INTRODUCTION AND PROJECT BACKGROUND

The archaeological investigations at Ifield encountered the remains of the first Wealden finery forge to be excavated in more than 25 years and compliment previous work at Chingley (Crossley 1975), Ardingly (Bedwin 1976) and Blackwater Green (Place and Bedwin 1992).

Evidence of earlier, medieval, ironworking was also discovered, together with structures and deposits related to the later mill phases at the site. The investigations took place under watching-brief conditions, as rapid rescue archaeology, during works required by the Reservoir Act (1975). The fieldwork contributes to the understanding of the Wealden Iron Industry, a heritage asset of national importance.

The site is located at Ifield on the western periphery of Crawley, West Sussex (Fig. 1). It comprises a mill pond with associated building, as well as a number of small streams set amid landscaped woods and parkland.

The original hammer pond, bisected by the Arun Valley railway line in 1848, was first formed by the damming of the Ifield Stream. The resulting body of water (now Ifield Mill Pond) is reasonably large (about seven hectares) and is also fed by the Broadfield, Douser and Bewbush Brooks. The dam was built in the mid-16th century in order to create a head of water to drive waterwheels associated with Ifield Forge.

The modern development comprised improvements to the mill pond, the dam and associated spillway, as well as minor works which included a new car park. The north and south ponds were desilted and a quantity of the excavated material retained on-site to be utilised during landscaping and as the fabric of an improved dam structure.

The latter was constructed on the upstream face of the existing dam, with a clay core built from material excavated from a borrow pit (situated in the bed of the north pond). The works also included concrete revetments and a new auxiliary spillway with associated downstream structures.

The archaeological investigations were initially designed to have a significant geoarchaeological component. However, on-site constraints and safety concerns meant that hand auguring of the pond sediments proved impossible (Archaeology South-East 2014).

Work was therefore restricted to general observations of alluvial sediments, undertaken during the archaeological watching brief and silt extraction. This was carried out by Archaeology South-East (UCL Institute of Archaeology) in conjunction with historic building recording. The work took place at intermittent periods between May 2014 and January 2015.
Fig. 1. Site location.
IRONWORKING IN THE AREA OF CRAWLEY AND IFIELD

The Weald comprises a nationally important landscape in terms of its early industrial heritage. During part of the Roman, Tudor and early Stuart periods the area comprised the principal iron-producing region in Britain. The Crawley district plays a prominent role within this history, although ironworking within the town itself largely pertains to the late medieval period, when the settlement constituted a major concentration of smelting and smithing activity (Hodgkinson 2008, 41–42).

The earliest evidence of ironworking from the Crawley area, and possibly the Weald in general, currently dates to the Middle Iron Age. Bloomery furnaces, potentially originating as early as the 4th century BC, were found about two kilometres east of Ifield Mill Pond at Rathlin Road, Broadfield, Crawley (Cartwright 1992; Pine 2013).

Crawley is located on the western fringe of known Iron Age and Roman iron working, which exists in two concentrations on either side of the High Weald. Crawley is part of the larger of the two groups.

Bloomeries have been identified on the banks of Broadfield and Ifield Brooks, in the vicinity of the Ifield site. Whether these date to prehistoric, Roman or medieval industrial activity is currently unknown; however, the area of Crawley appears to have been well utilised in this regard during the 13th and 14th centuries (Hodgkinson 2008, 40).

It is likely that the town’s economy was heavily orientated towards the iron industry (Saunders 1998, 93) and this has been confirmed through archaeological excavations which show evidence of primary and secondary ironworking throughout the medieval High Street (Cooke 2001; Stevens 1997; 2006; 2008; Grant 2019).

With the introduction of the blast furnace to England in the 1490s, Crawley’s importance as a centre for the industry appears to have diminished, with workers’ settlements and industrial activity dispersing into the surrounding landscape (Barber 2008, 133).

The more sophisticated, ‘indirect process’ associated with the blast furnace involved the reduction of the ore to produce a liquid iron containing about 4% carbon. This was cast into ‘sows’ and ‘pigs’ for later conversion into malleable iron at the finery forge. Here, the pigs were reheated in the finery hearth to burn off the excess carbon and then worked under the tilt hammer to produce wrought iron bar.

A chafery hearth reheated the iron, which cooled when under the belly helve hammer. Multiple waterwheels were required for the water-powered bellows associated with both the hearths and for the hammer. Both forge and furnace sites required the construction of dams (locally called bays) across stream valleys to create furnace and hammer ponds.

The need to search out suitable valleys in which to create these new, more elaborate ironworking sites may have led to the transfer of activity from the centre of Crawley to multiple forge and furnace sites in areas such as Tilgate, Ifield and Worth. A furnace was operating at Bewbush by 1567, when sows were transported to Burningfold, some 24km distant, for further processing (TNA REQ2/115/2).

Ifield Forge is possibly not recorded until 1574, when it was leased by Roger Gratwick, who also operated several similar sites in St Leonards Forest. However, earlier evidence of the forge may be referred to in relation to Thomas Fenner’s occupation of an ‘iron mill’ in the parish in 1569 (TNA REQ 2/226/4).

Sows carried to Bewbush Forge in 1602 (TNA REQ2/166/46) probably relates to Ifield, which was again documented in 1607/8 when a ‘messuage called Ifield Forge’ was leased from the crown by one John Middleton of Horsham. This was for a term of 1,000 years (WSRO Add Mss 33,389).

The demise of Ifield Forge is recorded during the time of the English Civil War. John Middleton was involved in the Royalist rising of 1648 and consequently fined by the Commonwealth (Gibson-Hill and Henbery 1978, 13).

His later antipathy towards the Parliamentarian cause may have been partially influenced by the treatment of his forge at Ifield. This was destroyed (along with those of St Leonards Forest) by Colonel Sir William Waller’s forces after a successful siege of Arundel Castle (Lower 1849, 211). The Middleton family were later able to recover their land at Ifield and it remained in their hands until 1715 (Gibson-Hill and Henbery 1978, 13). By this time the forge site had been replaced by that of a flour mill (see below).
THE CONTEXT OF THE SITE: IFIELD MILL

The earliest documentary records for a mill in the Ifield area date to 1247 and 1341. These refer to tithes for a mill awarded to the Chaplain of Crawley (WSRO Ep. I/1/5, f.60) and the Rector of Ifield respectively (Vanderzee, 1807).

The location of this medieval mill, or mills, is not known; however, the predecessor to the current building has been identified as a flour mill, assumed to have been erected on the site of the earlier ironworks (Gibson-Hill and Henbery 1978, 13–14). The structure’s date plaque (1683) is incorporated in the current mill building, a four-storey, weather-boarded construction, with the ground floor walls of brick (Fig. 2), established early in the 19th century (prior to 1817).

An idea of the size of the new mill in relation to its contemporaries can be gained from a survey carried out in response to the threat of French invasion during the Napoleonic wars.

Sussex mills were asked how many sacks of flour they could supply in a day. Within the area of Crawley, Balcombe Mill could produce four, Tilgate three, Hazelwick one, Copthorne three, and Ifield a staggering total of 16 (Gibson-Hill and Henbery 1978, 14). The mill was practically unused from 1927 until 1974, when it was acquired by Crawley Borough Council. It was in a bad state of repair and was the subject of volunteer restoration.

Prior to this recent refurbishment, the dam measured 154m in length, although originally it was longer, the eastern end being truncated during the construction of the railway line.

Its structure consisted of an earthen bank across the northern side of the mill pond, occupying a site sloping gently south-west to north-east. The embankment was less than two metres high at its western end, rising to six metres high to the east. For most of its length it was topped by a flat walkway around two metres in width (Fig. 3).

The face of the dam was principally of brick, aside from its western end, where the spillway was
The bricks, produced by the Freshfield Lane Brickworks, Danehill, Sussex, were the same as those from which the mill building and wheel pit were constructed. This suggests that the dam was refaced at around the time the mill was rebuilt (about 1817). Scattered around the dam embankment was a quantity of loose Tunbridge Wells Sandstone. This may have been the dam’s facing material prior to 1817.

The dam had two major features: a spillway towards its western end and the mill race near its middle. Nothing of a boathouse recorded on historic maps within the western dam end of site remained, although it was depicted on an early photograph (Fig. 5).

The existing concrete spillway consisted of a broad-crested weir with a stepped cascade and a sluice gate. It enabled excess water to leave the mill pond in times of spate, discharging into Ifield Stream beneath a 19th- or early 20th-century footbridge.

Near the middle of the dam, the headrace to the wheel pit was fronted by an iron sluice, or penstock, to a concave culvert of the same reddish-brown brick seen throughout the site. This had been repaired in the past, but essentially dates to the rebuilding of the mill in about 1817.

The sluice was relocated here from Hammonds Mill, near Clayton, when the latter was demolished in 1975. It was then fitted with a reproduction gate based on the nearby example at Bewbush Pond (Gibson-Hill and Henbery 1979, 6).

The sluice is flanked by thick, stepped, retaining walls of unadorned brick. Thereafter, the water is borne the short distance to the overshot waterwheel via a trough of cast iron, supported by simple, cast-iron columns (Fig. 6).
ARCHAEOLOGICAL RESULTS

OVERBURDEN AND NATURAL DEPOSITS

Excavations revealed a stratigraphic sequence that largely comprised deposits of made ground or recent topsoil overlying the natural Weald Clay. Over the area of the new auxiliary spillway, overburden deposits were up to four metres in depth, comprising significant post-medieval levelling associated with the construction of the mill (see photograph Fig. 7).

PERIOD 1: MEDIEVAL SMELTING AT IFIELD POND

Bloomery furnace

The earliest feature on the site, an irregularly shaped sub-oval pit [258], filled by three distinct deposits, was encountered beneath the silt of the mill pond, cutting the underlying Weald Clay.

This earliest of the deposits consisted of an alluvial silt, perhaps derived from contemporary flooding of the nearby Ifield Stream. Overlying this was a large cylindrical concretion of clay with iron oxide pellets measuring 335mm tall with a diameter of about 340mm (Fig. 8).

This was in turn overlain by dark deposits of slag in silty sand matrices. The looser consistency of the uppermost fill may simply be due to weathering of the pit’s upper horizon.

Samples from this deposit returned radiocarbon dates of 805±33 BP (SUERC-70620; 1170–1273 cal AD; 95% confidence; beech (Fagus sylvatica) charcoal) and 771±33 BP (SUERC-70621; 1209–1285 cal AD; 95% confidence; oak (Quercus) charcoal).

These two taxa dominated the associated charcoal assemblage and were likely chosen due to their suitability for fuel. It is probable that this pit was related to a bloomery of the late 12th or 13th century, although it could be earlier as the dated material was derived from an upper disuse deposit.

Slag-tapping bloomery furnace (with Catherine Batt)

Overlying pit [258] were the remains of a second bloomery furnace [145]. This comprised a halo of heat-affected natural surrounding a sub-circular depression. A southerly projection related to a rectangular area for ‘tapping’ the slag produced during the smelting process (Fig. 8).

On the northern and eastern edges of the feature were the truncated remains of the furnace’s superstructure, consisting of packed clay and heated local sandstone. Across much of the bloomery’s base, except for the very central portion, a thin (90mm) lining of off-white, compacted and heated sand or mortar was encountered.

This was overlain by an in-situ deposit of slag, which was in turn partially overlain by a mixture of frequent small slag fragments in a dark black/grey sandy silt matrix. This deposit, the result of the furnace’s last firing, was in turn overlain by similar material of slightly browner colouration.

Close to the east of the furnace, and forming a further part of this bloomery ‘group’, was a small circular pit, [147]. This feature was surrounded by heat-affected natural and was filled by dark red-brown silty sand, with a large piece of centrally placed slag. This feature possibly represents a receptacle for the removed bloom; here it could be further processed with a hammer for removal of slag and consolidation of the bloom.
Fig. 7. Site plan showing encountered features, with photos of pond desilting and auxiliary spillway excavations.
Fig. 8. Period 1: plan, photos and section.
Bloomery [145], specifically the lining, was the subject of archaeomagnetic sampling by MoLA and dating by the University of Bradford. A total of 24 samples were collected from the feature, with one being lost during this process.

The full archaeomagnetic report should be referred to for detailed analysis of the results (Harris and Batt 2015; Margetts 2015). A summary is provided in Table 1.

The mean magnetic direction recorded by the feature was calculated from 20 specimens (after removal of a statistical outlier). The calibrated dates obtained using the European geomagnetic model (Pavón-Carrasco et al. 2009) was cal AD 1150–1540 (at 95% confidence level) and cal AD 1260–1290 or cal AD 1400–1540 (68% confidence level).

The date ranges are relatively large as there is an apparent loop in geomagnetic behaviour in the period in question (Harris and Batt 2015) but they certainly point to a medieval origin for the furnace. Well-dated bloomeries are a minority within the Weald and the example(s) from Ifield Pond joins a small number that have been scientifically dated.

The bloomery therefore contributes to a small but significant data set. In 2008 only 29% of all known Wealden bloomery sites were dated. Of these the majority were assigned to the Roman period (62%). Only 21% of the 113 sites could be claimed to be of medieval origin (Hodgkinson 2008, 27, fig.14).

**Table 1. Summary of archaeomagnetic information.**

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**PERIOD 2: THE 16TH—17TH-CENTURY REMAINS OF IFIELD FORGE AND HAMMER POND**

**The hammer pond, dam and sluices**

Despite a lack of dating evidence, tree-throw [107] (Fig. 9) was equated to this phase due to its presence beneath the pond silts. It likely relates to clearance of local vegetation prior to the construction of the hammer pond serving Ifield Forge.

As mentioned above, the creation of the pond was reliant on the damming of Ifield Stream. Apart from the postulated clearance, this comprised one of the earliest acts in constructing the forge site.

A dam formed of blast furnace slag (contexts [416] and [417]) was thrown across the valley, blocking the watercourse. The inclusion of blast furnace slag in the dam’s make-up is a common occurrence within the Wealden iron industry and may indicate that Bewbush/Ifield furnace was already in operation, the site being the nearest source of such material.

This would appear to confirm documentary accounts which record a nearby furnace earlier than Ifield Forge (1567, TNA REQ2/115/2, versus 1569 or 1574, TNA REQ 2/226/4; TNA SP 12/95 f.48 piece 20).

As well as alluvial sediments, other archaeological remains related to the hammer pond comprised two timber mechanisms located to the south of the forge and within the dam ([128] and [414] respectively).
Context [128] (Fig. 9) formed the loosely L-shaped construction cut for a timber sluice comprising two lengths of squared tree trunk with a hollowed internal trough or gully.

The wooden pipe had a well-fitting lid, fixed in place by wooden pegs and hand-wrought nails with rectangular sectioned shanks and rectangular pyramidal heads. A square hole in the eastern, pond end, of the timber contained an in situ, carved wooden plug, or tampion [135] (Fig. 9).

Clearly, this timber was intended to regulate water flow between the pond and the pipe. Also located at this end was a plank-walled outlet which surrounded and protected the pipe. This was built of four sharpened stakes which held the plank walls in place against a redeposited, well-tamped natural clay. The outlet was filled by an alluvial silt relating to the contemporary hammer pond.

A similar working to that described above was found against the dam wall to the east of the current watermill. Cut into an early alluvial deposit and built within the fabric of the dam was a two-piece, jointed, pipe [414] (Fig. 10). Again built of hollow squared trunks joined by hand wrought nails, this comprised both an upright and a horizontal timber with a recessed end which would have contained a simple sluice.

Also similar to the working described above, was a plank walled outlet. The planks were laid on their edge and fixed in place by sharpened stakes. Close to, but not adjoining the walls were five posts. Again driven into the alluvial clay these may have accommodated a raised walkway or jetty-like structure needed to access the sluice.

Artificial ponds of the medieval and early post-medieval period required frequent maintenance, desilting and repair. It is almost certain that the mechanisms described above were intended to drain the hammer pond to facilitate just such a purpose.

An additional benefit of a drainage facility would be the collection of fish, and it is possible that the presence of the wooden sluices at Ifield indicates use as a stew pond (Brian Herbert pers. comm.). Outlets made from tree trunks provided an alternative to breaching a dam and were a recommendation of John Taverner in his Certaine Experiments concerning Fish and Fruite (1600; 4–5). He describes how in the creation of a pond you are to:

lay your sluice in the head against the deepest place of your channel, being made of a whole piece of timber, or at least with the forepart thereof being a whole piece, and the residue of one or two pieces more, being joined very close; and stopped with haire and tarre in the joynts: for if therein be never so small a hole, it will spoyle your head at the sewing of your pond. Having made and hollowed your trough, hewn through at the tayle, but close at the end next to the pond, you are to naile thereon a strong board or planke, very close in all places: or else which is better, a slab being before the hollowing of your trough, sawne from the same: then turn that side downward, and then the upper side will be that which before was the bottom of the trough: at the end whereof next to the channel in the upper part thereof, you are to make the tampion hole square, and likewise make a square tampion to shut close the same, with the steale, either of the same piece which is best, or else strongly motised with a dovetail mortice into the said tampion, and so reaching up as high as the top of your head, or at least to the uppermost part of the water. And the best fashion for the head of your sluice, is two strong plankes, fastened on each side of the tampion hole, being in breadth somewhat borader than the square of your tampion, and grated boards nailed before and behind the same , some two or three foot from the bottome. But for the most speedy sewing out the water, you may make as it were a nose of grated boards before the tampion, at the bottome of the sluice, of some three or foure foot long, and a foote deepe. The residue of the sluice may be boarded up to the top with boards ungrated, and I think grated boards to be better for this purpose, being made with a hand saw, rather than holes made with piercer or auger. The trough of this sluice had need be layd so soone as you begin to make your head, because it may convey the water from you, which else will trouble you in making the channel.

Timber sluice [128] is almost identical to those recommended by Taverner, being of the type made from a single trunk. It was found with the tampion preserved in situ [135], which is very similar, albeit on a smaller scale, to the late 19th–century replacement for an earlier (pre Georgian?) plug which served a masonry drain sluice at the Great
Fig. 9. Sluice [128]: plan, photos and section.
Pond, Ravenfield, North Yorkshire (Fig. 11; Binnie fig. 2.24, 41).

The mechanism was also similar to one gifted to the Singleton Open Air Museum (now the Weald and Downland Museum) by Leconfield Estates and now lost (Fig. 11; Binnie 1987, fig. 2.21, 36).

Sluice [414], on the other hand, represents a different form of drain. The vertical timber probably housed a long wooden tampion. This could be withdrawn from the horizontal pipe in order to drain the pond through the dam (see Fig. 11). The tampion was probably located in guides in
the sealed compartment to ensure ease of lifting; however, neither these nor the tampion survived.

As well as a jetty projecting into the pond, for removal of a simple plate within the horizontal pipe’s end, there would have probably been a tower on the dam, accessed via a ladder. This would have allowed easy lifting of the tampion to allow water to pass through (Brian Herbert pers. comm.). Such towers could be shown associated with pond sluices on a map of about 1665 of the Mayfield Place estate (Fig. 12; ESRO AMS 5831/3; Brian Herbert pers. comm.).

**Ifield Forge**

Features and structures associated with Ifield Forge were located to the west of the current mill building, close to Ifield Mill Stream (Figs 13 and 14). The features were revealed beneath overburden deposits related to the later phases of Ifield Mill.

The base of the construction cut for the main forge area, [171], was almost 3.6m below the intact natural horizon found west of the mill pond. This degree of terracing represented significant landscaping in the early post-medieval period, undertaken in order to create both the hammer pond and the working area below.

Adjacent to the forge building were the remains of an associated wheel pit (Fig. 13). This comprised a linear, trench-like cut [207] in which two or more oak longitudinal members of about 420mm square had been placed.

These sill beams, which effectively formed the base of the frame of the wheel pit, were linked by at least two cross-beams. The southerly of these was joined by lap joints to the longitudinal members, whereas the northerly (lost) had been linked via a lap joint to the east and a pegged mortise and tenon joint to the west.

Upon these cross-beams were the broken planks of the floor of the wheel pit. These measured about 0.38m in width and were 0.04m thick. Their entire lengths could not be discerned, due to damage.

A proportion of the wheel pit was not recorded in detail due to practicalities in excavation. However, the two exposed portions showed that the frame of the pit was also comprised of plank walling, with upright oak tenon posts forming the vertical components (Figs 15 and 16). One of these, timber [188] (Fig. 17), was sent for dendrochronological dating (sample <19>). This showed the oak from which the timber was cut was short-lived and fast grown. It was felled sometime after AD 1548.

Deposits filling the wheel pit comprised a compact, almost solid, blueish-black layer of slag mixed with ash, charcoal and organics in a silty sand matrix. This backfilled industrial waste, which included some fragments of wrought iron bars, had clearly been tipped into the structure from its western side.

Overlying this deposit, but restricted to the northern end of the wheel pit, was an alluvial silt. This clearly related to a period of abandonment and flooding from the adjacent stream channel.

Where inundation had not occurred, the industrial waste was directly overlain with fragments of two waterwheels, perhaps deliberately broken (timbers <9> [198] and <18> [208]) (Fig. 18). Both comprised curved pieces of radially converted oak wood (Fig. 19).

The largest, <18>, was highly abraded on its outer surface and no clear tool shadows or other working marks were visible. One end of the timber was substantially damaged and further damage to the outer edge and end occurred during excavation and storage.

Several joints were visible on the timber, including two parallel slots approximately 50mm wide and 20mm deep, running perpendicular to the long axis on the timber’s outer edge. These are likely to have held the paddles of the waterwheel.

A circular hole about 15mm wide by 30mm deep, halfway between these slots, may have held a wheel spoke or other fitting, while a circular hole, 20mm wide and 60mm deep, at the undamaged end of the timber would have connected it to the next wheel section using a dowel or treenail. The curvature of the piece suggests that the waterwheel to which it relates is likely to have had an inner diameter of around 1.80m.

The section of waterwheel preserved in timber <9> was smaller than timber <18>, with a depth of 42mm. The section preserved was 553mm long, but wider than <18> at about 436mm.

The timber was again very poorly preserved, with no clear tool marks and substantial post-depositional damage to the surface and edges. A single horizontal paddle slot about 60mm wide by about 15mm deep was preserved. At one end of the timber were one whole and a further partial notch, or open mortise, which would have connected to the next wheel section.
Fig. 12. Extract of the circa 1665 map of the Mayfield Place estate, possibly by William Benge. It is arguable whether the extract shows towers associated with sluices on the pond bay (ESRO AMS 5831/3).
Fig. 13. Plan of Ifield Forge.
Fig. 14. Ifield Forge: photos and section.
The section preserved in timber <9> was too small to estimate wheel diameter. However, due to differences in width, depth and joinery, it seems likely that the two timbers represent the remains of two different waterwheels (Mooney 2014).

The presence of two waterwheels within the same pit can most likely be accounted for by the deliberate destruction of the site. The size of one of the wheels (<18> inner diameter of 1.80m) does indicate, however, that the pit would have been large enough to accommodate two wheels (Tim Smith pers. comm.).

At Ifield Forge, the first, and probably larger, wheel would have been used to power the hammer; the second could have operated the bellows of the finery or chafery hearth.

A chafery was intended for reheating a bloom of iron during its formation into a wrought iron bar.
Fig. 16. Diagram of the wheel pit construction.
Fig. 17. Photo of timber [188] <19>.

Fig. 18. Waterwheel fragments in situ.

Fig. 19. Timbers <9> and <18>: photographs.
on the nearby anvil. It is very probable that another wheel pit was located on the unexcavated eastern side of the forge building.

This would have been equipped with a waterwheel, which would have powered the bellows of the finery hearth. This is where cast iron sows were refined (decarburised), with the sows usually being fed through a hole in the wall of the forge. The smaller wheel fragment <9> could have been derived from this second wheel pit.

The earliest structural evidence related to the forge building comprised six horizontal timbers of a rough plank raft or anvil base. Also at this level, two further timbers perhaps represented remains of a construction phase for the forge building, a structure that proved to be remarkably well preserved.

Timber [187] comprised the oak sill beam for the timber frame superstructure of the southern end wall. This had mortise holes for upright studs (missing) and served to delineate an area of ground along the eastern side of the wheel pit which would have been occupied by the forge building.

Due to the limitations of the excavation area, which was designed to mitigate the impacts of the new auxiliary spillway, the entire footprint of this building could not be exposed.

A sample of the sill beam (<10>) was submitted for dendrochronological dating. This showed that the oak tree from which the timber was cut was slow grown and rather stressed in its later life. It was felled somewhere between AD 1549 and 1585 which correlates well with the first certain documentation of Ifield Forge (AD 1574; TNA SP 12/95 f.48 piece 20).

Within the building was an area of exposed natural clay. Cutting this underlying geology were a number of structural and industrial features. Of these, [184] was possibly related to a smithing hearth.

In addition to this hearth there would have been a finery. The finery was usually located on the opposite wall to the chafery and would have likely existed beyond the limit of excavation.

Filling the remainder of the forge area, and creating a platform on which the structure could be placed, was a levelling and bedding deposit [214]. This comprised dark brown/black fuel ash and clay silt. It contained no slag and was spread across most of the area occupied by the forge building.

This was to a thickness of approximately 0.70m. Cutting this layer, post-holes [173], [182], [252] and [438] were likely associated with the hammer frame. Post-holes [173], [182] and [438] were found with preserved posts in situ. It is likely that they were left upright after the abandonment of the forge. Post-holes, [226],[241],[243],[245],[254] and [256], may have related to a frame supporting the bellows for the chafery, internal supports or a division within the building itself.

Further features cutting [214] comprised a chafery hearth [236] (Fig. 20). This was surrounded by fire-reddened clay resulting from burning in situ and comprised a square hearth with an ashpit on the eastern side.

Both parts of the hearth were filled by the same two deposits. The lower of these was comprised of dark black/brown sandy silt with frequent inclusions of charcoal (largely beech and oak), ash, slag, spherical hammerscale, burnt clay fragments and pieces of iron.

This was overlain by concreted, orange-brown slag. To the south-east of [236] was a square cut, [224], for a huge, in-situ timber, [247]. This massive...
block of wood, measuring approximately 0.70m in length, 0.60mm in width and almost a metre in depth, was clearly formed of a squared oak trunk. Although the upper portion had become significantly weathered, the lower two thirds, which had been buried in the natural clay, remained well preserved (Fig. 21).

This timber has been confidently identified as the anvil base against which the water-powered helve hammer would have been set. A further square pit, [180], filled by dark black/brown silty sand with frequent inclusions of poorly preserved charcoal, ash, slag and fired clay may have related to a further anvil, possibly not contemporary.

Overlying [214] were the partial remains of a floor surface, [201]. Composed of solid, compacted slag and cinder of a brownish orange colour, this floor layer was punctuated by voids where the features described above, as well as raft [202], were situated. In the case of the latter, something, perhaps a timber or anvil base, may have been removed from the void in the past. This floor layer had been broken and redeposited in places; however, whether this was the result of human agency or other taphonomic processes is difficult to say. It was slightly truncated during excavation which probably accounts for the lack of hammerscale accumulation within its upper horizons.

Overlying [201] was a dark black and reddish-brown layer of silty clay, [172], containing frequent iron-working slag and charcoal, often vitrified, as well as occasional wood fragments, hammerscale, pieces of wrought iron bar and pieces of sandstone (see Fig. 14).

One of the iron bar fragments measured 0.82m+ long, with a cross-section measuring between 35 x 35mm and 40 x 35mm. This is thought to be part of a bar produced by the forge, ready for the blacksmith.

An iron wedge (<RF> 7 Fig. 22) was also recovered from the levelling deposit, which had been laid down after the abandonment of the building and likely dates to the middle or end of the 17th century. Also overlying [201] was a large block of sandstone, [223]. This rare survival of positive masonry remains may relate to a post-pad or part of the chafery hearth [236]. It is not thought to be part of a wall, as no mortar was found adhering to its surface.

This floor layer had been broken and redeposited in places; however, whether this was the result of human agency or other taphonomic processes is difficult to say. It was slightly truncated during excavation which probably accounts for the lack of hammerscale accumulation within its upper horizons.

LEND 3: THE CREATION OF IFILED MILL

Landscaping

Significant archaeological deposits were encountered associated with the conversion of the area from a hammer pond and forge to a water-powered corn mill. The process of creating this new installation first required the levelling and landscaping of the area.

As described earlier, levelling layer [172] (see above) likely dates to the middle or the end of the 17th century. As such, it marks the transition from period 2 to period 3. Also dating to the 17th century was context [175]. This thin layer of redeposited natural clay was clearly intended to cap the disuse and abandonment layers of the forge.

It was in turn overlain by a layer of made ground or buried former topsoil [176]. This incorporated
moderate inclusions of CBM, as well as a small sherd of pottery from the late 18th to early 19th century.

To the rear of the spillway wall (see below) was a thick layer of mixed orange and grey silty clay. Full of post-medieval construction materials, including both frogged and unfrogged bricks, this deposit was clearly intended to heighten the area of land to the rear of the spillway.

Although many of the finds retrieved from this deposit dated to this broad phase, it is likely that they derive from the demolition of the earlier 17th-century mill building and the construction of the present mill. The deposit also included finds of mid-19th- to early 20th-century glass, a mid-18th-to early 20th-century clay tobacco pipe and a sherd of 18th- to 19th-century glazed red earthenware.

**Spillway Wall**

To the south of the earlier forge area (discussed above), against the baulk and therefore not fully exposed, the remains of a brick wing wall were encountered. This comprised a linear construction cut, [166], which contained the remains of brickwork capped with Horsham stone slabs and partially rendered by a grey, mortar-like cement.

The construction cut had been backfilled with redeposited natural clay and was overlain by mid-blue/grey alluvial silt. This was in turn overlain by a compressed, but poorly humified, blackish brown 'peat'.

Derived from leaf litter and decaying pond plants, this deposit abutted, but was clearly later than, the construction cut for a spillway wall, [109]. The wall itself was constructed of roughly coursed Wealden sandstone, bonded by a sandy mortar (Fig. 23).

In places, brick repairs had been made to these walls and at some later date (possibly the 18th century) a brick wing wall (context [153]) and facings had been added (contexts [110] and [151]).

The facing was on the mill pond side of the spillway wall and comprised courses of headers with two courses of stretcher-bonded bricks where the wall stepped out into the mill pond. Although the majority of the pointing had dissolved, the remnants of the bonding material were seen to be comprised of a sandy lime mortar.

**The dam**

To the rear and east of the spillway, and clearly cut by features associated with the existing 19th-century mill, was an upper level of dam comprising a bank of blast furnace slag. The most likely explanation for this deposit, which overlay the period 2 sluice mechanism [414] and was stratigraphically later than deposits associated with an earlier (forge period) dam, is that the bank underwent some degree of refurbishment during the late 17th century when the use of the site was changed from derelict forge to corn mill.

**Other Features**

Context [104] comprised a rubbish pit or well (Fig. 23). This feature had sharply sloping, nearly vertical sides; however, the base was not seen as this was too deep to be safely reached by hand and was located outside the area of deeper machine impacts. Finds produced included bricks and tile, a complete cattle astragalus and a whetstone of Midlands origin.

Truncating landscaping deposits located on the mill pond edge was context [118]. This pit or layer of rubbish deposition may relate to nearby construction activity. It was filled with 19th-century debris that included finds of animal bone, pottery dated between around 1840 and 1900, iron nails, a tanged knife, a bolt or tool, clay tobacco pipe, roof tile and brick.

Adjacent to, and cutting the upper horizon of [118], was the construction cut for a brick pad [122]. The pad was one brick thick, of two stretcher courses and one course of bricks laid on edge.

The unfrogged bricks date to the 18th or 19th century and the pad was faced with a plank of wood on the eastern side. It probably relates to the earlier of two boathouses known in this location (see Fig. 5).

The brick wing wall described above [166] was very likely to have been related to a slipway associated with the second boathouse built between 1910 and 1912.

**DISCUSSION AND CONCLUSIONS**

Archaeological investigations at Ifield Pond, although limited due to their rapid rescue nature, were successful in revealing one of the earliest excavated finery forges in Britain. The work is also noteworthy for providing the first physical evidence of mechanisms to drain a Wealden hammer pond, as well as the scientific dating of Wealden bloomery furnaces.
Fig. 23. Period 3: plan and photos.

Spillway wall [151] looking north

Spillway wall [110] looking west

Spillway wall [151] looking north-east
These were shown to be of medieval origin, with a furnace of 12th–13th-century or earlier date, and a bloomery related to the 13th or 15th/16th century. The more sophisticated nature of the later furnace could indicate that it was associated with a late medieval ironworks and was a forerunner to the developed Tudor industry which followed.

The evidence adds to a growing data set providing potential for future study. This will help facilitate analysis of the apparent disparity between the degree of Wealden iron production during the Roman and the medieval periods, and whether this truly reflects the size of the relative industries.

Ifield Forge is only the fourth site of its type to be excavated in the Weald. It was found to be more complete than either Ardingly (Bedwin 1976) or Blackwater Green (Place and Bedwin 1992), although preservation and exposure of the forge building was more extensive at Chingley (Crossley 1975).

The wheel pit appears to relate to a single construction phase (1549–1585) contemporary with Chingley II (1574–1588; Crossley 1975, 18), but shows significant similarities to the Chingley period IIIb wheel pit of probable late 17th-century date (ibid., 25).

Dendrochronological dating of the oak sill beam for the forge building’s southern wall, together with documentary recording of the site in 1574 (TNA SP 12/95 f.48 piece 20), may suggest that Ifield Forge was constructed and in operation sometime between 1567 and the early 1570s, based on the presumption that the forge was not complete by 1567 when sows were being transported from Ifield Furnace to Burningfold (see above; TNA REQ2/115/2).

The possibility remains, however, that elements of the wheel pit and forge building could have been reused in later structures. The multiple locations for possible anvil sites and the similarities in construction with Chingley IIIb may be testament to this, as would the site’s survival into the early 17th-century before destruction by Waller’s forces (Lower 1849, 211).

Nevertheless, anvil blocks seem to have been frequently replaced within finery forges (Crossley 1975, 24) and an alternative explanation could be that the industrial complex was so well constructed that its use persisted for around 70 years.

The forge building was primarily of timber construction, although there was a small amount of evidence for stonework associated with the hearths. The building would have been leased by Roger Gratwick soon after its construction and may have been operated by foreign workers recorded in the Sussex Subsidy rolls of 1576 (Awty 1984, 63).

The obliteration of the ironworks is well attested in the documentary evidence, with destruction by parliamentarian forces in 1643 (Lower 1849, 211). This act is perhaps reflected in the abandonment layers found at the site, with industrial waste (slag, ash, cinder and charcoal) having been tipped into the wheel pit, perhaps from a heap, from the western side.

This act may have been accompanied by the deliberate breakage of the waterwheels and was post-dated by a period of abandonment and flooding prior to landscaping of the site.

The destruction appears to have been so comprehensive that use as an ironworks was never resumed. Industrial land use did reoccur, however, in the form of a corn mill. It is clear that the water management created by the pioneers of the Wealden iron industry shaped a landscape suited to the needs of later generations. The debt owed to the Tudor creators of the forge and hammer pond is reflected in accounts from the Napoleonic era of the mill’s production which dwarfed those of its nearby contemporaries.

The following supplementary reports can be found on the ADS website at http://archaeologydataservice.ac.uk/archives/view/sac/

Metallurgical Remains by Luke Barber
Ironwork by Elke Raemen
Nails by Elke Raemen
Charcoal Analysis by Mariangela Vitolo

ACKNOWLEDGEMENTS

The historic building work was undertaken by Michael Shapland. The watching brief was undertaken by Andy Shapland. The historic building work was undertaken by Michael Shapland. The watching brief was undertaken by Andy Shapland.
REFERENCES

The National Archives
TNA REQ/2/118/2. Court of Requests: Pleadings, Elizabeth I. 1558–1603.
TNA REQ/2/166/46. Court of Requests: Pleadings, Elizabeth I. 1558–1603.
TNA SP 12/95 f.48, piece 20. State Papers, 1574.

East Sussex Record Office
ESRO AMS 5831/3. Untitled map of the Mayfield Place estate [by William Benge].

West Sussex Record Office
WSRO Add Mss 33, 389. Deeds of land in Ifield, Crawley and Lower Beeding.
WSRO Ep. 1/1/5, f.60. Diocese of Chichester Episcopal Records, Bishop Sherburne.

Secondary sources
Barber, L. 2008. ‘The Metallurgical Remains’, in S. Stevens, Archaeological investigations at the ASDA site, Crawley, West Sussex, Sussex Archaeological Collections (hereafter SAC), 146, 131–133.

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