In early fall 1670, the London printer John Redmayne received an unwelcome visit from Stationers’ Company officials. Redmayne, who sometimes signed his works “J.R.,” was printing a clandestine edition of Thomas Hobbes’ *Leviathan*, the first edition of which had scandalized Europe in 1651.1 *Leviathan* was so controversial that no printer involved in any of its three 17th-century English editions would ever put his or her name on it.2 The Stationers’ Company officials who searched Redmayne’s shop in late September found just two sheets out of the roughly 100 needed for the full edition. The officials seized copies of those two sheets.3 A week later, they returned to find Redmayne in possession of 38 more sheets of *Leviathan*. The officials seized these while also seizing Redmayne’s presses.4 This much we know.

Yet this essay centers primarily on another J.R. responsible for the illicit printing of *Leviathan*—not John Redmayne but a second J.R., this one the London printer John Richardson (1632–1703). Richardson has been less studied than other printers of the period, and little about his life and printing career has appeared

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in scholarship. But Richardson, as we show in this article, was the one who got away with it.

What follows comes in four parts. In part I, we lay out the mystery of *Leviathan*’s so-called “Ornaments” edition and say why we attribute its printing to John Richardson. In part II, we give a short sketch of Richardson’s life and career. In part III, we present evidence that supports a new date for the edition, and in part IV, we conclude with some implications for book history and bibliography, on the one hand, and Hobbes scholarship on the other. Ultimately, we argue that what we call “computational bibliography”—the analysis of bibliographical evidence through computational methods such as machine learning and computer vision—offers new angles for seeing the materiality and craft of clandestine, anonymously-printed books like Hobbes’ *Leviathan*.

**TOWARD JOHN RICHARDSON**

One of the most enduring mysteries in Hobbes scholarship has concerned the origin and circumstances around the three “first” editions of *Leviathan*. The Ornaments edition (ESTC R13935, Wing H2248) is one of three bearing a 1651 date. The Ornaments differs from the other two editions—known respectively as the Head (ESTC R17253, Wing H2246) and the Bear (ESTC R13936, Wing H2247)—in several ways, most significantly in the ornamental shape on its title page built up from 25 printer’s fleurons (ornaments).

Like the Head and Bear editions, the Ornaments’ imprint says it was “printed for Andrew Crooke, at the Green Dragon in St. Paul’s Church-yard, 1651,” yet this declaration has long provoked skepticism. The late 17th-century antiquary Anthony Wood noted in *Athenae Oxonienses* that a *Leviathan* folio had been printed in London around 1680, though “reprinted there again with its old date.” And a catalog of “Books Printed for and sold by Richard Chiswel” appended to two books published in 1680 and 1682 included “Hobbes’s *Leviathan*” among folios for sale.

The evidence that a new *Leviathan* appeared around 1680 has led many to wonder about the Ornaments. Were Wood and Chiswell referring to the edition that began in Redmayne’s shop in 1670, or are these references evidence of another, different false imprint? Hugh MacDonald and Mary Hargreaves in their influential Hobbes bibliography give the Ornaments edition a 1680 date, and so too does Donald Wing in his *Short-title catalogue of books printed in England, Scotland, Ireland, Wales, and British America*. But Noel Malcolm has argued that the edition to which Wood and Chiswell referred was the culmination of efforts started by Redmayne a decade earlier that, with help in Amsterdam from the Dutch printer Christoffel Conradus, ultimately became the Bear edition.

It is only in work associated with two 21st-century editions of *Leviathan* that the Ornaments’ origin story has received detailed consideration and, in turn, lively debate. In their 2003 *Leviathan*, Rogers and Schuhmann suggested that Ornaments originated before Hobbes’ death in 1679 and even reflected Hobbes’ authorial revisions. In their account, the Ornaments was “printed by two different firms” without access to each other’s work. Rogers and Schuhmann speculated that Redmayne had completed the 1670 *Leviathan* and successfully hidden the
remaining sheets from the authorities, meaning that a second printer needed only to reprint the 40 seized sheets to finish the edition.

Behind the Rogers and Schuhmann account were important facts about the Ornaments’ collation. The Ornaments is a folio gathered in fours. The edition divides more or less into two parts at sig. Q and uses two different Roman body fonts (here called F1 and F2). F1 appears in gatherings B–P and Cc, while F2 appears in A, Q–Bb, and Ee–DDD, with the two sheets of gathering DD divided between the two fonts. With enough imagination, therefore, the Ornaments edition could reasonably appear to have been printed by two separate houses.

While Rogers and Schuhmann’s theory could explain why the Ornaments might have two different fonts, Malcolm, as part of his editorial work on the Oxford Clarendon edition of *Leviathan*, pointed out several deficiencies in the Rogers and Schumann account. It has been said that “[h]aving an article follow Noel Malcolm’s in Hobbes Studies is a lot like following Beyonce at the Gramm[ys],” and Malcolm is today’s foremost authority on *Leviathan’s* printing history. Malcolm argued that the Ornaments’ two parts were tied together by a consistent, albeit unmarked paper stock and consistent Greek letters and marginal italics. He found the Ornaments’ two distinctive fleurons in works printed by just two printers and ultimately ascribed Ornaments to the London printer John Darby, notorious in Restoration London for his clandestine printing of dissenting and Whig materials. While Malcolm had difficulty saying whether the edition was the work of the Restoration Darby or Darby’s son, also named John, he felt confident attributing it to their shop. Malcolm also gave it a later publication date than previous scholars had proposed. Noting the earliest dated inscription on a copy of Ornaments is 1702, he called that the *terminus ad quem* and suggested the period between 1695 and 1702 as the edition’s most likely date. Malcolm’s reasons for the attribution include similarities with Darby’s fonts, the Darbys’ proclivities for surreptitious printing, the availability of Ornaments’ low-quality paper stock, textual evidence in the edition itself, and an apparent price drop in copies of Head and Bear editions concurrent with the lapse of the Licensing Act in 1695.

Our research has confirmed aspects of these accounts, but it has also shown that the Ornaments’ printer was not John Redmayne, nor John Darby, but John Richardson. We make this attribution on several grounds but perhaps most decisively based on damaged type belonging to Richardson—evidence we assembled using a purpose-built, computational toolkit for typographical search and discovery.

Initially, we aimed to confirm Malcolm’s attribution to Darby by working with a digitized copy of the Ornaments edition held in Carnegie Mellon University’s Special Collections Library. Malcolm had identified only two printers in late seventeenth-century London who used Ornaments’ two fleurons, with Darby emerging as the likeliest printer—based, in part, on similarities between Darby’s fonts and the fonts in Ornaments. Nevertheless, something that had so far remained elusive was distinctive or damaged type pieces that might clinch the case for Darby. Some of our earlier work using the historical Optical Character Recognition (OCR) tool Ocular to inspect examples of a given letter, or “sort,” had given us hope that we could supplement Malcolm’s findings with typographical evidence. We were able to confirm Malcolm’s finding that Darby’s shop used Roman fonts similar to
the two fonts in the body text of Ornaments—the first in books like Toland’s *Life of Milton* and Harrington’s *Oceana* (F1) and the second in Calamy’s *Sermons* and Nye’s *Historical Account* (F2). Despite these similarities, however, it remained difficult to match any particular sort of type from Darby’s output to any of the roughly 200 distinctive sorts we identified in the Ornaments edition. The similarities between the type impressions in the Ornaments edition and the type impressions in Darby imprints seemed more consistent with type cases deriving from the same punches, as opposed to similar impressions from the same physical piece of type.

The difficulty of matching individual type pieces to Darby introduced a puzzle. Were Rogers and Schumann wrong about Redmayne but correct after all that Ornaments had been printed in two different shops? Or, perhaps Malcolm had inferred correctly that the edition was printed in one shop but had prematurely dismissed the second London printer, John Richardson, who—as Malcom himself noted—also used the fleurons that appear in the edition?

To address this puzzle, we selected about 130 books printed by Redmayne, Darby, and Richardson and compared their body type to the Ornaments’ type. We compiled these books, printed between 1660 and 1710, from digital archives including Early English Books Online (EEBO), the Internet Archive (archive.org), Google Books, HathiTrust, and the British Library’s digitized materials collections. While books from each archive required slightly different preprocessing, we used page-segmenting and OCR on all books to isolate their body text characters and group characters by letter (As, Bs, Cs, etc.). Over the course of the research, we also processed and examined the multi-line text type (larger letters) of about 1800 other publications. Aggregating all (or most) examples of a given letter did not eliminate the need for close human inspection, but it significantly reduced the time and labor of doing so. For each of the books, we selected distinctive damaged characters and compared the results to the Ornaments. We inspected hundreds of thousands of body Roman type impressions, reconstructed the compositors’ headlines, and examined the Ornaments’ paper and multi-line type (see below). This research led us to the conclusion that the edition was printed by John Richardson in late 1695 or early 1696.

PRINTED IN A SINGLE SHOP

To see that Richardson was the sole printer of the Ornaments, readers will find it helpful to understand a few key bibliographical aspects of the edition. Even though two different Roman fonts are interspersed in the main text, our analysis of the book’s skeletons, patterns of composition, and paper stocks allows us to say that the Ornaments was produced in a single shop, likely on two presses.

For those scholars inclined to think the Ornaments was printed in two shops, the most compelling bibliographical evidence has usually been the prominent difference in the edition’s two body fonts, which we refer to as F1 and F2. Yet there’s been an instructive confusion in where the edition divides by font. The *Carl H. Pforzheimer Library* catalog declares that “the copy was divided between two shops at . . . Sig. Cc,” while for Rogers and Schumann, the division between F1 and F2 begins at gathering Q. This confusion has only been possible because F1 and F2 share seven different boundaries—namely, the divisions between gatherings...
A and B, P and Q, Bb and Cc, Cc and Dd, Dd1 and Dd2, Dd3 and Dd4, and Dd and Ee. As Malcolm noted, advocates of the two-shop theory have tended to miss or elide the messiness of gatherings Cc, Dd, and Ee in which the fonts alternate in rapid succession. That the two composite sheets of gathering D are printed with different fonts poses a particular challenge to the two-shop theory because it suggests compositors of the two sheets had coordinated their casting-off.

It is nothing new to analyze headlines for bibliographical clues, but computer vision facilitates this research considerably. Isolating, compiling, and displaying headlines computationally (see Figure 1) helped us identify patterns that others missed. In particular, evidence from the headlines in Cc, Dd, and Ee shows that the sheets of the Ornaments edition were printed in the same shop, despite alternating fonts. Figure 2 shows verso headlines for gatherings Cc, Dd, and Ee. Within Cc (printed using F1), the verso headlines on the second, third, and fourth leaves contain a distinctively damaged majuscule F in “OF.” The same F reappears on the verso of Dd’s second leaf, even though Dd is a typographic hybrid, in the sense that the conjugate first and fourth leaves are printed with F2, while the conjugate second and third leaves are printed with F1. Even if we posited that F1 belonged to one print shop and F2 to another, how could the damaged F travel from one shop to the other—in the space of two gatherings? Finally, we see in Ee, which is printed entirely in F2, the verso headlines on the first and second leaves (pages 212 and 214) retain the distinctive italic characters of F1, while the words “Chap” and “Page” have been reset with type from F2. Most notably, we see that the damaged F from F1 in Cc and Dd remains in the headlines of Ee, and throughout the Christian Commonwealth section—in particular, it appears anywhere that headline ξ is used on the recto page (see Figures 1 and 2).

Paying closer attention to the paper of the Ornaments edition points to a single print shop just as consistently as do the dual-font gatherings and the headlines. The paper in Ornaments derives from three identifiable stocks, all of foolscap size (approx. 41 (W) x 33 (H) cm), of which one is used only for the frontispiece (see Appendix C). Most significant for our purposes is the pattern in which the other two stocks are distributed throughout the CMU copy of Ornaments. In broad terms, there are two fonts and two main paper stocks, yet they do not align neatly with one another. The likeliest explanation for the pattern seen in Figure 4 is that all the fonts and paper were housed under a single roof. The first stock of paper, more common in the first and final third of the book, but appearing throughout, is unwatermarked, is at times diaphanously thin, and contains small quantities of fibrous matter in the form of brown flecks. The second stock, found mainly in the central gatherings of the book, is marginally darker, thicker, and with denser quantities of fibrous matter mixed in, likely rope or woolen filaments that Malcolm evocatively likens to “chopped hair.”

The second paper stock is watermarked with a monogram “IB” so difficult to perceive that it has eluded previous scholars, even Malcolm. This watermark appears in two forms, or “twins,” across the work’s pages. As Allan Stevenson first observed, watermarks occur in pairs in most stocks of early modern paper, a result of the fact that paper moulds were manufactured in matching sets that would be worked in tandem by a vatman and a coucher.
coucher turned the other out onto a growing stack of drying paper interleaved with felt. Employing a pair of moulds in this way, both bearing similar (though not identical) watermarks, allowed the coucher and vatman to work quickly without interruption. Assuming that Richardson and his publishers followed established practice, the publishers would have bought and supplied Richardson with the watermarked and unwatermarked stocks of paper.

The twinned IB watermarks in the second paper stock are readily distinguished. One watermark measures 34mm in width, 15mm in height, and 36mm...
diagonally, with the diagonal measurement taken from the upper left serif of the “I” to the outermost point of the lower right bowl of the “B.” The corresponding measurements of the second watermark are 33mm, 17mm, and 35mm. The two letters in this second, narrower twin-mark are also more closely aligned, with the foot of the “I” falling on the same baseline as the foot of the “B.” In contrast, its twin is misaligned. The foot of the “B” falls 3mm below the foot of the “I.”

The distribution of the two paper stocks through the Ornaments’ gatherings suggests successive bouts of collaborative work, divided between two presses, each provisioned with its stock and stack of paper. Additionally, the fact that the composite sheets and the editions’ two fonts are both staggered indicates that the Ornaments was likely printed in a single shop. The relationships between fonts and papers are illustrated in Figures 3 and 4, showing that neither paper stock neatly coincides with either font. Instead, both stocks of paper appear in gatherings printed using both of the edition’s English-size Roman fonts, F1 and F2, at some point in the edition. Had the edition been shared between two shops, we would expect a consistent, uninterrupted pattern of coincidence with, say, one shop printing with F1 and the unwatermarked stock of paper and the second shop printing with F2 and the “IB”-watermarked stock of paper. Here, however, we find no such consistency.

There is not, however, no pattern of coincidence between font and paper stock. The unwatermarked stock appears through the first third of the work and is printed exclusively with F1 in “Of Man” and much of “Of Commonwealth,” for instance. And while the “IB”-watermarked paper first appears in “Of Commonwealth” printed with F1 (sheet P2.3), it is printed with F2 exclusively through most of “Christian Commonwealth” (Ee through Rr, with the sole interruption of sheet Pp2.3, which is unwatermarked). The underlying cause of this staggered pattern—the correlation, that is, that appears to link the unwatermarked stock of paper with F1 and the ‘IB’-watermarked stock of paper with F2—remains obscure. Most likely, it was the result of shared work divided between two teams working at presses with two stacks of paper, one of each stock. Yet tracing this pattern through the edition’s gatherings hints at where multiple compositors shared the work. Some gatherings of the edition were apparently printed rapidly, presumably with all hands on deck, while some were printed more slowly on a single press from a single stock of paper. While the cycle of apparently slow-then-fast production recurs throughout the Ornaments edition, generally speaking, the unwatermarked paper most frequently accompanies F1, while the “IB”-watermarked paper most frequently accompanies F2.
Figure 3. Arrays of matching, distinctive type in Ornaments linking all combinations of main fonts, paper stocks, and their indentation styles. The characters in the top table are the output of an algorithm designed to return the minimum number of matches necessary to connect all possible combinations. We are aware of 191 sets of internally matching body characters in Ornaments. The bottom table shows two multi-line T’s that appear with both fonts.

Figure 4. The main fonts, paper stocks, and indentation styles of Ornaments by gathering and leaf (omits frontmatter). Shading indicates subtypes for each variable. The interlaced fonts and paper stocks refute the theory that the Ornaments issued from two different shops.
Nevertheless, the interlaced fonts and paper stocks refute the theory that the Ornaments issued from two different shops. In the following section, we present our analysis of body text matches, titling letters, and fleurons that take us from our first conclusion that the Ornaments derived from a single shop to the conclusion that the shop in question was John Richardson’s.

**BODY TEXT MATCHES**

“Type,” Harry Carter once remarked, “is something you can pick up and hold in your hand.” Type is also something printers and compositors can drop and damage. As those in the print trade had long known, and Charlton Hinman was among the first scholars to demonstrate, individual pieces of metallic type in the letterpress era were often damaged over the course of their use. Damaging their type was of course undesirable for printers eager to keep their materials pristine, but the consequences continue to yield clues for historians and bibliographers. As historian David Como recently demonstrated, damaged type used “to isolate the producers of surreptitious publications” often “elucidates the networks and immediate contexts in which works were produced, opening novel avenues for interpretation.” Even if printers wanted to sift out all their damaged sorts, they had little hope of doing so amidst vast quantities of type. The ability to match damaged body type pieces at this scale thus yields some of the most reliable—if also difficult to attain—evidence for identifying clandestine printers.

In attributing the Ornaments to John Richardson, we observe distinctive damaged sorts from both F1 and F2 appearing consistently in Richardson’s books. Our toolkit for computational bibliography helped us gather instances of damaged type and track their recurrence across the Ornaments. Roughly 200 distinctive type impressions, gathered with automated page-segmentation, line-segmentation, character-segmentation, and OCR, formed a kind of typographical fingerprint we used to attribute and date the Ornaments’ printing. In the process, we analyzed majuscule body size characters from 130 books attributed to, or attributable to, Redmayne, Darby, and Richardson. Richardson’s responsibility for the Ornaments soon became clear. Distinctive damages in Richardson’s books match those in both F1 and F2 in the Ornaments (see Figure 5). These matches prevail both singly and in aggregate. For example, impressions found nowhere else amidst hundreds of thousands of type images include an F with a split stem and an A with a severely bent right diagonal. The F and A, and dozens of other distinctively damaged characters, appear in books with “J.R.” and “J. Richardson” imprints. The many body type matches to Richardson’s acknowledged publications make it very difficult to imagine scenarios in which John Richardson’s shop did not print the Ornaments. In the following sections, we discuss corroborating evidence from titling letters and fleurons—compiled with a mix of computer vision and shoe-leather sleuthing.

**MULTI-LINE LETTER MATCHES**

Seventeenth-century printers routinely marked the beginning of sections or chapters of a work with multi-line or titling letters. John Richardson was no exception. The name “multi-line” refers to these letters’ height, often expressed in the number of lines of the body text they accompany. A four-line “T” occupies
the same vertical space as four lines of its paired body text. For our purposes, the unique affordance of these large letters is the ease with which they can be identified through time and across multiple works from the same print shop. Multi-line letters accrue damages (pitted stems, bent serifs, and slackening shoulders) at a faster clip than smaller sorts belonging to body-sized fonts. These damages are partly due to equipment scarcity: since printers used multi-line letters less frequently in imposed formes, typecases held fewer of them.\(^\text{39}\) Their scant multi-line letters saw comparatively frequent use and were thus at increased risk of damage from wear and tear. Moreover, the weight and size of multi-line letters rendered them more susceptible to bending, cracking, and chipping when dropped or locked into the chase compared with body-sized letters. Because of this, damaged multi-line letters are prominent, reliable clues in attributing a work to a particular print shop and are also easier to trace and track than body-size letters.

Using computer vision to partially-automate the extraction of tens of thousands of multi-line letters from about 1800 books, we determined that the Ornaments contains at least eight of these letters that also appear in works attributable to Richardson between 1682–1700. We show a chronology of these letters in Figure 6, where each column corresponds to a book printed by Richardson. The last column shows these eight distinctive multi-line letters as they appear in the Ornaments. Each letter bears damages or other idiosyncrasies that allowed us to identify them in the eleven books noted in Figure 6.\(^\text{40}\) These are all strong matches, especially the distinctively pitted four-line N and V and the two four-line Cs.

In addition to confirming our attribution to Richardson—he demonstrably had access to these eight distinctive letters that appear in the Ornaments throughout the period in question—analysis of these idiosyncratic multi-line letters also assisted in dating the edition’s printing. Since we see the damages worsening over nearly two decades, we can place instances of each letter on a timeline. What remained was to locate the point on this timeline at which the state of the damaged letter most

![Figure 5. Damaged body type from Ornaments compared to damaged body type from publications attributed to John Richardson, 1683–1700.](image)
closely resembled its match in the Ornaments edition. Dating, of course, warrants its own discussion (see Section III). First, though, we examine and attribute the distinctive ornaments, or fleurons, that give the edition its name.

**FLEURONS**

Still more evidence for Richardson can be found in the Ornaments’ fleurons. The title page uses 25 large fleurons (here called “fleuron 1”) arranged to form an inverted isosceles trapezoid with a long base of seven fleurons, a short base of three fleurons, and non-parallel sides of five fleurons each. Fleuron 1 is also printed 19 times at the head of *Leviathan*’s “Introduction” at sig. A3r, surrounded by a second, smaller fleuron (here called “fleuron 2”) printed 126 times.

Richardson most certainly held both kinds of fleurons. Although we cannot say that Richardson printed every imprint with the initials “J.R.”—John Redmayne was also active between 1675–1683—Richardson likely printed fleuron 1 in no fewer than 19 books between 1675–1696, fleuron 2 in at least ten books between 1680–1693, and both fleuron 1 and fleuron 2 together in the same book five times between 1680–1690. One of Malcolm’s contributions to debates about the edition was to suggest the only candidate besides Richardson who printed with both fleurons during the period was the Restoration printer, John Darby. As far as we have been able to determine, however, Darby only printed fleuron 1 in a named imprint once (Anon., *Answer to a Letter from a Gentleman in the Country relating to the Present Ministry* (1699)). And fleuron 2 only appears in a single Darby imprint—roughly 30 years before Malcolm’s hypothesized date for the Ornaments’ production (Schroder, *Compleat Chymical Dispensatory* (1669)). Darby apparently never printed fleuron 1 and fleuron 2 together. There are then at least 34 books from Richardson with fleuron 1, fleuron 2, or both, to Darby’s two.

Figure 6. Damaged multi-line titling type from Ornaments compared to publications attributed to John Richardson, 1682–1700.
Moreover, only Richardson appears to have had either fleuron in such quantities necessary to have printed the Ornaments edition.\textsuperscript{48} Whereas Darby, in the rare cases that he did use these fleurons, never used more than five of the first fleuron on a single page, and never more than 39 of the second, Richardson used as many as 28 of fleuron 1 and 142 of fleuron 2.\textsuperscript{49} These numbers are closer to the Ornaments’ 25 (fleuron 1) and 126 (fleuron 2), respectively. Richardson also had a habit of printing large blocks of fleurons interspersed with Roman and italic colons like those in the block at the head of the Introduction in Leviathan.\textsuperscript{50}

Finally, damaged fleurons from the title page of Ornaments can be matched to damaged fleurons in at least four Richardson works: Fettiplace, Sinner’s Tears (1680); Monteage, Debtor (1690); Langston, Lusus (1688); and Patrick, The Heart’s Ease (1695).\textsuperscript{51} Like the matching letters, damaged fleurons in Richardson imprints and in the Ornaments reveal Richardson as the edition’s printer.

**WHO WAS JOHN RICHARDSON?**

Given how strongly the various pieces of evidence converge for Richardson’s role in printing the Ornaments, something should be said about the printer himself. Records are scant, but Richardson was the son of a brick mason and bound to the Stationers’ Company in 1646 at age 14. He was freed in 1653 after apprenticing with John Legate the younger, during the period that Legate served as printer to the University of Cambridge and Warden to the Stationers’ Company.\textsuperscript{52} Roger L’Estrange’s 1668 survey lists a John Richardson Senior and Junior both working for James Flesher (sometimes Fletcher; son of Miles Fletcher), although it also lists a “Jon Richardson” as an apprentice to Evan Tyler.\textsuperscript{53} Since there are other examples in L’Estrange’s survey of the same individual working in multiple shops, these could be separate people or the same.\textsuperscript{54} In any case, one of these Richardsons is cloathed on October 6, 1673 and, at this point, has set out on his own.

Our John Richardson first entered a book into the Register in 1675 and ran his printing business near the Mitre Tavern, Fenchurch Street for 28 years. By the time Richardson set up shop near the Mitre around 1673/4, the tavern had long been a royalist hub.\textsuperscript{55} Before Richardson died in 1703, more than 230 titles would appear under the names John, Johannis, or Johannem Richardson, J. Richardson, and the initials J.R (Figure 7).\textsuperscript{56} He took on 14 apprentices over the course of his career, with Henry Tyler and Thomas Winstanley serving in the period when Richardson’s shop most likely produced Ornaments.\textsuperscript{57}

Judging from his output, Richardson printed much of the standard fare of late seventeenth-century print culture, but he seems to have had a somewhat specialized corner that included sermons, Welsh-language materials, almanacks, and mathematics textbooks. Richardson further enjoyed a close relationship with the “moderate non-conformist publisher” Brabazon Aylmer and printed many of the sermons establishing Aylmer’s reputation as a religious publisher “of a recognizable type, encompassing the middle ground between moderate Anglicanism and moderate nonconformity.”\textsuperscript{58} In the course of research for this article, we have identified seventeen previously unattributed sermons, treatises, and trial transcripts that Richardson printed for Aylmer between 1690 and 1700.\textsuperscript{59} All might reasonably be located within the broad context of tolerationist Williamite churchman-
ship. Especially notable among these previously unidentified Richardson imprints are 1696 imprints critical of the Jacobite conspirators Sir William Parkyns and Sir John Friend, whose ultimate absolution by Church of England bishops inflamed tensions between sacerdocalist churchmen and the Williamite state.60 We have also encountered clues to suggest there may be many more unacknowledged Richardson imprints from this period.

Richardson’s 1685 edition of Cocker’s *Arithmetick*—listed by Plomer as his first notable achievement—and its companion volume, *Decimal Arithmetick*, gave Richardson a foothold in printing what would become the standard textbooks for grammar school mathematics in England for the next 150 years.61 Richardson’s son William (active 1684–1706?) would print a 1701 edition of Cocker’s *Arithmetick* as well.62 Between 1681–1696, John Richardson printed no fewer than 14 books on arithmetic, algebra, accounting, logic, and trigonometry in increasingly complex feats of page geometry.63 Such books suggest both that Richardson’s shop had considerable skill in the complex problems of laying out and composing mathematical materials and also that Richardson possessed in enough quantity the specialized set of rules and brackets needed for tables, equations, and the like. *Leviathan*’s fold-out “Table of Sciences” meant to accompany Ch. 9 of Hobbes’ treatise may well have demanded such expertise and equipment.

If Richardson’s many math books demonstrate his specialized skills and materials, his relationship with the Stationers’ Company is more varied. In 1678, at the urging of the Bishop of London, a John Richardson was indicted by the Stationers’ court, along with several others for being “irregularly Sett up.”64 A decade later, however, in 1687, Richardson was an assistant for the court. While he was removed in 1688 for reasons unknown, he was re-elected in 1689. It is around this

![Figure 7. Annual titles printed by John Richardson and “J.R.,” 1673–1700, according to Early English Books Online, plus new attributions listed in footnote 59.](image)
time that Richardson is referred to in the Stationers’ Court Books as “Capt[ain]” Richardson, having been excused from Company duties in July 1685 “by reason of commands to attend his Majesty’s service.” In late 1692, Richardson was among a group of London printers sent to Oxford “as soon as possible” when the Stationers’ Company had assumed control of Oxford printing. Subsequently, he served as the Company’s under warden from 1696–1697, took his last apprentice in 1699, and ceased his fairly regular attendance at Stationers’ Company meetings September 1700–June 7, 1701. Richardson returns only once that June, then is absent again June 19, 1701–March 1, 1703, when he returns one last time.

Even if biographical details beyond this rough outline are difficult to come by, it is nevertheless true that Richardson throughout his career sat near the center of a network of publishers and booksellers with financial stakes in *Leviathan*. On this topic, Malcolm’s scholarship on the surviving records of specialist auctions between booksellers remains authoritative. As Malcolm discovered, Andrew Crooke’s widow sold *Leviathan*’s copyright in Feb. 1675 to John Wright (d. 1685), who subsequently divided ownership of the book into shares that were sold to booksellers Richard Chiswell and Robert Scott (sometimes Scot). By the mid-1690s, *Leviathan*’s copyright was almost certainly shared among Chiswell, Robert Wotton, George Conyers (sometimes Coniers), and Thomas Basset. Richardson had connections to all of them. He regularly printed books for Chiswell, Wotton, Conyers, and Basset, and *Leviathan*’s earlier copyright holders such as Wright and Scott. Between 1679 and 1699, Richardson printed no fewer than five books for Basset, seven books for Chiswell, thirteen books for Conyers, and fifteen books for Wotton. In short, Richardson’s imprints demonstrate close associations and rapport with the men who, at varying times, owned the corner pieces of our puzzle.

**DATING THE EDITION**

With this necessarily limited sketch of Richardson’s biography in place, we can now turn to the tricky question of dating his *Leviathan* edition. Evidence of progressive damage to titling letters and previously unnoticed booksellers’ advertisements for *Leviathan* indicate that Richardson likely printed the Ornaments in late 1695 or early 1696.

Typographical evidence from titling letters gives us a new upper bound for dating the edition. The aforementioned four-line V in the Ornaments appears in three Richardson books printed between 1683 and 1700 (see Figure 6). It is possible to see different states of the same V over 17 years. Figure 8 shows it in two successive states. The V on the left, illustrating the first state, is taken from a high-resolution scan of the CMU copy of the Ornaments edition. The V on the right, illustrating the second state, is taken from a high-resolution scan of the CMU copy of the third volume of Isaac Barrow’s *Works*, printed by Richardson for Brabazon Aylmer in 1700 (ESTC R226555). The large nick below the left outer serif and the angular fracture about one-third of the way up its right arm indicate they’re the same piece of type. The two V’s are far from identical, however. The upper serifs of the right V from Barrow’s *Works*, for instance, are smaller, with the right serif (bent but still present in Ornaments) now considerably hooked and thinned.

We can infer which of the two V’s in Figure 8 was printed first based on the progression of damages between these two impressions. When enlarged, the serifs
cap of the V’s right arm shows a pattern of breakage and warping (see Figure 8). In the Ornaments, this cap includes a rounded inner serif with a hairline fracture that terminates in a thin juncture. This threadbare juncture appears to barely hold the round serif to the end of the V’s arm. In Works, however, this rounded piece has broken away from the serifed cap along the line of the fracture, leaving a beaked remnant, bent inward. The V in Works, then, is necessarily printed after the Ornaments since it exhibits damage absent in the Ornaments. These two V’s consequently provide a terminus ante quem for the Ornaments of 1700—that is, the date Richardson printed Barrow’s Works. This terminus is notably two years earlier than Noel Malcolm’s latest possible date for the Ornaments edition, which he established based on an early owner’s inscription dated 1702.70 Although it would be misleading, a second piece of evidence might be seen to point to 1700 as the edition’s terminus. That’s because 1700 was also the year when a previously unnoticed list of “Books Printed for Matthew Wooton,” appended to the 1700 edition a John Rushworth’s The Tryal of Thomas Earl of Strafford, included “Hobb’s Leviathan, Folio.”71

Even so, several puzzles remain when trying to date the edition. Given the severity of the added damage to the V in Barrow’s Works, it appears unlikely that Richardson printed Ornaments immediately before that volume. Type damage normally develops and worsens over several years, if not decades. Here, non-typographical evidence, specifically another previously unnoticed advertisement, hints at an even earlier date. Published by Chiswell in 1696, Thomas Langford’s popular Plain and Full Instructions to Raise All Sorts of Fruit-Trees contains an advertisement for “Hobbs’s Leviathan” under the heading “FOLIO.”72 While Plain and Full Instructions is dated 1696 on its title page, the same advertisement includes an announcement for a third volume of John Tillotson’s Sermons and Discourses that, it promises, “will be Printed in Easter Term, 1696.”73 In other words, Plain and Full Instructions was made available for sale by Chiswell early (likely January–March) in 1696, suggesting that a new edition of Leviathan was available in London’s bookstalls concurrently with Plain and Full Instructions, or even earlier.

![Figure 8. On left, Richardson’s battered four-line V as it appears in the Ornaments edition of Leviathan (p. 32). On right, the same 4-line V as it appears in Isaac Barrow’s Works (ESTC R226555), printed by Richardson in 1700. Detail of the serifed caps on the right arm of the two Vs. On left, the serif on the Ornaments four-line V retains a piece of metal that is later separated and absent in the serif in Barrow’s Works, on right.](image-url)
Together with the typographic evidence, then, late 1695 or very early 1696 seems to be the likeliest date one could purchase a copy of the Ornaments. Chiswell had, of course, advertised *Leviathan* before, but *Leviathan* apparently goes unmentioned in his book lists between 1683 and 1696. It isn’t even included in an otherwise similar Chiswell book list from the previous year. The 1695/6 reappearance of *Leviathan* in Chiswell’s catalogs of available books strongly suggests a new edition.

A late 1695 or early 1696 dating is consistent with several other pieces of evidence. 1695 also coincides with the expiration of the Licensing Act. True, the false imprint indicates Richardson and his publishers’ caution. Still, any potential for adverse consequences for illicitly printing *Leviathan* reduced considerably with the Act’s lapse on May 3, 1695. As Malcolm noted, the prices for *Leviathan* show an interesting pattern in this period. *Leviathan’s* second-hand price (at auction) increased by nearly 25% between May and December 1695. Malcolm found it unlikely that a surreptitious new edition could depress *Leviathan*’s price so quickly and indicated that the price drop likely reflected a general downward valuation of previously unlicensed and non-licensable books. However, the newly discovered advertisements make it less “surprising [that] the appearance of the Ornaments edition had become generally known in a matter of just a few months.”

Widespread notice was precisely the aim of Chiswell’s advert. The price drop between May and December 1695 could indicate precisely when the Ornaments appeared on the market. Separately, we also have indications that one of *Leviathan*’s copyright holders, Thomas Basset, was under particular financial strain in this period. In 1696, Basset would liquidate his copyrights in several holdings, including *Leviathan*, so a 1695 attempt to squeeze whatever profits might be gained from *Leviathan*’s copyright is consistent with the facts. Finally, if William Bulman is correct that another of Hobbes’ publishers, William Crooke, died in 1694, this would have made it less awkward to print an edition purporting to have been published by Crooke’s kinsman, possibly father, Andrew Crooke.

Perhaps most suggestive for dating the Ornaments *Leviathan* is a distinctive four-line T that appears in both the Ornaments and the third volume of an edition of Tillotson’s *Works*, printed posthumously in 1695/6 (ESTC R4684). Beginning at sig. 4Q, this volume includes Tillotson’s treatise *Rule of Faith*, which is preceded by a separate title page dated 1695 in the imprint. The third volume of *Works* appears listed in the Term Catalogues for Hilary Term (January to March) 1695/96. For dating the Ornaments, it is suggestive that this T appears only in the *Rule of Faith* section, which again bears a 1695 date.

Under magnification (Figure 9), the slightly curled left terminal or toe of the T in the Ornaments is longer than in *Rule of Faith* and made up of two segments, separated by visible breaks. The same T in *Rule of Faith* lacks this outermost segment. At some point between printing *Leviathan* and *Rule of Faith*, then, the outermost segment evidently broke away, thereby rendering the corresponding toe measurably shorter. Furthermore, the upper-right arm of the T in the Tillotson volume displays a hooked bend, absent in the Ornaments’ T. This subtle progression of damage to the T suggests, at a minimum, that at least part of the Ornaments preceded the *Rule of Faith*, which, as we have seen, was printed and made available for sale before Hilary Term (January–March), 1695/96. There is little doubt, then, that the Ornaments *Leviathan* issued from Richardson’s print shop in 1695.
Even more tantalizing is the career of what may be a single English italic F that appears 21 times in Richardson’s *Leviathan* and, possibly, in two other books attributable to Richardson from 1695 and 1696, respectively.

Figure 10 shows the F in question. It remains challenging to say with certainty, but if these images correspond to the same F in two states, it would both provide another firm 1696 upper bound for dating the Ornaments, and suggest that Richardson printed Ornaments and *The Rule of Faith* concurrently. Initially characterized by a damaged lower stem, its first state has a forked, left leg that appears to be pushed back or repaired during the printing of the edition to merge, in its second state, with its bent right leg. In and of themselves, the two states of our italic F would yield interesting information about the chronology of printing the Ornaments’ gatherings, indicating that signature C, for example, was printed after signatures E, L, and P. But an intriguingly similar F can also be found in its second state in the “J.R.” imprint *A general challenge to all the Antipœdobaptists*, printed in 1696.81 The Ornaments, therefore, would necessarily precede *A general challenge*.

Finally, if the F in Richardson’s *The Rule of Faith* seen in Figure 10 is the same F, it appears in its pre-*Leviathan* damaged state. What the F in its earlier
state could indicate is that Richardson printed parts of The Rule of Faith and the Ornaments concurrently, since the Ornaments contains an earlier version of the four-line T shown in Figure 9, but the later version of the italic F in some sections. The case for the concurrent printing of Rule of Faith is hardly conclusive, but is supported by the observation that, in all the books Richardson printed using F1, no book we examined shares more distinctive English type with the Ornaments than Richardson’s Rule of Faith. The majority of the evidence, then, points to the conclusion that the Ornaments was printed late in 1695.

CONCLUSIONS

We have argued first that the Ornaments edition of Hobbes’ Leviathan is not the work of John Darby or John Redmayne but John Richardson and secondly, that Richardson printed it in late 1695. These findings have implications both for Hobbes scholarship, on the one hand, and for digital humanities and book history, on the other. We now discuss each of these in turn.

Hobbes and the Ornaments

What does it mean that John Richardson printed the Ornaments in 1695? Given how little we know for sure about Richardson’s political and religious beliefs, it is difficult to do more than speculate, but the evidence invites two main lines of inquiry. One line of inquiry has to do with Richardson’s connection with mathematics textbooks and almanacks. Could it be that Richardson’s Leviathan was perceived especially as work from the “mathematician of Malmesbury”? This would be less the Hobbes of self-preservation, obedience to the sovereign, or antclericalism than the Hobbes associated with optics, geometry, and the debates with John Wallis and Seth Ward. Even if Hobbes’ “mathematical work was sometimes incompetent,” Hobbes participated in some of the liveliest seventeenth-century mathematical debates. Leviathan was a work that could be seen as extending Hobbes’ mathematics into politics. Richardson, moreover, had the right materials and expertise.

A second line of inquiry, however, is suggested by Richardson’s association with the works and sermons of low church Williamite divines. Very little in the classic accounts of Hobbes would predict associations with the many clerical figures who populate Richardson’s acknowledged and unacknowledged works. Preachers like William Bates, William Payne, and Isaac Barrow are usually understood as swimming in different cultural eddies than Hobbes and his Leviathan. Nor would there seem to be much intellectual coherence in a printing oeuvre that includes both Hobbes and the Archbishop of Canterbury, John Tillotson—Hobbes being the arch-critic of priestcraft, Tillotson (at least as Hobbes might have seen it) the arch-priest. Richardson’s role in printing Hobbes alongside tolerationist sermons, however, introduces the question of print culture’s contributions to what Jeffrey Collins terms “prerogative toleration.” Tillotson’s sermon on Joshua 24:15, Protestant Religion Vindicated, for instance, explicitly vaunted the “Power of the Civil Magistrate in matters of Religion.” Was the grand compromise of Whiggish religion—characterized by nonjuror detractors as a “supine episcopate colluding with an aggrandizing monarch”—catalyzed at the material level by the
At least in the eyes of Tillotson’s most prominent enemy, the nonjuring bishop Charles Leslie, Tillotson’s sermons were “all the genuine effects of Hobbism.” Hobbism, Leslie wrote, “loosens the notions of religion, takes from it all that is spiritual, ridicules whatever is called supernatural: it reduces God to matter, and religion to nature . . . [Tillotson’s] politics are Leviathan, and his religion is Latitudinarian, which is none.” Further research could determine whether Richardson’s Ornaments edition represented precisely what Leslie feared—and whether it should be seen as part of a larger Williamite project of counter-Jacobite propaganda.

**Computational Bibliography and the History of the Book**

Beyond the specialized world of the history of political thought, our work also has methodological implications at the intersection of bibliographical analysis and digital humanities. As Ian Bogost recently observed, digital humanities is productively understood as a kind of “tool use”—as a disciplinary and “spiritual successor to humanities computing, a practice intended to advance the existing practice of humanism through computational methods.” The choice to name these methods “computational” is, Bogost further remarks, intentional and tactical: computational (as opposed to “digital”) methods “emphasize information processing and analysis over the creation and dissemination of information as-

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Figure 11. John Richardson’s titling letters as they appear in *Leviathan*’s Kingdom of Darkness and *A Sermon Preached in St. Maries given by James Brome* (1694).
sets.” And this is precisely what our methods offer: the computational gathering, identification, and categorization of seventeenth-century type sorts that adopts the traditional tools of bibliographical analysis but extends those tools to work at different scales. One thing that makes computational bibliography valuable is the way it translates unmanageably large volumes of typographic evidence into a humanly-comprehensible scale.

What we can find using these methods is more than merely bibliographical, though. “Bibliographic metadata,” Michael Gavin argues, “fold documents into history, connecting them to libraries and authors, to booksellers, printers, and patrons.” Much as attributing the Ornaments to John Richardson folds both *Leviathan* and Richardson into the distinct print culture of the mid-1690s, the marriage of traditional analytic bibliography and computational analysis offers new angles for understanding print in the long 18th century—and other periods as well. As Andrew Bricker has rightly put it, eighteenth-century title pages are a “bibliographical mess . . . teeming with misleading and fake attributions.” In some cases, false imprints have led to cascading errors. In other cases, mistaken attributions have impeded further inferences or proper contextualization. The ability to compare body type, titling letters, and fleurons at scale—and to combine new insights with detailed analysis of paper stocks and type damages—offers a powerful method for re-integrating anonymous and clandestine materials into their original contexts.

Our approach also represents an alternative to those who implicitly value digitized page images primarily as containers for words and sentences. Gavin’s otherwise excellent “How to Think About EEBO” locates the origins of Early English Books Online (EEBO) in 20th-century cataloging and microfilming projects. Gavin tracks EEBO’s progress through the invention of SGML and TEI to its implied *telos*, the marked-up transcriptions of its 125,000-book corpus. Joseph Dane, similarly, assesses EEBO and ECCO for their “searchability,” by which he means text search. Digitized page images, in such accounts, are implicitly waypoints on the journey toward the natural language processing made possible by computationally-tractable transcriptions.

Our research, in contrast, has sought possible alternatives to text-centric approaches to digital surrogates, illustrating the potential of paying more attention to digital images as images. Aided by computational methods, the visual aspects of letterpress printing and typography represent a vast but still under-theorized storehouse of evidence. Digital images held in EEBO, ECCO, Google Books, and the Internet Archive are not mere husks or packaging. As we have sought to demonstrate, digitized books can be studied—as images or even as surrogate pages and sheets—to supply new understandings of early modern books and to revise received histories of ideas.

The richer array of tools and evidence made possible by computational bibliography has payoffs for depth and breadth. Editorial work, for example, has long included deep attention to the material production of individual editions, but, as Sarah Werner has observed, “most facsimiles of books prioritize easy reading of the text, rather than . . . aspects of a book’s material presence.”
tional bibliography offers researchers with access to physical and high-resolution facsimiles opportunities to reason much more comprehensively about time, labor, and materials in letterpress print shops.

It seems reasonable to conclude, then, with the paradox that digital surrogates prompt a more complex engagement with material processes and originals. In our case, applying computer vision techniques to the high-resolution Ornaments facsimile forced us to confront many new questions about the material artifact. For example, asking whether the Ornaments derived from a single shop prompted us to look more carefully at the edition’s paper, its collation, its headlines, and the skeletons used to frame its formes. Recurrences of damaged type, gathered through historical OCR, made it possible to ask and answer whether individual sorts tied together all the occurring combinations of paper, marginal indentations, and fonts (Figure 3). From this and similar data, we were able to see not only that the Ornaments was printed in a single shop but also to find new anomalies. It remains to be seen, for example, why paper type B is used for the first and last gatherings (A and P) of the F1 section even though the rest of the section is on paper type A. Similar departures in paper types mysteriously occur at gatherings X, Ce/Dd, and Pp. Full explanations of such anomalies, it seems, would only be possible through detailed modeling of Richardson’s multiple presses, his compositors, and their paper. This kind of reconstructive modeling would be aided by examining many more copies than the one considered here. So, too, with the indentation patterns in marginal notes. The tools and ways of looking that are facilitated by computational bibliography helped us to see that indentation occurs in long blocks with deviations at gatherings X and Xx and also revealed particular oddities occurring on the sheets that make up pages 140/145, 157/160, and 358/363, respectively. In these pairs, one of the formes’ two pages has indented margins, the other does not. The point is not that such surprises have a direct bearing on who printed the Ornaments but that data generated through computational bibliography should, and does, lead back to the materiality of the book.

While our analysis called upon a wide corpus of digitized early modern books, our investigation also brought us back to the material artifact itself—to its inking, watermarks, chain lines, collation, binding structures, and traces of ownership scrubbed from its pages. Digital approaches to bibliographical analysis are necessarily both/and in the methods and tools they summon. Backlights and rulers still obtain, as do pixels and algorithms. For the time being, at least, what digital corpora and machine learning afford students of book history and bibliography is a methodological overhaul that differs more in degree than kind.

But there is also a horizon worth contemplating. What appears at one scale to be a difference in degree appears at another scale to be a difference in kind. We have been repeatedly struck in the course of this work how computational bibliography can shuffle us back and forth between the smallest visual details, such as the serif on a V, and large-scale social phenomena such as 1690s print culture. D.F. McKenzie long ago warned of analytical bibliography “disappearing into its own minutiae.” Computational bibliography offers a vehicle not only into but also out of those depths. There is at once a granularity of evidence that feels fresh
and exciting and also a surprising experience of sublation—a reassuring sense that granularity need not just tell us more and more about less and less, but that minute details can indeed put us in closer contact with larger, untold histories of people, networks, structures, and institutions. These larger social phenomena are hardly reducible to the mundane materials of bibliography—matrices, type, paper, and skeletons—and yet they’re composed of them nonetheless. In the end, computer-aided bibliographical analysis helps us see the making of books as a process of emergence, a process whereby the unsung people and materials of the book trade come together to compose what, at the largest scale, we call history and culture. By changing what we can observe, computational bibliography can also change what we know.
APPENDIX A: LOCATIONS OF THE LETTERS IN FIGURES 3 AND 5

Letters are identified by letter/page/line. Line numbers are exclusive of blank lines. Appendix B is the Key to Short Titles.

Figure 3:

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| D/250/35                  | D/225/27                  |

| **T/11/24**               | T/67/33                   |
| A/166/41                  | A/31/2                    |
| P/140/15                  | P/206/6                   |
| D/250/35                  | D/225/27                  |

| **Damaged from Barrow2**  | A/93/18                   |
| G/33/4                    |                             |

APPENDIX B: KEY TO SHORT TITLES

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APPENDIX B: KEY TO SHORT TITLES


Cynghorion = Cynghorion Tad Iw Fab: Yn Rhoddi Iddo Gyfarwyddiad Pa Fodd i Ymddwyn Ei Hunan Yn y Byd Presennol. Llundain: [John]. Richardson yn y Flwydden, 1683.


Fuller2 = ———. *Some Rules How to Use the World so as Not to Abuse Either That, or Our Selves*. London: John Richardson for Thomas Parkhurst, 1688.


APPENDIX C

A. Paper

The twin watermarks in the two stocks of paper in the Ornaments edition can also be distinguished by their position relative to adjacent chainlines (translucent impressions in the paper left by wires in the mesh grid of the paper mould). This position is conventionally represented in a measured diagram, as follows:
The vertical lines in the diagram represent chainlines, while the numbers between these lines indicate the distance, in millimeters, between adjacent pairs—what David Vander Meulen terms “chain space measurements.” Meanwhile, the bracketed measurements indicate the position of the watermark relative to the two nearest chainlines. We took these measurements by laying a ruler across the centerline of the watermark. In plain language, the chain space diagram for Twin A indicates a space of 23.5 mm between the first and second chainlines to the left of the watermark, 22 mm between the second chainline and the leftmost edge of the watermark, 4 mm between the leftmost edge of the watermark and the following chainline, etc.

The third and final paper stock that appears in the Ornaments edition is that used for the engraved frontispiece. This paper is of superior quality compared to the two stocks used for the text. It has (at least in one-half of surviving copies) a small armorial watermark depicting the Arms of Amsterdam—a crowned escutcheon containing a banner of three stacked St Andrew’s Crosses, supported by two lions rampant. The watermark measures 80 mm in width and 90 mm in height and crosses three adjacent chainspaces. This unique discrepancy in the stock used to print the frontispiece fits with the standard practice of the period: the typographic content of a work was almost always printed separately from its accompanying engraved illustrations. Printed on a rolling press from an intaglio plate, the frontispiece required distinct technologies and skills separate from those available to the typesetters and pressmen employed in Richardson’s shop.

**B. Watermarks**

An effort was made to identify and attribute both watermarks that appear in the Ornaments *Leviathan* using standard reference works (Heawood, Churchill, and the Gravell Watermark Database). Unfortunately, we found no unassailable match, neither for the twinned ‘IB’ marks or the Arms of Amsterdam mark, unique to the paper used for the frontispiece. In consequence, neither watermark was of use in establishing the Ornaments’ date of printing. Despite the inconclusive nature of watermark identification and attribution, however, it is safe to infer that the paper used for the frontispiece—with its Arms of Amsterdam mark—was imported from Holland. The “‘I B’” watermark remains unidentified and unattributed, though a Dutch origin is also likely.
C. Type

The body fonts that appear in the Ornaments edition of Leviathan, F1 and F2, are both of “English” body size. They measure as follows, according to a formula described in Philip Gaskell A New Introduction to Bibliography, p. 14, i.e. [face height x 20] x [x-height]: [capital height]:

F1 — Body 94.5. Face 94 x 2.45: 3.35
F2 — Body 94. Face 90 x 2.25: 3.45

D. Headlines

From the header information, we can see that Of Man, Of Commonwealth, and Of Darkness are printed mostly with one headline pair at a time, suggesting that primarily one press is operating. In contrast, throughout most of Christian Commonwealth, we see two pairs of headlines alternating by 1–2 gathering chunks, suggesting that the Christian Commonwealth section is printed on two presses simultaneously. At gathering E, we see that one of the headlines is reset, indicating a potential pause in printing. A similar reset of one of the headlines occurs at gathering Y.

We observe the bent F in gathering B, then it later appears in the headline of Cc, both font 1 sections. When the headline is not fully reset to print Ee, the damaged font 1 F is passed into font 2 and appears throughout most of Christian Commonwealth. This tells us that the first portion of Of Man is printed before Christian Commonwealth. It is difficult to establish the printing order of Of Darkness, partly because that section follows the Bear edition in using fewer 4 line supra-text characters. The shape of the C and the P internal body text matches within the book suggest that Of Darkness may have been printed before Christian Commonwealth, but it is hard to be certain because of inking effects at this scale. This would be consistent with the change of paper at Ss and throughout Of Darkness. We note that the indentation begins again at Ss and continues into Of Darkness, with Of Darkness being divided into two halves by indentation, suggesting two different compositing efforts.

NOTES

1. For assistance inspecting and photographing materials, we gratefully acknowledge invaluable help from Aaron Pratt at UT-Austin’s Harry Ransom Center, Mark Russell at the Pittsburgh Theological Seminary, Will Shire at Magdalen College, Oxford, Sarah Arkle at Queen’s College, Oxford, Ben Albritton at Stanford University Libraries, John Pollack at University of Pennsylvania Libraries, and rare books staff at the Bodleian Library. Noel Malcolm kindly waived his anonymity as a reader for the journal and offered characteristically generous and learned comments. Brent Sirota, Daniel Shore, and an anonymous reviewer offered excellent and timely suggestions. For software development and longstanding fruitful collaboration, we thank Taylor Berg-Kirkpatrick, Shruti Rijhwani, Kartik Goyal, and Nikolai Vogler. Research for this article was undertaken with support from National Science Foundation Award 1816311, Print and Probability: A Statistical Approach to Analysis of Clandestine Publication, and XSEDE award HUM150002.


6. The first modern scholar to observe that there were at least two different editions dated 1651 was William Whewell, *Lectures on the History of Moral Philosophy in England* (England: J. W. Parker & Son, 1842), 21.

7. The same ornament, or fleuron, reappears at the head of the Introduction of the edition (sig. A3r), where it is combined with a second, smaller ornament to form a block. The term derives from the Old French: *floron* (“flower”).


12. Both F1 and F2 are of “English” body size, i.e. 20 lines measure approximately 94 mm in height. See Appendix C.


Malcolm, “Editorial Introduction,” 230. Malcolm records seven copies of the Ornaments with dated inscriptions from 1702–1733. For the argument that Malcolm’s examples are too few to count as evidence for dating the edition see Leviathan, ed. Schuhmann and Rogers, 1.166–76.


21. Richardson and Darby shared imprints: Keach, Tropologia (1681; printed again in 1682 by “J.R” and “J.D.”); Goodwin, Works Vol. 3 (1692); and Jeake, Logisikelogia, or Arithmetick (1696).

22. See further Warren et al., “Damaged Type and Areopagitica’s Clandestine Printers.”

23. For the useful reminder that “printed by” should usually be interpreted as “printed with the type of”, see Riccardo Olocco, “A New Method of Analyzing Printed Type: The Case of 15th–Century Venetian Romans” (Ph.D., University of Reading, 2019), 147, http://centaur.reading.ac.uk/88833/.


26. Schuhmann and Rogers, Leviathan, 1.164.


32. Gaskell, A New Introduction to Bibliography, 42.


39. Michael F. Suarez and H. R. Woudhuysen, eds., *The Oxford Companion to the Book* (Oxford: Oxford Univ. Press, 2010), 1160. The skeleton forme is that from which the type for the text blocks has been removed. The skeleton contains all of the items that show up on the printed page besides the text blocks (headlines, ornamental stock and supra text type, rules (printed lines), etc.).

40. See Appendix B for the key to the short titles in Figure 6.


42. Scholars since at least Macdonald and Hargreaves have referred to the array as a triangle but the shape is an isosceles trapezoid. See Macdonald and Hargreaves, *Thomas Hobbes*, 44; Malcolm, “Editorial Introduction,” 269.

43. Parts 3 and 4 of *Leviathan* (sigs. Cc1r and Vv1r) both begin with a floral factotum that we have not found elsewhere.

44. We give abbreviated references to Richardson imprints. Fleuron 1: Clarke, *Marrow* (1675); Brierly, *Soul-Convincing* (1678); Fettiplace, *Sinner's Tears* (1680); Tomylins, *Faith* (1680); Owen, *Discourse* (1681); Stockton, *Consolation* (1681); Gowan, *Ars Scienti* (1682); Catholic Church, *Actes* (1682); [R.B.,] Crouch, *Admirable* (1684); de Grey, *Compleat Horse-man* (1684); Norden, *Poor Man's Rest* (1684); Drexelius, *Considerations* (1684); Ovid, *Metamorphoses* (1684); Hughes, *Cynghorian* (1684); Patrick, *Heart's Ease* (1685); Jordaine; *Duodecimal* (1687); Langston, *Lusus* (1688); Monteage, *Debtor* (1690); Walwyn, *Physick* (1696). Although Malcolm assumes the “J.R.” who printed Hayter, *Meaning* (1675) is Richardson, we believe John Redmayne is likelier given that a 1676 edition was printed by Redmayne. See n. 47 below.

45. Fleuron 2: Roberts, *Clavis* (1675); Fettiplace, *Sinner's Tears* (1680); Stockton, *Consolation* (1681); De Laune, *Tropologia* (1681); Basse, *Discourse* (1682); [R.B.,] Crouch, *Admirable* (1684); de Grey, *Compleat Horse-man* (1684); Anon., *Advice* (1688); Monteage, *Debtor* (1682; 1690) Anon., *Psalter* (1693).


47. Fleuron 1 is also found in books printed by John Redmayne including Hayter, *Revelation* (1676), Davies, *Lucius* (1676), and Anon., *Temperate Man* (1677).

49. Fleuron 1 appears 28 times on one page in Jordaine, *Duodecimal Arithmetick* (1687). Fleuron 2 appears 167 times on one page in De Laune, *Tropologia* (1682).

50. Richardson regularly inserts Roman and italic colons, or other grammatical marks (including question marks), into single lines or large blocks of mixed fleurons. See Roberts, *Clavis* (1675); de Grey, *Compleat Horse-man* (1684); Drexelius, *Considerations* (1684); Fettiplace, *Sinners Tears* (1680); Basse, *Discourse* (1682); Langston, *Lusus* (1688).

51. Locations of matching, damaged fleurons in the Ornaments and in Richardson imprints: Fettiplace, *Sinner's Tears* (1680), between #5 (counting left-to-right, top-to-bottom) and the penultimate fleuron at sig. A2 (counting left-to-right); Montage, *Debtor* (1690), between #19 and #3 at sig. C1r; Langston, *Lusus* (1688), between #14 and #5 at sig. A3r; Patrick, *Heart's Ease* (1695), between #19 and #10 at sig. A3r.


62. For William Richardson, see Plomer, Dictionary, 1668–1725, 254; Shell and Emblow, Index to the Court Books of the Stationers’ Company, 1679–1717, 339. We have found no evidence indicating familial ties with Samuel Richardson of Pamela fame or with the Joseph Richardson associated with the Salem Social Library.

63. Chronologically: Gowan, Ars scientiæ sive logica (1681); Monteagle, Debtor (1682); Vernon, Compleat Comptinghouse, (1683); Montage, Instructions for Rent Gatherers (1683); Cocker, Decimal Arithmetick (1685); Pickering, The Marrow of Mathematics (1686); Baker, Arithmetick (1687); Jordanæ, Duodecimal Arithmetick (1687); York, A Practical Treatise on Arithmetick (1687); Hodgeson, Practical Gauging (1689); Forster, Arithmetical Trigonometry (1690); Ayres, Arithmetick (1693); and Jeake, Logisikelogia, or Arithmetick (1696). The printer Joseph Moxon argued that the press and the printer partook in a tradition of the mathematical sciences going back, through Tycho Brahe, to Vitruvius. See Adrian Johns, The Nature of the Book: Print and Knowledge in the Making (Chicago: Univ. of Chicago Press, 1998), ch. 2.

64. McKenzie and Bell, Chronology and Calendar of Documents, 2.164.


68. Printed for R. Chiswell, M. Wotton, and G. Conyers (or Coniers): Discourse (1682); A Great Assize (1691; printed again 1693, 1697); Heart’s Ease (1695; reprinted again for R. Chiswell 1699). Printed for M. Wotton and G. Conyers (or Coniers): David’s Blessed Men (1682); David’s Repentance (1691; printed again 1694); Markham’s Masterpiece (1694; printed again 1695). Printed for R. Chiswell: Ecclesiastici (1683), Heart’s Ease (1699). Printed for M. Wotton: Baker’s Arithmetick (1687); Practical Treatise on Arithmetic (1687); Mt. Pugab (1689); Devout Christian (1691; printed again 1696). Printed for G. Conyers (or Coniers): The English Teacher (1688); The Merry Tales (1690). Printed for T. Basset: Nolens Volens (1682); Christ’s Passion (1687; printed again 1697 with canceled title page). Printed for R. Scot, T. Basset, J. Wright, and R. Chiswell: A Dictionary, English-Latin, Latin-English (1679); Poor Man’s Rest (1684).


72. T. Langford, Plain and Full Instructions: To Raise All Sorts of Fruit-Trees That Prosper in England (London: for Richard Chiswell, 1696), sig. Q6r; For a later, also previously unnoticed appearance of this advertisement, see T. Langford, Plain and Full Instructions to Raise All Sorts of Fruit-Trees That Prosper in England (London: for R. Chiswell, and sold by D. Midwinter and T. Leigh, 1699), sig. Q6r.

73. Langford, Plain and Full Instructions (1696), sig. Q8v.

74. On Chiswell’s advertisements for the Bear edition, see above, esp. n. 9; Malcolm, “Editorial Introduction,” 255.


90 Leslie, *The Charge of Socinianism against Dr. Tillotson Considered*, 13.


98. Thanks to Ben Albritton for comparing this watermark to the one that appears in Stanford University Libraries’ copy of the Ornaments frontispiece (JC153 .H65 1651 f).