Began an Airedale Biological station- forerunner of the biological data bank founded here in 1974. Museum displays were still rows of objects with lots of instructive text ie classified displays for education. With all this activity, the museum became so pop a policeman had to be on duty on Sundays to keep order. 60,000pa

1902 Kly museum subscribed Egyptian Exploration fund; and-hence AncientEgyptians items acquired and mummy. (Briggs also of CLASS)

Mosley left disgruntled in 1910 and the trend turned to local history
but the collections he acquired were enormous including 10,000 geology specimens of Croft, Campbell and Spencer colls, which he remounted. Graham plant coll made in 1850s, Booths coll of local mollusc etc all of which we still have.All were older 19th C collections And in jan 1908 alone 16,230 specimens were transferred from his own private museum (called Beaumont Park Museum in Huddersfield where he had collected many older colls eg CS Gregson of Liverpool geol as "Greg coll"), Also that Jan, 230 butterflies and moths of s america,100 packets of exotic seeds, 27 foreign stamps, volumes of books, two long reared owls shot near Keighley with comment that they should not have been shot as useful birds and the museum is not in need of this king of thing. Croft geol coll has specimens figured or cited in Davidsons Monograph on Brachiopods of 188?. Loaned to Nat Hist a few years ago and now lost but appeared in a paper attributed to BM NBAT HIST colls so data about them clearly wrong.
Alexander Graham scottish plants coll in 1850s acquired 1884

8(Bradford)8
For students of the history of science, the collections originating in Bd now hold the most interest since they are older but sadly, as in the other museums, the change in interest in museums in 20th c from nat hist to social history has meant considerable neglect and great deal of loss, particularly of once grand geol colls as we shall see.

Public museum in Bd began 1879 in cramped rooms above the public library, In. 1889 the museum was one of first electrically lit buildings. Like the other museums it acquired the collections of the failing scientific societies , in this case the BPSoc. Textile millionaire Lord Masham offered money in 1898 to build an art gall and museum on site of his old home at Manningham Hall, but it was to commemorate the Yorkshire educated agricultural and textile machinery inventor and FRS Edmond Cartwright b 1743. Thus Cartwright mem hall was purpose built in bradford , the last flamboyant building in local stone. Opened in ` 1903 with a botanic garden laidout with representative geology of Yorkshire and including a walk up Ingleborough with Horton slates Carb Lst and topping of gritstone complete with mini replica of thornton force (which Playfair had drawn in 18thc 17 to illustrate Huttonian theory) Although mini Th Force survives, now destroyed by council for a millennium fun park.

Bolling Hall, one of the oldest and most important manor houses in west yorks acquired as a bradford museum in 1912 illustrates the shift towards social history and art in the 20th C. But the family of
17th C astronomer and mathematician Abraham Sharp lived nearby and donated some important scientific material made by AS. (we will see i case) Although regarded as local/ social history rather than scientific it needs to be more widely recognised.

9 BPS
BPS material still makes up a large part of the geol colls today. The Soc and its museum had several starts before reaching its golden years in the late 19th C and one unusual survival is a mineral collection dating back probably to the 18th C with a catalogue dated to 1810 (Coll made by Rev Joseph Dawson of Royds Hall Bradford a minister an iron works entrepreneur who had taught himself a good deal of science and knew Jo priestly the chemist. AP has recently found out

a lot about Dawson which highlights scientific thought at that time.) (leeds Phil Soc began 1783-86 and one of earliest and Dawson a member)
(Other towns also had thriving Phil Socs which developed into wonderful museums still seen today eg 1823 in Whitby,York 1823,. In Bradford attempts to found a Phil Soc were made in 1808 by joseph Dawson who had a flourishing iron works with blast furnaces of 1791, and whos collection we can see in our stores. Samuel Hailstone b 1754 who knew Dawson through business was a solicitor and botanist whos plant and fossil colls are important and now at York and whos brother was Woodwardian prof of geol at Cambs. Also Joseph Priestley (a canal engineer not the chemist was a partner in the ironworks) In 1808 the three tried ti firm a circulating library

(1818 Steinhauer of Fulneck Moravian school studied Stigmaria and gave it a non Linneian name. Were any collected? OMIT)

1823 Sam Hailstone again tried to form (2) a BPhil Soc and museum for the second time but Vicar Rev Heap discouraged such activities including the mech inst and many supporters were frightened away.
By 1832 Bradford did have its first Institute, with a museum and the rise of Mech Institutes and education of the working man were to continue. The Inst kept link with the BPS housing parts of its coll.
1839-43 surgeon Will Sharp FRS again revived (3) the Soc for a third time and urged the formation of museum (having one himself?) and making a coll of natural products of the District within 15 miles of Bradford (the first museum collecting policy; nothing new ?). Rev William Scoresby (younger) was at that time vicar of Bradford (Scoresby sound in Greenland and one of the Arctic scientists of Whitby) BPS Members included Dawsons son C Holdsworth D. Collections were apparently purchased and hon members of BPS included Buckland, sedgwick and Lyel and Faraday since Bradford was not to produce scientists of this calibre itself. The 1840s saw a depression not just in textile industry but in learning institutions and societies and decline set in again

1864 the BPS revived for a fourth time appointing 22 year old Louis Compton Miall as first paid curator. Went on to become sec of Leeds Phil So c study medicine, become Pro at Leeds and as an educationalist promoted a hands-on practical approach to science learning. He met an elderly Adam Sedgewick in Dentdale fieldwork and knew TH Huxley who was to lecture on coal in Bradford in 1870. Members included the districts leading manufacturers like SirTitus Salt and Jacob Behrens and women too. Also local doctor James Monckman and John Mc Landesborough who collected from dealers- and remnants of their colls exist.

One of first purchases by BPS was 1885 was mineral collection of Joseph Dawson of Royds Hall quote from BPS Minute books in Library "Mr Dawsons collections had been amassed with great care during a long series of years and was enriched by many from foreign lands so that few private cabinets could rival its contents and completeness"
This gives a sense of acquisition for prestige rather than for science.
Dawson catalogue was given a year later. We shall see for it is a chemical classification and also annotated His notes show how he referred to books, consulted others and expressed his own opinions about the specimens.He was a thinking man. He tells how wavellite and zeolite got their names
AP points out that in writing his cat of 1808 he is using a classification by Thomas Thompson 3rd ed in 1807 who also gave him specimens. He also mentions John Kidd whose ideas differed from TT and whos Outlines of mineralogy were published in 1809. The classification includes orders, families and species rather like a biol classn.The third order being volcanics and combustibles

Sam Hailstone may have begun his interest in geology .
We know D training as a minister at non conformist Daventry Academy in Midlands (and later Glasgow)and in 1750s he met Joseph Priestly (later Minister at the big MilHill chapel in leeds and

known as discoverer of oxygen gas in 1774) who was a teacher there and much later does seem to have acquired, in 1790, some of Priestleys equipment but there is no evidence that geol specimens were got from Priestly. Priestly possibly tutored him in science. The interest in iron founding, heat and gases may have been of mutual interest. As a married man and minister at Idle near Bradford Dawson supplemented his income with coal mines nearby. When the partners Dawson,Hird, Hardy(solicitor) and Jarrat founded the Low MoorIronworks Dawson was the one with the geological knowledge about coaláand ironstone. 1791 blast furnaces began. Proposed 1797 tax on pig iron so heads delegation to meet Wiliam Pitt. Forms Yorks and Derbys Ironfounders Assoc and suggests scientific papers are read at meetings

localities mentioned in coll cat include Scarbro Whitby malham and 56 other UK sites from Scotland to Dorset. There are E and W European sites and Peru Brazil e indies, china, egypt, Labrador is the only N American specimen so Priestley certainly did not send specimens.....

Did John and Saml Hailstne contribute?. John was prof at Cambe and went to Saxony to hear Prof Werner (a neptunist and role of water in formation of Earth as opposed to Huttons ideas of heat and vulcanicity in rock formatn)

In 1865 BPS purc hase of Richardson of Northowram geo col for £350 - a huge sum- "primarily of interest to local inhabitants of district" and . "As a private collection it is unsurpassed." One begins to read words that suggest cultural rivalry rather than scientific interest in the coll . "fossils are superb..rare.. unique.....singular beauty and perfection...valuable minerals.....rich in specimens"
Probably now the remains of the fossil colls at cc

1866 purchase of Mountain lst fossils of Wetton for £35 "finest of the kind in England" "many specimens are unique"
1867 CLASSES BEGAN IN GEOL in BPS as interest grew

1868 Richard Mawson (who with Mr Lockwood was architect of many notable local buildings) extensive COLL OF BUILDING STONES (difficult to recognise now in colls but possibly serpentines?))

In 1868 an important fossil discovery was made of "A large and unique batrachian from the coal meas of the neighbourhood" It was named and described as a new genus and species by Prof T H Huxley (see copy on table). The holotype fossil ***Pholiderpeton scutigerum*** is on display
LC MIalls diaries and accounts tell of the discovery of this interesting fossil. W Firth the coal miner at Toftshaw was obviously a collector for others just as Mary Anning earlier collected at Lyme Regis for Buckland. Down coal pit, props and plaster of paris. Sent on train to London. Prof T H Huxley (flamboyant traveller biologist, populariser of science, supporter of education for all, and namer of archaeopteryx the fathered reptile and dinosaurs) declared it genus and species new to science and named it.
Recent research; bits of pholi in Nat Hist Mus and USA in John Wards coll.(died 1906 was a collector of Carb vertebtrate fossils, he was from Longton Staffs. A Longton spec in Bradford colls . Also member of BPS in 1866. Did he borrow bits?

BPS museum closed again in 1872, the year the Brit Assoc for Ad of Sci met in Bradford, as no one visited but the colls reopened in 1879 in town museum as "curiosities" and "there was no doubt there would be a number of visitors who would find both entertainment and instruction in the perusal of the valuable collection"
1875 saw rise of Bradford Scientific Association, influenced by the BAAS, although it had no

museum, but produced journals (see on table)

1879 Charles Birds (Bd school master) relabelled BPS colls. In 1884 published Geol of Yorks (copy to see on table)

1884 -1900 heyday of BPS, Thomas Tate was curator following Miall but it no longer had a museum which seems to have become a drain on resources. It remained active with lectures but the colls were now scattered between the public library Tech Coll, grammar school which marked the decline in private collections and Phil Socs., finally declining in 1911 with its collections donated to public museum.

OTHER COLLECTIONS IN MEUM

1886 fossil tree stumps were found in the quarries at Clayton above Bradford. Prof w c Williamson of Manch who in 1887 wrote the definitive work on these fossils in " Monograph on the Morphology and Histology of Stigmaria ficoides" hastened to the scene. The large 5 ton specimen with its spreading roots were purchased for Manchester Museum which opened in 1888 just in time to make the appendix of his Monograph. It was "without a rival for magnitude and grandeur in any of the museums in the world" It is still there but other tree stumps were donated to the three public parks in Bradford, one near the Cartwright Hall museum, where they still stand in neglected state

1880 excavation by YGSoc of Raygill fissure a limestone quarry in Airedale near Skipton. It is one of 3 interglacial sites in Yorkshire from which bones of Hyaena , hippo, and elephant sp where found. At Raygill were a number of young Straight -tusked Elephant teeth. Finds went to Leeds Museum but at least one to Bd and is on display.

William Cudworth(a local antiquarian,member BP, and publisher of local historiesS) acquired bone cave material including Neanderthal man tools, from Cresswell Crags in Derbyshire which was being excavated by Boyd-Dawkins and others in 1880s, now nominated as a world heritage site. Recent dating of this material from our colls includes horse teeth 30,000 years,w rhino 50,000, hare scapula with tool markings 12,340 ya.

John Holmes collection of Carboniferous goniatites
most of his coll in BM and Sedgwick in Cambs, but rest here as he was local man . Helped with field work for Dr Wheelton Hind and Bisat's pioneering studies of fossil goniatite shells for zoning Millstone Grit rock series in 1920s which was to change the geological map of the area (compare the two maps on the tables 1875 and 1950s resurvey)

Wm Cash;purchases made in 1909 Main coll in Manchester

John Mc Landsborough collection 1902 acquisition. collecting in 1840 and 1880s

One could go on but in conclusion that is a taster about some of the older material in the museum collections here. There are I am sure many more connections to be made .There will opportunity to see some of the geology in the store later on but I hope it will provide inspiration for research on some of the amazing collections which make up the science collections in museums such as this one.

Richmond Rd. At Gt Harth Rd. ①

Introduction

"Local bygone extractive industries"

For 100 ft for the talk Huge topic - looking at geol point of view with support of Geological point of view, verges on ind arch. & local history. Not a historical account, Hope folk won't be disappointed. Quite honestly the historic background for this area is extremely scanty & one could probably spend years researching just one parishes extractive industries.

Effect of extractive industries - perhaps not always obvious.
Evidence of extractive industries still ~~noted~~ noticeable.
By products also evidence
Remnants of large stone quarry Products themselves eg. stone give a the character of area.

Look at Iron, coal, shale & clay, sand & gravel, limestone, peat & STONE

Start off with stone.

Object brought along - hope you will look at them & also visit the museum.
Nat Resources exhibit planned for 1st Thurs June 1982 (next summer). Will be able to see ~~more~~ larger objects than I can able to bring tonight & much more of the historical background.

New Geol. Gall telling story & Are values ~~are~~ as in progress at CC. - but is not open yet. Perhaps near spring. - to come

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Objects

bloomery slag
Blast furnace slag
M Cr ironstone
C M. ironstone

limestone boulder

fireclay
shale brick

coal
goniatites?

pyrite gunatite

gritstone
flagstone

Stone.

(1) Moor Lane above Shipley.
Baildon Green quarries & Fernichurst (Rough Rock) top of M. Grit)
slightly landscaped – coal pits of Baildon Hill, clay pits to R on chose
Quick boom at same types of quarries
(2) Baildon Green quarries from Saltaire 1851–53
Part of mill & canal built from stone. ~~20~~
20 local quarries. (some in centre of Saltaire) Heaton & Shipley,
Quarry boom really started in 1860's with Ind. Rev. Canal Rd all quarried.
(3) Manywells
Moorland site Black Moor – (Ilky – Halifax Road). Typical qu
Rough Rock flags
Crane platforms
discarded blocks of stone
Informal recreation & tipping
~~Over road~~ Just up road – glacial sands once worked
36 – ~~Acon Parkers~~ Redland Concrete crushing ~~Heath~~ gritstone of lower horizon than below. Stone mined in Harden valley at Allerton & Idle
(4) Shipley Glen.
Look like natural outcrops but probably worked
Loose blocks pulled out.
Discarded millstones near bottom of Shipley Glen.

(5) Other side of Rombalds Moor – crop above Ilkley
Much of natural looking outcrop worked for centuries
in distance Hangingstones Quarries above Cow & Calf
Used to build much of Ilkley when it grew in (19) incl. Ilkley hydro

(6) Rocky valley (above Ilkley)
Part of outcrop quarried for centuries.
Add Edge Grit (R1)
quarried all way to distant crag.
Discarded stone troughs & millstones
Addingham Millstone quarry in (17). Lord of Manor's quarry on common land

(7) Also in Wharfedale, as in Airedale, natural landslips
Landslip blocks worked in late Middle Ages: easier than quarry

(8) Dimples Qu, Haworth
Now landscaped as car park
~~Reminds us~~ Reminder of how & when local rocks formed
Local rocks are MG & CM.
350 M years ago delta & swamp – deepening over Ilky &
shallow on ancient block N of Grassington
→ Manchester basin & Lancs. TILT. ~~Old~~ Old quarries provide interest for the descent

(9) Penistone quarry. (Haworth)
Wadhouse Grit (R_2) ~~Big~~ quarry early 19C, huge by 1890s
1950s derelict
Shows how band of stone varies - flaggy & blocky & broken
Shows natural blocks which can be pulled out
Shaley partings

(10) Eastern Qu.
Famous for its pulping stones sent to Canada till (20)
Addingham Edge Grit
small fault through quarry
Had to work deeper on right
shattered rock of fault.
Silty rock on r. full of plant fossils
Rare Megalichthys Coelacanth fish scales from there
Ripple marks

(10b) Slickensides — sign of faulting

(11) Quarry blocks show rock features of palaeoenvironment.
Current bedding
Sand ripples or (bigger scale) sand banks
moved along by river, eroding top of earlier bank
left in quarry : will not break squarely

(12) Penistone quarry.
Small scale current bedding & erosion
current ↓ to left

(13) Same. - Notice how sandstone weathering & eroding

(14) Ripple marked block of Siltstone
lagoon ripples?

(15) Load casts where sand sank into mud below

(16) fossils. — Dimples Qu. (Wadhouse Grit)
Stigmaria root in gannister (leached soil).

(17) Harden Moor - Rough Rock impressions.
Pith casts. Logs washed down?

? North slope of Castlehyll Hall Hill

(19) Objects made Millstone (Addingham)
(shadow of mill over it)
French burrstones from Rhine valley lava mee prep
in Norman & Roman times.
Montmorency millstones from Paris basin made of chert &
cement in vogue occasionally. Iron bands. Often seen
Bamforth, Wensleydale - b

(20) Stone built community of Ind. Rev.
Haworth Main Street. Canadians found it incredible

(21) City Centres - huge demand for stone
Spinnwell etc since 1787. Millstone from Leeds Bramley Fall etc
(E.F. 1850)

(22) Mills (no ornamentation ∴ functional)
Warehouses eg. Little Germany are prestigious)

(23) Cartwright Hall. 1903
Last piece of exotic masonry in B'd.
local stone from.? Gaisby rock
quarries decline 1914 ∵ incr cost + labour
& concrete, steel & bricks

(24) MAP - 1860 Sudden incr in quarries.
Old quarries enlarged
New ones open as estates & lands are sold.
Machinery used ∵ deeper & bigger commercial quarries
This map shows geological sects - 1873
Elland Flags
Morlsen was a JP & Mayor of B'd in 1888
& built many famous buildings in B'd & Leeds.
Buried in Undercliffe Cemetery? where did some of the tenstone
Egypt quarries near by - fudd walls of Jericho

x Morlsen & Farrar employs as many as in all the other quarries of Thornton combined.
Thornton Heights quarries in 1830.

(25) Finally working STONE

Holing & bottoming picks - quarrymen & banksmen.
Wedges.
jumper + plugs & feathers
iron balls
flag fetters - Nicking chisel, hammers
scrapping hammer
Wallstone dressers - pitching tools
Masons - bolsters & chisels

frame saw - see farrahs in h'ly

Shale & clay

Muddy rocks eg. fissile shale, blocky mudstone & fireclay make up a large proportion of local rocks. More common than sandstone, particularly in coal measures. — indicating that conditions changed ie. swamp not river deltas any longer.

<u>Clay & shale</u> – L. Coal Measures

For centuries there had been a demand for pottery items but with the beginning of the industrial Rev, things really began to boom. 3 sources boulder clays – earliest source
fireclay – high temps, better quality
shale (19)

① This is Clay Clough at Denholme which as its name suggests was a source of clay. Fireclay or seatearth of the Hard Bed coal &/or 36 yard Band coal. Fireclay is high in silica was mostly used for stoneware pottery & required a high firing temperature. Lower coal measures. Potteries in a N-S line along this outcrop. Country potteries for local market town & Huddersfield

② Site of ~~old~~ 1875 (19) pottery. with kiln. Old farm buildings. Note Denholm edge behind pitted by coal & clay workings. Denholm famous for its 'black pottery'/china
Many pottery began between Wly & Halifax in late (18
c. 1770 Leetham (Raggalds Inn)
1779 Soil Hill (STILL GOING)

1830 Bradshaw Head
c. 1800 Small Clews near Bradshaw
1875 Denholme
Dig carried out in this field in 1968 – This is site of (19).
~~other~~ All these early potteries made earthenware crocks etc. often using the glacial boulderclay ~~not fireclay.~~ or fireclay very near the surface.
The clay seams become deeper to the east ~~—~~ & tend to be later.
<u>Baildon Hill</u> – an outlier of the L. Coal Measures & away from the N-S outcrop of clay & potteries
Here (14 & (15, kiln floors & pottery. frags found at Hope Hill farm. Typical upland site there so wind could fire kiln. Probably supplied village of Baildon for centuries. ~~Fireclay~~.

③ These are kilns of ~~Thornton~~ fireclay works on Thornton Rd. – now demolished! Were going to preserve them. (19 works Made stoneware items eg. sanitary wares, sewage pipes, chimney pots, garden wares, firebricks for ovens from coke from
The valley between Clayton & Thornton is full of clay pits. Whiteheads of Clayton fireclays used coal & clay from a nearby pit.

Also at Wibsey stoneware pottery was made from 1770's
Another well known pottery - now gone was at Eccleshill
The Manor Potteries began about 1835 tho there seems
to have been a pottery there in 1812. Stoneware was
made until 1867 but after that bricks & chimneys were
made. Thornbridge Spash dub now on the clay pit workings.
Process - clay is crushed in dry pan, mixed with water to a slurry, so stones feel air,
Then dried. Pug-mixed to mix it, then ready for forming into pots or bricks

(4) On driving up & down the Aire valley around Bingley, Kly & Baildon you probably notice this chimney landmark which seems to always be at the hill top. This is the kiln chimney in the Bingley Brick Pit. Nav this is in M.G not C.M. rocks. In the last century the demand for bricks increased dramatically & with use of machinery it was found that. unweathered shales & mudstones could be artificially ground down by machinery to make common bricks. So the first time brick making was not confined to the clay belt.

Park Wood Brick Pit, Keighley also began.
Wrose Hill Fireclay Co. & Wrose Brow Brickworks
both used the shale. Also at Yeadon, Hawksworth
Greengates Fireclay Works. Shipley, Fieldhouse Works Keighley

large scale Fireclay works used Hard Bed. fireclay in Victoria times eg. Wrose Hill Greengates Fireclay (Keighley) Fieldhouse Brickworks Burras, Clayton

Bingley Brick pit incidently has produced a no. of type fossils. brachiopods eg.
Park Wood pit in Keighley also contains marine band fossils.

Bricks mainly used for interior walls or firebricks for ovens. Tong Hall in S. Bradford, until last year. one of the L.A Museums is one of the few brick built buildings around. (18).

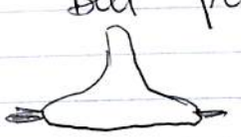
Birkbeck brick works at Wyke still going
Victoria Brick Works at Dudley Hill Mostly demolished?

(5) Tong - Fireclay - worked by open cast & 1779?
Re-instated land as agricultural land.
Coal was worked here - Low Coal & Black Bed ironstone
~~Bottle~~ Bed coal with fireclay

Local potteries exhibition at Ind Museum Nov.
History, items made - pottery chairs, ~~garden~~ iron (garden ornaments) baths.

Coal & Iron

① Baildon Moor – Pre 1638 (17) :- Stone Age tools & implements - polished ~~Coal & iron All usually worked together~~
Bell pits for coal though iron may also have been worked - Med – (19) . Domestic fuel
Age of pits (17) ?
'Iron Age Dwellings'
Soft Bed Coal 16" thick. L. Coal Measures
Hard Bed Coal 27" thick
Coal worked almost anywhere where it outcropped or from shallow shafts

② Pyne's Microcosm c. 1800 . 20–40'
Bell pit – simple shaft with a winding mechanism at the top for both people & coal.
Waste deposited round edge. . Horse gins at Wilsden
'Bell' pit :- shape of the working seen in cross sect

Shortage of wood & debris at even (14)
Wilsden – 1594 Thomas Illingworth killed by a firedamp (methane gas) explosion in Elizabethan pits at Clayton's shaft.

③ Waste shales from the bell pit often contains marine sand fossils – goniatites & bivalves & sometimes fish teeth & coal worked on all L.C. Measures

④ Not all coal from Coal Measures
Penistone Hill – Millstone Grit. Coal seam near Add Edge gnt
In M.G. trees grew on islands in the delta but seams thin :- conditions. This seam about 14".
Domestic use. Black shale goniatites.
In 1870's coal was scarce & expensive & demand high
Much prospecting in North Valley by local landowners
Sir J. Brigg planned a number of new deep shafts with engine houses here. Shafts remain ~~but~~ abandoned when found seams too thin. Seams & pits at Withens
Later Pits owned by Greenwoods – the Mill folk. Mills owned coal pits eg Black Dyke Mills owned Cleaves Moor pits.

⑤ 1880's ~~Opencast~~ mining along seam of coal. – shafts & adits
Thwaites Brow Ltd. gnt (shafts & adits)
Millstone Grit seam below Woodhouse gnt
(19) working here :- high price
Mortan Banks colliery opposite was also worked by finally abandoned by flooding. 5' coal
Worked up to 1850 Later attempt to reopen
Bell pittings on Rivock Edge from (16) (17)

re-used :- coal stones :- earth (20)

⑥ Leeds colliery c. 1800 Deepershafts.
One of first mechanised railways.
Horse gin & coke kiln
local coal alright for domestic use & steam raising
Too much sulph & ash for iron industry ∴ coked
~~take~~ so that like charcoal it was pure carbon
With ⑲ deeper pits were made with winding gear eg,
Heaton Royd colliery (Shipley) Shipley Moor Colliery, Allerton & Wibsey
Colliery, Bunkers Hill Colliery, Reecroy Hill colliery. + COKE KILNS
As well & low grow & Bowling area. L-C.M. seams

Iron Industry

IRON

① Cliffe at how ~~Hall~~ Mill, Addingham
Iron had also been worked for centuries.
Roman coins found with iron slag ~~too~~ at how Moor
Quite a rural iron smelting industry here in ⑫ ⑯ - ~~17~~ 18
Source. - clay ironstone nodules found in M.G & C.M shales
septarian structure.
Worked from outcrops & bell pits (coal usually left)
& smelted nearby in bloomery furnaces.
Shale full of ironstones here
⑯ record of smith working on land opposite. bygoby
Greatest clue to locating these iron working is SLAG
Bloomery slag from furnaces found at.
Baildon (pits for iron & ~~later~~ coal)?
Northcliffe Woods Shipley - = probably Med.
(Chellow + Shipley) Harden (Hall) 1200 - 1540 Rievaux Abbey
Harden Gill Silsden
Lumb Beck, Add ~~17~~
Bolton Woods
Bloomeries usually by streams or hill tops POWER
Charcoal & iron layers in hole.
Covered sods. Air inlet for wind or bellows
"Blower" Hill at Silsden
There are ~~16~~ references to iron smithies at Windhill 1583
Tong & Fanley ⑯
1591 Hirst Wood forge & furnace
Escholt - 1570 accounts of charcoal & ore from Otley

Iron heated to 1,100°C in reducing atmos to soft
Soft spongy iron or bloom beaten out
forged by smith
Workings in S. Bd probably obscured by later mining

⑱ Blast furnaces using coal or coke came in.
Bd had Better Bed coal (v. pure)
Black Bed iron.

Ironmaking on large scale began

(2) 1A/v/14 Iron industry moved to S. Bradford. Puddling proc (refining of pig iron prior to hammy.

1782 Birmingham Ironworks
1788 Bowling
1791 Low Moor
1786 Shelf foundry
1810 Bierley ironworks.

Low Moor ? 1869-15 collieries, 8 blast furnaces; 36 puddling furnaces; 7 rolling mills. 2,000 tons p a in 1795

Steam powered machinery for cold blast furnaces.
Coal & ironstone pits owned by companies.
Pits & railway lines still seen across fields of S. Bd.
Craven limestone for flux by canal & rail
Blast furnace slag - efficient ∴ all silica
Sold to turnpike trusts in early 19C.
Can still be seen under setts - hard core

(Copperas) Iron Pyrites

(4) 18. & early 19C (1870) copperas (iron sulphate) made from iron pyrites & used to make a black dye for local dyeing industry.
Copperas House at Denholme. (Much in Huddersfield
One of 3 copperas making places at Denholme
Seam - pyrite in nodules in shales above Halifax Hardbed
Method/Extraction
Pyrite laid in trench.
Rain runs through - forms a dilute sulphuric acid
Collect water in pan & evaporate (to reduce)
(titration?) Waste iron added.
Acid takes up iron. Resulting liquid cooled
Forked sticks added to liquid - 10-20 lb crystals formed
Also made from Eocene clays in S. of Eng
Amazing how acid saturated & pyrite can be - Irish cats

End of solid fuel extraction.

~~LIMESTONE~~ -

① Geol. map.
~~Thus~~ Drift map. - ie. deposits from ice age on top of solid rock.
Pale blue covering is boulder clay - thick sticky blue clay which weathers yellow. Full of boulders of local sandstone & rocks from further afield M. limestone & Sd. grits
green in valley bottom - moraines (mounds of wiffle
isolated purple pink - sand & gravel (M - glacial)
dull brown - Peat - formed in last 6,000 yrs.
gravel terraces.

LIMESTONE — moraines
② Hly golf coarse (Otley) moraine & R. Aire

③ showed up well in Aire valley floods
See restricted water
④ Up valley — very wide flood plain - lake flat:
⑭ Another view

⑤ Burley moraine & lake flat. from E Rodesden Hall

⑥ Burley moraine at 5 rise locks.
Valley filled with moraine
Records show in (17) Burley moraine was full of workings for limestone boulders. Impaired the land.
Lime burnt in ~~kilns~~ kilns to make quicklime for agriculture & slaked lime for building trade.
Many poor people became a burden on the parish Itinerant lime burners?
Micklethwaite & Castlefields. Flora today shows lime influence
Pit kilns - hole in ground, boulders burnt up, fired with wood/coal & limestone & left to burn. Air channels at base
kilns found in building Burley railway.
In kiln carbonic acid given off leaving calcium oxide
Several kilns found in building of Myrtle Park area even in 1930's.

⑦ Slippery ford - Newsholme valley above Hly
Moraine full of lime - workings recorded
Further to west from here - Wyrtlar - rush lime burning
from drift in (18) Remains of kilns seen.

(7) Wharfedale moraines also
Addingham. Lewis's mound – perhaps a kiln.
Wharfedale different ∵ river full of limestone.
(14 repairs to Skipton Castle – lime from Add. & B Abbey.
Probably using river limestones ∵ both are glacial areas with small moraines
(7a) – River shingle at Add ∴ white lot.

(8) Lanshaw Delves, Ilkley, Burley – Hawksworth Moor (Aredale
lateral moraine of Wharfedale glacier
Note green grass compared to sedgy moor.
Pock marked with lime workings.
Many limestones still found.
Remains of kilns seen there decent century.

(9) Hawksworth Moor.
Other end of Lanshaw moraine – goes over into Airedale
Again pock marked & thoroughly turned over, small lot still

(10) Boulder clay limestone workings – Swartha (Silsden)
pipeline thro here also.

(11) Holden Gill. (Silsden)
Botanical interest
~~Bell~~ Pitting in the drift preliminary for lot ∵ records for Silsden
(Ironstone) blooming slag at top

(12) Holden Gill
Stream cutting thro boulder clay
Boulder stream

(13) Ice scratched limestone boulders
(above Silsden nr Holden Gill)
flat iron & shape

(14) Limestone boulders
Peel Park – B'd in 1895

(15) Bolton Bridge – limestone quarries here to Skipton
brought up by ~~[illegible]~~ Parting. Tolding
With canal & incr. demand for lime quarries
opened up on big scale in early 19c. Canal side kilns
permanently burning lot & raking out!

(16) Reason for living from (17 onwards was for this — improve land & restore for farming. Reclaim acid moorland
Characteristic stone edged fields .. many still done but by calcination plants in 1920's. Old kilns do used

SAND & GRAVEL

(1) Worked where needed.
Huge reserves in Aire & Wharfe.
Valley bottom river terraces — Utley

1a Riddlesden river terraces

(2) Wharfe valley river terr

(3) Wharfe valley terr

(4) gravels — Lower down Aire.
Most sand was made from ground up sandstone

(5) Glacial lakes
Shows how you get upland deposits of sands.
Goose Eye — ~~Newsholme~~ (Holme House)
N Beck / Newsholme Dean.
Worthy till recently

PEAT.

(1) Peat at Fly Flats (beyond Oxenhope Moor)
6,000 yrs ago weather became wetter
buried forest (2) types — pardey hill peat - heather covered but spoilt by pollution & rain..

(2) (2) basin peat — cotton grass. Geographically names of moss.. Communal worked

(5) Harden Moor — peat once worked here — paved Lower road
Nab Hill & Oxenhope Moor. Turbary rights still
Peat pits often filled in with ~~top~~ ~~soil~~ surface plant.
fuel where no coal.
Foreside above Thornton moor worked this century
Cowling — peat dug this year

lynes microcosm

(5) Peat working.
Dug in summer & stacked up to dry.
Brought home in August.
Turf spade for removing top veg. & poorer peat.
Peat spade.
Turbary roads still seen & footballs now

Water. - it is an extractive industry

Finally water - a natural resource that is essentially ?Extracted?

(1) Water power. Whites Mill (now Mill Addingham)
built 1780s - first successful worsted spinning mill in Yorks. Mills used last amounts for fulling & washing

(2) High Mill, Addingh
Originally water powered medieval corn mill later used for worsted, cotton & silk spinning.
One of few Med. mills on River with a huge weir one of largest in Yorks. Quite a ~~problem~~ feat when think of how much whole goes up & down in. No problem with frost or drought. Most wood display - paper, cotton etc.

(3) White Wells Ilkley.
Bath House (18) Squire Middleton.
Numerous springs on Moor ∴ effecting ground.
Stone bath. Outside - no properties - just cold Spa water.
Water harnessed (19) for drinking etc for Ilkley, Baildon, E & W Morton etc. ~~Changing~~ Extraction is changing the moor & drying it.

(4) Leeming Res. Oxenhope built by B'd W. Works c. 1860;
Build along with other reservoirs up the Worth valley for mills to control drought.
B'd acquired Bordon Moor etc last century

(5) Finally water extraction & demand has caused Y.W.A to form new schemes ~~to~~ which help to compensate & even up water supply in times of drought or demand

PTV Pipeline - Chelker to Bingley in 1979/80
Also gave me a ~~chance~~ rare chance through excavation to collect.

Finally back to where we started
View from Mow Lane

Limestone pits in moraine built over (but greenfields)
Quarries infilled
Brick pit [illegible]
Coal pits uncommunicated.