65 tons) delivered on shipboard [JH 559–567]. The trade's export measure, the Vending Ten (T), can then be regarded as not less than 26.5 tons (but often more, because of "sweeteners"). However between pit and staith the measure was based on a count of wains or waggons of a declared volume, the "leading ten", intended to "make out" at one Vending Ten (at least) of coal merchantable on the London market. Though both size and numbers of vehicles were carefully defined in leases, allowance for rejection varied considerably. Before 1700 it was often a quarter, 40 wainloads or fothers of $17\frac{2}{3}$ cwt (three to the chaldron), 35.3 tons, but there is too little data to generalize, JH's conversion to an "average" 35 tons is an underestimate.

It is safer to think in the Tens of declared or projected vends. The quotas for export to the London market allotted by the Company of Hostmen before the Civil War [SS 105] and by the Coal Office after 1700 [AFT 90–97 and passim] represent neither all the coal leaving the Tyne nor even what quota-holders managed to sell, at times perhaps not much over half the coal raised. But they give the agreed productive capacity of a colliery and are the most reliable guide to the overall development of the coalfield. A cartel quota of 1,000T may or may not mean between 35,000 and 45,000 tons raised and 26,500 tons sold; it does show agreement among coalowners that the concern is among the "great collieries" of the Tyne.

ARCHIVAL SOURCES

DRO	Durham County Record Office (D/)
GPL	Gateshead Public Libraries (G/)
NRO	Northumberland County Record Office (Z/)
PRO	Public Record Office, Chancery Lane, London
SCL	Sheffield City Library, Sheffield
TWAS	Tyne and Wear Archives Service, Newcastle (TWAS)
BL	British Library
CSPD	Calendar of State Papers (Domestic)
DKPR	Deputy Keeper of the Public Rolls.
DUPD	Durham University, Dept of Palaeography and Diplomatic
RCHM	Royal Commission on Historic Manuscripts

PRINTED WORKS

AA	*Archaeologia Aeliana*
AFT	G. Bennett, E. Clavering, A. Rounding *A Fighting Trade: Rail Transport in Tyne Coal 1600–1800*, Gateshead Public Libraries 1990
AR	Arthur Raistrick *Quakers in Science and Industry* 1950, 1968
DCLHS	*Bulletin* of the Durham County Local History Society
HB	Winlaton and District Local History Society *A History of Blaydon* 1975
JH	John Hatcher *The History of the British Coal Industry vol. I: before 1700* 1993
L&W	David Levine and Keith Wrightson *The Making of an Industrial Society: Whickham 1560–1765* 1991
MFa	M. W. Flinn "Industry and Technology in the Derwent Valley" TNS XXIX (1955)

MFb	M. W. Flinn "Men of Iron" 1962
Nef	J. U. Nef *The Rise of the British Coal Industry* 1932
SS	Publications of the Surtees Society (volume number and page)

SOURCE NOTES

[1] *The Making of an Industrial Society: Whickham 1560–1765,* David Levine and Keith Wrightson 1990.

[2] L&W 181 n 50: an estimated 725 miners out of 773 adult male respondents to the 1640 Protestation. L & W suggest as explanation uncounted child, transient, and outside labour. Unfortunately the figure must be revised—upwards! Blakiston pits have been omitted; their inclusion gives 767 miners or 99%. There is a problem here; one explanation might be that the estimate of 200 tons output per man-year used in this calculation is too low for the Tyne, though it is based on an assumption of a ton per manshift which was by and large valid until the 1950s. On L&W's calculation the percentage of miners in Ryton parish would be in the 70s, but in Gateshead only in the 30s.

[3] Nef i 28, followed by MFa 256, has Blackburn Colliery, whose burn flows into the Team, "in the Derwent valley"; Mfa 256 confused Winlaton on its hill and Winlaton Mill, despite the explicit granting of "the benefit of the whole River of Darwin thereunto adjacent" in Crowley's lease of 8.4.1691; AR 176 and JH 299 were unaware that Blaydon is in Ryton parish and also Winlaton manor; JH refers always to "Stella" colliery, by which he means not Stella Colliery, a freehold in our area, but Stella Grand Lease well outside it, the Bishop's leasehold whose coal was led to staiths at Stella.

[4] Nef adduced 41 suits before Privy Council, Star Chamber and Durham Chancery, 30 of them concerning Whickham [map AFT 36], and of the 59 distinct primary sources cited by Levine and Wrightson for the period 1570–1652 35 arose from litigation.

[5] The most recent account of the Grand Lease is JH 514–16; Nef i 151–4 is fuller.

[6] Whickham cases in PRO class C2 not cited in L&W include Jas1/A9/24, D1/29, Jas1/L1/56, L2/10, L8/46, A9/24, L11/60, Chas1/H19/35 (AFT 37–44, 65–66); also C10 2/88, 13/25, C21 V7/16; there are many more. For Durham Chancery *Tempest v Arnold*, cited by L&W, GPL G/Ellison C15/1–3 offers a useful 18th century transcript.

[7] Geological data from British Geological Survey map and borehole data.

[8] DKPR xiv 279, inquest post mortem of Ralph earl of Westmorland.

[9] R. York & S. Warburton in Leicstershire Industrial Society Bulletin 13 1990/1, 49–57 and Association for Industrial Archaeology Bulletin vol. 18 no. 4 1991; R. F. Hartley "Tudor Miners of Coleorton, Leicestershire", in T. D. Ford and L. Willies, *Mining Before Powder* 1994, 91–101.

[10] W. W. Gibson "The Manor of Winlaton" AA(4) xiii 12.

[11] Nef ii 424–7.

[12] PRO E134/29. For *tens* see *Coal Trade Measures* above.

[13] Barbara Blunt's relations with Selby and Hodgson DRO D/CG 19/10, PRO E134/29. All Tyne export figures and vend allocations from SS 105 passim. Blaydon pits *A History of Northumberland* vol. 9 plate III, Map of Castle Ward, "about 1600", but perhaps a decade later—in Whickham it shows Riding Field (opened 1606) but neither Peal Flat (still open 1610) nor East Field (sunk 1617).

[14] There is no mention of the Grand Lease in Sir George's will [DUPD Probate]. Other leases in PRO DURH2 9, cited by Nef

[15] Calculations based on the conservative assumption of Grand Allies viewers in the 1720s of 70T per acre for a 5' seam, some 45,000T per square mile; for detailed estimates of actual volumes for given thickness of seams see John Curr, *Coal Viewer and Engine Builder's Practical Companion* 1797, 92–93.

[16] SS 184, Parliamentary Survey of Whickham ; SS 38 266, will of William Greenwell; AFT I 37–44; DRO D/BP3/165.

[17] SS 137 133; DRO D/CG 7/1–11, 14–16; L&W 37.

[18] L&W 33–34, Nef ii 415; for some of the 14 Harding cases in PRO see note 54 infra; Blakistons DRO D/St/D5/2/16, 17, D/St/D5/2/120–6; SS 142 27.

[19] G. Nicholson DCLHS 18 1983, W. Bourn *History of the Parish of Ryton* 1896, HB 78, 171–2; L. Drury "Leadworks in Weardale 1423–25", DCLHS 1987, *VCH Durham* II 350; C. M. Fraser *Accounts of the Chamberlains of Newcastle on Tyne 1508–1511* 1987; DRO D/St/B/2/142–145.

[20] H. Hammersley *Daniel Hechstetter the Younger: Memorabilia and Letters 1600–1639, Stuttgart* 1988, 168–70, 181, 201, 233, 279 and passim, Höchstetter's successors Emanuel Hechstetter and Daniel the younger both married daughters of the Puritan Grand Lessee Roger Nicholson, as did Clavering. Their tight-knit merchant circle included Butlers,

Kirkleys, Barneses, and of course Maddisons. Seven Hechstetters of later generations obtained apprenticeships within it.

[21] Schubert *History of the British Iron and Steel Industry* 1957, 313 and passim; C. M. Fraser *Accounts of the Chamberlains of Newcastle on Tyne.*

[22] H. Binnie *Early British Dam Builders* 1968, 128, 132; DRO D/St/D5/1/65, D/St/D5/2/23; D/St/D5/1/6, D/St/D5/1/70.

[23] DRO D/St/D5/6/1; D/St/P7/7; C. R. Andrews *The Story of Wortley Ironworks* Nottingham 1958, 24; AFT II 27; TWAS 2644.

[24] BL Add MS 40748 Bowes MSS III f 53 verso, cited M. M. Wills, *Gibside*, Newcastle University unpublished Ph.D. thesis I 19; GPL G/CK5/183], suggesting a population of 50 families [see L&W 156, 206]; GPL G/CK5/183.

[25] DRO D/St/P7/7; an incomplete copy in HB 68.

[26] Brockwell Waggonway AFT I 47–49, 59; Nef ii 415–16; PRO C8 55/178.

[27] We are grateful to Mr. David Cranstone for this enlightenment on Selby water supply.

[28] DRO D/CG 19/231; CSPD ccclxxxvii No. 62.

[29] PRO C2/Chas1/C25/27 *Clavering v Hodshon* May 1639, C8 55/178 Selby response 1642, C2 Chas1/C126/53 *Clavering v Hodshon* 1643.

[30] DRO Plan D/X 35/7 of 1714 shows a curious structure just below Damhead which appears to be a timber dam, perhaps as *ad hoc* imposition by the court.

[31] SS 105 98; DRO D/CG 19/23, 26–28; GPL G/76/13/1.

[32] SS 111 185 et seq; SS 111 285. For the historical and technological implications of the Winlaton dispute, E. Clavering "The Coal Mills of Northeast England: The Use of Waterwheels for Draining Coal Mines 1600–1750", *Technology and Culture* April 1995.

[33] Ryton Parish Registers; SCL Bagshawe 3294.

[34] L&W 217.

[35] GPLG 76/13/1; DRO D/CG 19/30–33; PRO C7 107/55, 314/21; NRO ZBG 4/16, ZWN A/1 320fG; AA3 v 157; AFT I 47–9.

[36] GPL G/CK 11/4; plan and diagrams in E. Clavering "The Coal Mills of Northeast England" *Technology and Culture* April 1995.

[37] AFT I 86–89.

[38] JH I 93–4; AFT I 47–51, 51–65, 85–90, 143.

[39] G. Hollister-Short "Leads and Lags in English Technology" *History of Technology 1' 1976, 39.*

[40] *Arthur Bryant Samuel Pepys: the years of peril* 1935, 372–381.

[41] H. M. C. Fleming MSS 185–86, 194, 195; H. Hamilton *The English Brass and Copper Industries to 1800* 1925, 101–5, J. Day *Bristol Brass: A History of the Industry* 1973. Margaret Cock, second wife of the first Sir William Blackett, was the niece and perhaps heiress of Pepys' ally Captain George Cock, who had been Blackett's associate in the defence of the Merchant Venturers' privilege in 1663 (SS 101 passim), Early Cocks had been in ordnance; Margaret, a coalowner, was linked to Fletcher through Stella Grand Lease Colliery, and to Delaval by marriages.

[42] For Crowley in 1682 MFb 52–54; DRO D/CG 7/1577; AFT I 99–102; DRO D/BP/3/165; TWAS 2644.

[43] PRO E134/2 Wm & Mary/Trin 15, C11 1094/4; AFT I 61–62, 58; SS 105 passim; AR 168; SS 178 43. For Bowes lead in 18th century see DRO D/St/B/2/146–57.

[44] AR 168, 176–82.

[45] L. Labouchere *Abiah Darby* 1988, passim; SS 112 46; AA(4) ii 186; SS 38 115; L&W 202 and see Note 2 supra.

[46] AA(4) ii 174ff; 1582 PRO E134/29 Eliz, accounts in Nef ii 424–7; HB 14.

[47] R. Welford *History of Newcastle and Gateshead 1887*, iii 219, 210, 83; CRS 53 153; AA(4) 33 150; SS 135 39.

[48] *Recusant History* 4; RCHM *Salisbury* VI 62; R. Surtees *History of Durham* II 76.

[49] On the role of religious networks in the development of Durham coal see E. Clavering "Catholics and Coal" DCLHS 51 1993.

[50] CSPD cccclv No. 101. A further £5,000 was obtained by the sale of Jesmond Colliery.

[51] AFT I 71–73, 75–80; PRO C7 407/24.

[52] SS 111 101.

[53] AA(4) 33 150; PRO C7 413/6; NCH 22 24.

[54] PRO C2 Chas1/C112/3 *Clavering v Harding*, C8 42/118, C8 93/7, C8 52/188, C7 173/23, DURH2 9; C22 772/13; C7 3961.

[55] MFa 255.

[56] L&W 153–171; M. J. T. Lewis *Early Wooden Railways* 89–91; AR 163–177

A. Rounding
2 Ashdowne, Crakehall
Bedale, North Yorks