NEW DIRECTIONS IN DIGITAL TEXTUAL STUDIES

BOOK HISTORY, SCHOLARLY EDITING AND CURATION IN CONVERSATION

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CHAPTER 3
THE PRINTING SURFACE IN THE AGE OF DIGITAL REPRODUCTION

Giles Bergel

Printing surfaces, one of the lowest-profile elements of the printing process, nonetheless fascinate. Embodying the basic mechanics of printing – perhaps more intelligibly than the press itself – they also epitomize its rarely realized ideal, namely the production of uniform copies from one composition. While printing surfaces are intrinsically generative (emphasized by the synonymous term 'printing matrix'), wood blocks and metal plates are products of art and industry in their own right. They are attracting increasing attention thanks to work such as a collection of essays edited by Elizabeth Savage and Femke Speelman (Savage and Speelman, forthcoming); a number of digitization and cataloguing projects such as the collections of the Plantin-Moretus Museum in Antwerp; and a mailing list dedicated to early printing surfaces ('Blocks, Plates and Stones') that, at the time of writing, has just under 200 subscribers.[1] Surviving surfaces are boundary objects straddling the worlds of museums and print collections: since there are few common cataloguing standards across galleries, libraries and museums, they are rarely surfaced or described in full.

For bibliographers, printing surfaces are temporal and geographical milestones: a unique block, once separated from its inked impression on paper, may indicate the origins of an anonymously or pseudonymously printed book or may trace relationships between printers across time and space. This article outlines some computational aids to this task, focusing on relief woodblocks for letterpress printing. It places both the mechanical reproduction *of* blocks – and mechanical reproduction *from* blocks – that is to say, printing – in relation to digital imaging and discusses the impact of the latter on bibliographical methods. Last, it attempts to draw some parallels between block printing and digital facsimiles and other data. It will begin by exploring the history of one set of blocks along with their owners, copies and impressions, as a case study.

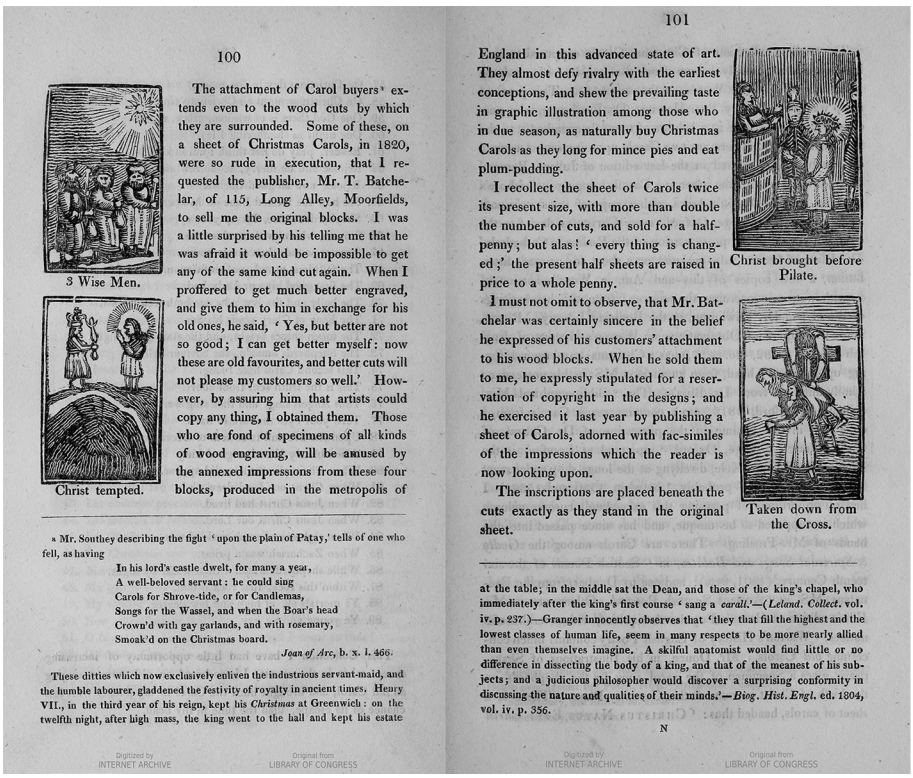
In 1820, the antiquary and radical satirist William Hone visited the London premises of Thomas Batchelar, printer of songbooks, single-sheet broadside ballads, carols and occasional longer works. Hone recalled the visit in his 1823 history of English popular religious drama *Ancient Mysteries Described* as follows:

[1]The Plantin-Moretus Museum in Antwerp has imaged their collection of woodblocks – see https://museumplantinmoretus.be/en/page/impressive-woodblocks. The Blocks, Plates and Stones mailing list is available at https://www.jiscmail.ac.uk/cgi-bin/wa-jisc.exe?A0=BLOCKSPLATESSTONES

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> The attachment of Carol buyers extends even to the wood cuts by which they are surrounded. Some of these, on a sheet of Christmas Carols, in 1820, were so rude in execution, that I requested the publisher, Mr. T. Batchelar, of 115, Long Alley, Moorfields, to sell me the original blocks. I was a little surprised by his telling me that he was afraid it would be impossible to get any of the same kind cut again. When I proffered to get much better engraved, and give them to him in exchange for his old ones, he said, 'Yes, but better are not so good; I can get better myself: now these are old favourites, and better cuts will not please my customers so well.' However, by assuring him that artists could copy any thing, I obtained them. (Hone, *Ancient Mysteries Described* 1823, 99)

Surrounding Hone's text, his printer John McCreery has arranged four woodcut illustrations of episodes in the life of Christ (see Figure 3.1).



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3 Wise Men.

Christ tempted.

The attachment of Carol buyers[a] extends even to the wood cuts by which they are surrounded. Some of these, on a sheet of Christmas Carols, in 1820, were so rude in execution, that I requested the publisher, Mr. T. Batchelar, of 115, Long Alley, Moorfields, to sell me the original blocks. I was a little surprised by his telling me that he was afraid it would be impossible to get any of the same kind cut again. When I proffered to get much better engraved, and give them to him in exchange for his old ones, he said, 'Yes, but better are not so good; I can get better myself: now these are old favourites, and better cuts will not please my customers so well.' However, by assuring him that artists could copy any thing, I obtained them. Those who are fond of specimens of all kinds of wood engraving, will be amused by the annexed impressions from these four blocks, produced in the metropolis of

[a] Mr. Southey describing the fight 'upon the plain of Patay,' tells of one who fell, as having

In his lord's castle dwelt, for many a year,
A well-beloved servant: he could sing
Carols for Shrove-tide, or for Candlemas,
Songs for the Wassel, and when the Boar's head
Crown'd with gay garlands, and with rosemary,
Smoak'd on the Christmas board.

Joan of Arc, b. x. l. 466.

These ditties which now exclusively enliven the industrious servant-maid, and the humble labourer, gladdened the festivity of royalty in ancient times. Henry VII., in the third year of his reign, kept his *Christmas* at Greenwich: on the twelfth night, after high mass, the king went to the hall and kept his estate

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England in this advanced state of art. They almost defy rivalry with the earliest conceptions, and shew the prevailing taste in graphic illustration among those who in due season, as naturally buy Christmas Carols as they long for mince pies and eat plum-pudding.

I recollect the sheet of Carols twice its present size, with more than double the number of cuts, and sold for a half-penny; but alas! 'every thing is changed;' the present half sheets are raised in price to a whole penny.

I must not omit to observe, that Mr. Batchelar was certainly sincere in the belief he expressed of his customers' attachment to his wood blocks. When he sold them to me, he expressly stipulated for a reservation of copyright in the designs; and he exercised it last year by publishing a sheet of Carols, adorned with fac-similes of the impressions which the reader is now looking upon.

The inscriptions are placed beneath the cuts exactly as they stand in the original sheet.

Christ brought before Pilate.

Taken down from the Cross.

at the table; in the middle sat the Dean, and those of the king's chapel, who immediately after the king's first course 'sang a *carall*.'—(*Leland. Collect.* vol. iv. p. 237.)—Granger innocently observes that 'they that fill the highest and the lowest classes of human life, seem in many respects to be more nearly allied than even themselves imagine. A skilful anatomist would find little or no difference in dissecting the body of a king, and that of the meanest of his subjects; and a judicious philosopher would discover a surprising conformity in discussing the nature and qualities of their minds.'—*Biog. Hist. Engl.* ed. 1804, vol. iv. p. 356.

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Figure 3.1 William Hone, *Ancient Mysteries Described, Especially the English Miracle Plays, Founded on Apocryphal New Testament Story, Extant Among the Unpublished Manuscripts in the British Museum: Including Notices of Ecclesiastical Shows, the Festivals of Fools and Asses, the English Boy Bishop, the Descent Into Hell, the Lord Mayor's Show, the Guildhall Giants, Christmas Carols, &c* (printed for William Hone, 1823), 100–1.

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Hone's book is a detailed history of and commentary on the transmission of the apocryphal Christian gospels within broadside carols, mystery plays and other forms of folklore and popular culture. As J. W. Robinson puts it, Hone is seeking to uncover the 'unofficial piety and poetry of the people' (Robinson 1978, 36). His appraisal of Batchelar's carols places them within a history of the persistence of a canon of popular knowledge and taste over time:

> Those who are fond of specimens of all kinds of wood engraving, will be amused by the annexed impressions from these four blocks, produced in the metropolis of England in this advanced state of art. They almost defy rivalry with the earliest conceptions, and shew the prevailing taste in graphic illustration among those who in due season, as naturally buy Christmas Carols as they long for mince pies and eat plum-pudding. (Hone, *Ancient Mysteries*, 100)

Hone's attestation that Batchelar's reluctance to sell the blocks is solid evidence for the popularity of their designs has been accepted in most repetitions of the story, despite the fact that his book contains what may be the only surviving impressions from the blocks (Marsh 2016, 79; Shepard 1969, 63). Broadside songs of any kind rarely survive: carols, used to decorate walls at Christmas, were particularly ephemeral. Hone anticipates the suspicion that Batchelar's testimony was a negotiation tactic, assuring the reader of Batchelar's interest in printing from the copied blocks exchanged for his originals:

> I must not omit to observe, that Mr. Batchelar was certainly sincere in the belief he expressed in the belief he expressed of his customers' attachment to his wood blocks. When he sold them to me, he expressly stipulated for a reservation of copyright in the designs; and he exercised it last year by publishing a sheet of Carols, adorned with fac-similes of the impressions which the reader is now looking upon. (Hone, *Ancient Mysteries*, 101)

Hone is certainly at pains to document both the mutual benefits resulting from the transaction and his own familiarity with the mechanics of printing, which, as at various times a bookseller, librarian and publisher as well as an author, he understood very well. As the author of illustrated political satires and histories, he worked closely with engravers such as George Cruikshank, a collaboration illustrated in one of their joint productions (see Figure 3.2).

As Mercedes Cerón notes of Hone and his associates, 'Regency radicalism benefited from recent developments in printing techniques while adopting the visual language associated with popular ephemera' (Cerón 2015, 225). Images constitute both evidence and argument in many of Hone's publications, whether acting as visual quotations in his antiquarian treatises or polemical counterparts to the incisive prose of his satires and

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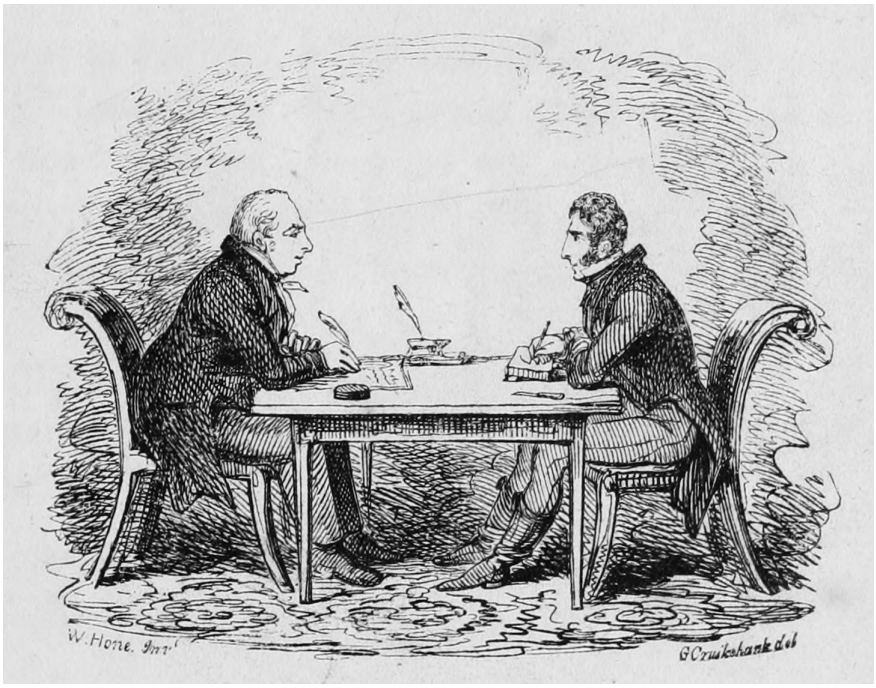


Figure 3.2 Hone and Cruikshank depicted in their 1823 joint publication *Facetiae and Miscellanies With one hundred and twenty engravings, drawn by George Cruikshank*, London: Hunt & Clarke, printed by: J. M'Creery et al. 1827.

political writings.[2] Relief woodcuts, unlike engravings printed from metal plates, can be printed simultaneously on the same press as type, allowing Hone in the *Ancient Mysteries* both to show the blocks and to tell their story at the same time. He exploits the obvious fact that printing surfaces can be printed as well as documented, departing from the usual antiquarian practice of rendering historical specimens in three-dimensional relief, as seen, for example, in an article on woodcut in Diderot and d'Alembert's *Encyclopédie*. (See Figure 3.3)

Hone, then, does not so much put the blocks on show as show them in action. Their messages are reproduced, while the accompanying text places them within a

[2]See Jason McElligott, 'William Hone (1780–1842), Print-Culture, and the Nature of Radicalism,' in *Varieties of Seventeenth-and Early Eighteenth-Century English Radicalism in Context* (Abingdon: Routledge, 2016), 241–60; Rick Bowers, 'Parody, Performance and Self-Defence: William Hone's Ancient Mysteries Described (1823),' *English Studies* 94, no. 1 (2013): 42–56; Kyle Grimes, 'Before the Trials: William Hone and the Rise of the Watchdog Press,' *English Studies* 103, no. 8 (2022): 1178–90, and Grimes, *Hone Bio-Text: A Biography, Bibliography and e-text archive*. https://honearchive.org (accessed 21/2/2025).

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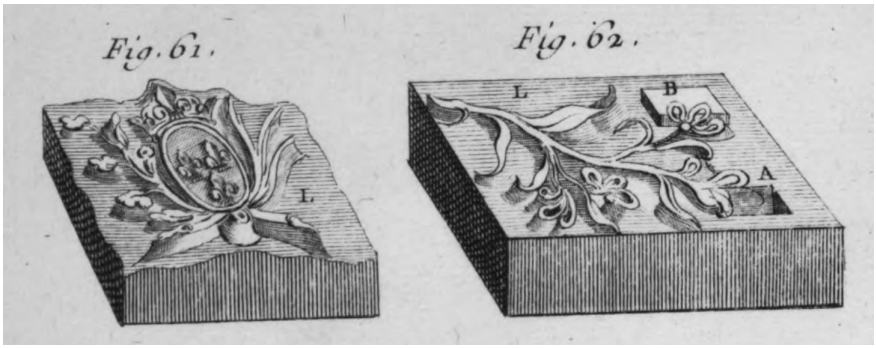


Figure 3.3 'Gravure en Bois, Principes,' *Encyclopédie ou Dictionnaire raisonné des sciences, des arts et des métiers*, vol. 5 (plates). Paris, 1765, http://hdl.handle.net/2027/spo.did2222.0001.502.

history of printing and of books from 'the earliest conceptions' up until the present. We are told that work in this style had become practically extinct: this perhaps undercuts their imputed popularity, but it is true that printing was becoming in some respects a more 'advanced art'. Hone may have had in mind technical developments such as the improved iron press, followed by the steam press, or the burgeoning of a substantial industry of typefounders, designers, etchers and engravers that, in contrast to a century earlier, were increasingly able to supply British printers with paper, type and other materials. Books themselves were still costly, but the cheap formats, such as broadside ballads that had entertained, informed and educated readers and audiences for centuries, were joined by songsters, prints, newspapers and other literatures able to reach increasingly large publics (Raven 2007 and 2009; Finkelstein and Nash 2024). From this perspective, the traditional illustrated broadside was both in a relative decline compared to newer formats such as songsters, and paradoxically of a forerunner of a new age of mass media and literacy that had long been anticipated, but had not quite come to pass.

This quantitative shift in media production was also qualitative: appreciators could perceive certain differences between the woodcuts on Batchelar's sheets and reused in Hone's volume and the emerging technique now usually called wood-engraving. While designs in woodcut are carved *along* the grain, often with a knife, wood-engraving is carved *across* the end-grain of a harder wood, often with tools resembling those of a copper engraver. As shown by Hone's own broad usage of the term 'wood-engraving', a categorical distinction had yet to emerge, but a contrast was often visually apparent, most famously in the work of Thomas Bewick's studio. Wood-engraving, as developed by Bewick, makes extensive use of white (uninked) lines carved into the sub-surface of the block: woodcut composition relies more on relief features that pick up ink and print in black. Combined with the new iron presses working on the improved papers of this period and the centralization and division of labour that the metropolis engendered, fine wood-engraved lines could be skilfully orchestrated to generate a richly textured image

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at relatively low cost, enabling the copious illustration of popular books and periodicals such as the *Penny Magazine* and Hone's own *Everyday Book* and other publications.[3]

While aficionados of what we now called wood-engraving will sometimes refer to the lower status of woodcuts by way of Horace Walpole's sneer against 'slovenly stamps',[4] blocks for broadside ballads and chapbooks were in fact designed with some precision and care. What Batchelar told Hone about readers' familiarity with their appearance seems to bear this out, while a letter from the Glasgow chapbook printer James Lumsden to Thomas Bewick himself points to a fundamental design requirement for such blocks:

> I received yesterday a Number of cuts and coincide in opinion with you that they are done in a very superior manner, but the style is very farr from what I expressed to you, and I am extremely sorry to say are useless for the purpose intended . . . Twould be useless to Putt them to press in the Present state as the coarseness of the paper we use would quite destroy them. (quoted in Tattersfield 2011, 149)

The coarseness of Lumsden's paper is a feature, not a defect, which allows his chapbooks to reach the widest possible market, priced at a penny or less. Bewick's exquisite blocks will not serve that market, while blocks with a simpler and bolder design will print strong and clear. Suitable for chapbook printers' narrow profit margins (and the narrow margins of chapbooks themselves), such blocks were both economical and durable: an original Newcastle printing block reproduced below was cut with a sparse pattern of hatched white lines and gouged white space, employing a robust and ingenious composition of rigid supporting elements (such as curtains and furniture) around the central design (see Figure 3.4).

This block was made to last, exhibiting a robustness that defines the aesthetic of many cheap print woodcuts, while its use of white lines also points to the emerging visual vocabulary of wood-engraving and its relationship with cheap print.

As printing was undergoing various interdependent technical, industrial and aesthetic revolutions, its history became of increasing interest to scholars and collectors, as traced by the emerging hobby and science of bibliography (Klancher 2009). The 1812 Roxburghe sale, an iconic moment in the rise of 'bibliomania', is famous for the unprecedented prices achieved by large books such as a copy of the *Decameron* (Connell

[3]See William Andrew Chatto, *A Treatise on Wood Engraving, Historical and Practical* (London: Charles Knight, 1839). On Thomas Bewick see Jennifer S. Uglow, *Nature's Engraver: A Life of Thomas Bewick* (Chicago: University of Chicago Press, 2009), and Nigel Tattersfield, *The Complete Illustrative Work of Thomas Bewick* (London: The British Library and The Bibliographical Society; Delaware: Oak Knoll Press, 2011).

[4]Jenny Uglow notes that 'engravings were the plain man's art, dismissed by the critic Horace Walpole in a cursory footnote in 1782 as "slovenly stamps," but Bewick transformed them into images of haunting depth and subtlety'. Ian Bain remarks that Bewick 'brought respectability to the woodblock as a medium for purposes more elevated than crude ballad sheets and chapbooks', 'Thomas Bewick and His Contemporaries,' in Ian Bain, 'Thomas Bewick and His Contemporaries,' in *Maps and Prints: Aspects of the English Book Trade*, ed. Robin Myers and Michael Harris (Oxford: Publishing Pathways, 1984), 67–80.

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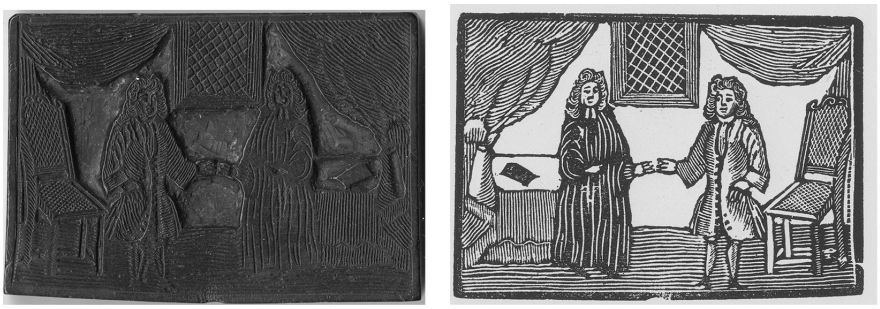


Figure 3.4 A ballad and chapbook block (McGill University Library Woodblocks Collection Box 13 Item 672) with an antiquarian offprint (*Specimens of early wood-engraving, being impressions of woodcuts in the possession of the publisher*, Newcastle-upon-Tyne: William Dodd, 1862). For these blocks see 'Pieces of Art: a Collection of Engraved Woodblocks'. https://blogs.library.mcgill.ca/rbsc/pieces-of-art-a-collection-of-engraved-woodblocks, and Leo DeFreitas, 'Newcastle Chapbooks, Broadsides, and Garlands: A Study of the Collection of Woodblocks in McGill University Library, Rare Books and Special Collections,' in Printers, Pedlars, Sailors and Nuns: Aspects of Street Literature, ed. David Atkinson and Steve Roud (London: Ballad Partners, 2019), 88–102.

2000; Ferris 2015), but it also saw the sale of a set of vanishingly rare broadside ballads from the previous three centuries.[5] Hone's visit to Batchelar superficially resembles a familiar narrative, in which the learned explorer 'discovers' and preserves the last relics of a dying culture. One example, much discussed by historians of popular print culture is the story of the young James Boswell buying and extravagantly binding twenty-four chapbooks, the 'old darlings' of his childhood, printed and sold in Bow Churchyard by the market-leading firm of Dicey (Boswell, quoted in Pottle 1991, 299). Pat Rogers accused Boswell of 'literary slumming' while conceding that he held 'a genuine affection' for chapbooks (Rogers 1985, 165; see also Mullan and Reid 2000, 10). Thomas Percy, later Bishop of Dromore, visited the same office and bought dozens of broadside ballads from Cluer Dicey, who he describes in a letter, using a printing metaphor, as being 'of a much lower stamp' than some of his other suppliers, but we know from the work of Nick Groom that Percy made (but did not acknowledge) extensive use of these sheets in his best-selling and influential *Reliques of English Poetry* (Groom 1999; see also Stoker, 2014). Frederic Madden, whose collections of ballads are now in Cambridge University Library, visited the Dicey firm's later owner, James Marshall, who convinced him that he was the direct descendant of the Ballad Partners, who dominated the ballad trade in the seventeenth century (Thomson 1987). William Hone is distinctive within this tradition because, while sharing these other collectors' genuine passion for printed traces of antiquity, his ambitions within the unreformed political culture of his day were distinctively and disruptively egalitarian.

[5]The Roxburghe ballads are held by the British Library and can be seen online through the English Broadside Ballad Archive, http://www.ebba.english.ucsb.edu (accessed 2 March 2025).

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Hone's political radicalism was never far beneath the surface of his antiquarian writings – indeed, it animated his whole life's work. His political satires attracted prosecutions on such consequential charges as sedition and blasphemy, from which he was able to acquit himself by erudite use of the literary evidence reprinted in the *Ancient Mysteries* (Robinson 1978). Hone himself had been fascinated by print since childhood: in his *Everyday Book* he recalls at the age of twelve being lent a bundle of fragments of early printing by a cobbler:

> he lent me a folio of fragments from Caxton's 'Polychronicon', and Pynson's 'Shepherd's Kalendar', which he kept in the drawer of his seat, with 'St. Hugh's Bones', and the instruments of his 'gentle craft'. This black-letter lore, with its wood-cuts, created in me a desire to be acquainted with our old authors, and a love for engravings, which I have indulged without satiety. (Hone 1825, vol. 1 col. 859)

Hone's appetite is not unlike Boswell's for chapbooks, but while it is undeniable that we now understand cheap print chiefly through the rarefied, iconic collections of ballads and chapbooks collected by Samuel Pepys, James Boswell, Frederic Madden, Thomas Percy and Hone's confidant and ally Francis Douce, among others, Hone's collections are now dispersed, their energies directed outward in Hone's lifetime into his writing and radical activities. Many of his books were auctioned in 1828 in an attempt to address his debts, but the 1843 catalogue of his posthumous sale reveals that he retained the bulk of his ballads and carol-sheets – and a quantity of unidentifiable woodblocks – until his dying day.[6]

While Hone seems to have struck an acceptable bargain with Batchelar, it's unlikely that the latter was unaware that blocks could be copied: printers of broadsides and chapbooks had been using blocks copied with varying degrees of precision for centuries. Loose copies can be seen throughout the ballad corpus, while very close copies could be made by cutting through a printed impression onto a block (Ivins 1943, 124–5). The block itself could be moulded in metal through the stereotype process, which was rapidly becoming an industrial norm: Thomas Hodgson wrote in 1820 that 'there are now in London twelve establishments for the casting of stereotype plates' (Hodgson 1820, 121). Cliché reproduction, in which a woodblock was impressed into molten type metal, may also have been known to printers as part of a repertory of skills typically unrecorded in the few manuals that we have and from which few printers would have

[6]I am grateful to the library of the Grolier Club of New York for providing a copy of the *Catalogue of the Valuable and Interesting Collection of Books, Tracts, Ballads, Prints etc of the Late Mr William Hone* (Henry Southgate and Co, 1843). The catalogue contains multiple entries ballads, carols and woodblocks, few of which are listed in more than scant detail. The auctioneer touts these items as 'once so popular as to be printed in every large town in the kingdom but [. . .] now altogether supplanted by other literature, and are no longer published. Opportunities of acquiring them but very rarely occur'.

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learnt their trade.[7] Judging from their appearance in Hone's reprint, Hone's blocks do not seem particularly well-worn, certainly compared to the cracked and worm-eaten blocks tirelessly worked across multiple decades by the ballad printers of the seventeenth-century monopoly period. Whether due to their antiquity, commercial value or sacred subject, Batchelar seems to have looked after his blocks. If he received metal stereotypes in return for his wooden originals, he may well have been glad to have had facsimiles that were both more durable than the wooden exemplars he sold to Hone and practically indistinguishable from their sources (Bevan 2023, 73 and fn. 20).

How we think about print now is captured by William Ivins's claim that it offers to generate an 'exactly repeatable pictorial statement', a characterization that was influential on Elizabeth Eisenstein's focus on 'fixity' (Ivins 1953, 180; Eisenstein 1979). But repeatability has always been partial. Bibliography, a science of difference, asks what, exactly, is meant by 'exactly'. The goal is generally not so much to debunk the very idea of repeatability but to manage deviations from the norm within certain pragmatic horizons: as Tom Davis puts it, 'If you ask an engineer to machine a metal rod a meter long, he or she will probably ask, "For what purpose?" in order to find out what kind of tolerances in measurement would be required' (Davis 1995, 148). Eminently practical and usually a service discipline to others, bibliography distinguishes authorial from other influences; detects earlier from later states within editions; tells originals from copies; and, perhaps most charismatically, uncovers forgeries and other mysteries. In contrast to the ideal of the exact copy, bibliography assigns epicurean gradations of difference. Differences include swollen or faded lines in illustrations, substituted or fallen type, cancelled or inserted pages, amended plates, or new combinations of old materials. Variously laborious, fastidious and sensual, bibliography delights as much in the puzzles it addresses as their logical solution. The state of an impression might differ only minutely: a crack in a block may appear, widen, or be offset by one of a thousand myriad hacks, workarounds, error corrections and trade secrets scarcely visible from the normative distance of the present. While it depends upon close observation, bibliography is often conjectural, as the phenomenology of matter in action inevitably outweighs what is visible on the surface. We weren't there when the book was made: our attempts to reconstruct what really happened in the printing house are necessarily imaginative, if not sometimes positively imaginary.[8]

As bibliography relies on observation, measurement, pattern recognition and tabulation, the computer is an obvious partner, but Davis's caution against drawing general inferences from what fits the researcher's specific purpose should apply no less to bibliography in the digital age. For studies of woodblocks, a range of computational

[7]See Hodgson's *Essay*, 38–44 and James Mosley, 'Dabbing, Abklatschen, Clichage,' *Journal of the Printing Historical Society* 23, 2015. An earlier version of this article can be found at http://typefoundry.blogspot.com/2006/01/dabbing-abklatschen-clichage.html (accessed 3 March 2025).

[8]That bibliographers had made fixed assumptions about printers' working practices was the central argument of D. F. McKenzie, 'Printers of the Mind: Some Notes on Bibliographical Theories and Printing-House Practices,' *Studies in Bibliography* 22 (1969): 1–75.

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aids are available. Through machine learning – a family of methods in which computers are taught to detect features within training data that they then may be able to detect in fresh data – illustrations can be extracted from their surroundings (see Figure 3.5).

Other methods can match printed impressions apparently printed from the same block, yielding a history of its working life (see Figure 3.6).



Figure 3.5 Object detection of illustrations in chapbooks printed in Scotland (Dutta, Bergel and Zisserman 2021).



Figure 3.6 Block impressions of chapbooks, matched using VGG Visual Search Engine (VISE) software (Dutta, Arandjelović and Zisserman 2021).

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Unlike the broader task of image classification with which most visual AI is concerned, the software tool (VGG VISE) that generated the above gallery of matches does not employ training data: instead, images are matched by counting the number of spatially consistent geometric features within an image, ideally one that contains a high degree of visual texture or contrast, as is typical of black-and-white woodcut illustrations on paper (see Figure 3.7).

While the block matches such as the above are statistically demarcated, their lower bounds are set by an arbitrary threshold of difference defined – as with Davis's analogy of a metal rod – by the researcher who must take into account the exigencies of blockmaking and presswork, the historical materialities of paper, ink and blocks, and the latter-day



Figure 3.7 A timeline of broadside ballad block impressions, as seen by computer vision, accessible at https://www.robots.ox.ac.uk/~vgg/demo/ballads/ (Chung et al, 2014). This sequence is also visualized as an animation, controllable by scrubbing across the stack of registered images with a mouse pointer, at https://www.robots.ox.ac.uk/~vgg/demo/ballads/history/comp7.html.

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materialities of digital imaging. We seek to reverse the printing process in order to isolate the bare block from the mediating layers of ink and presswork: the block is the 'signal', to borrow the foundational distinction in information theory made by Claude Shannon, while the medium through which it is reproduced is considered as 'noise' (Shannon 1948). While this bifurcation admittedly erases the materiality of presswork and the phenomenal effect of the impression, it does allow an archaeological reconstruction of a particular stratum of printing history – the one that included the block on the press prior to and during its printing.

While we consider the block as uniform across impressions, this uniformity, as with all matter in motion, is only relative. Blocks may have been deliberately altered: wood is also prone to cracking, warping, incidental damage, or consumption by woodworms (Hedges 2013). Such signs of entropy (which are in fact signs of life) can be exploited to generate timelines, in which the loss of ink is used as a proxy for the loss of the block's printable surface area.

This woodblock was heavily used over three decades: its deterioration provides a skeletal publishing history of the typically undated broadside ballads on which it appears. Each ballad may contain a number of woodcuts: each possesses its own timelines, and all intersect at the point of impression, in variable conditions at that time. The sequence has been computationally inferred from the images, but the captions providing date ranges (if known) are taken from external evidence, namely the conjectured dates in business of the printers and publisher.

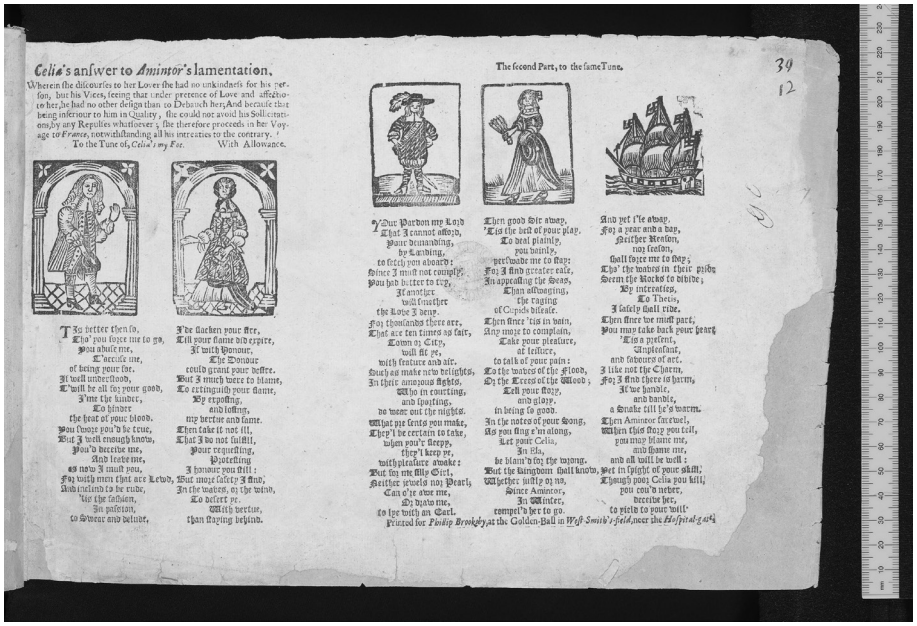
The external dating is both a challenge to and a constraint around the visual analysis. On the one hand, histories of block decay can be used to refine an externally sourced publication date, particularly when multiple blocks have been set within a single form. On the other hand, a purely visually conjectured timeline needs to be viewed with an awareness of a wider set of material considerations than may be immediately apparent. Publication dating by block damage rests on the assumption that the history of a block is always one of relentless decay. But blocks can be divided or combined, sections can be cut out and plugged, and broken lines (particularly those framing the block, which are particularly liable to wear) can be repaired or replaced. The clarity of the impression itself may vary due to uneven inking, the dampness of the paper, the quality of the presswork or any other natural variance.

The fact that the date ranges are not continuous with the order of the impressions tellingly reveals the complexity of this matrix of impressions. In the case of Impressions 16 and 628, we can see that each belongs to what appears to be the same ballad, as is consistent with their date ranges but not their position in the visual sequence.

The two sheets in Figures 3.8 and 3.9 appear to be identical, but some differences can be seen when the sheets are digitally superimposed. (See Figure 3.10)

This method of digital registration and overlay follows on from earlier, optical and mechanical 'collators' devised by twentieth-century bibliographers, which are still in use alongside software collators (Smith 2000). As can be seen in the ImageCompare application shown above, the third block from the left is not quite the same across both sheets: the position of the first two blocks and that of the printers' imprint have shifted

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Celia's answer to Amintor's lamentation.

Wherein the discourses to her Lover she had no unkindness for his person, but his Vices, seeing that under pretence of Love and affection to her, he had no other design than to Debauch her; And because that being inferior to him in Quality, she could not avoid his Solicitations, by any Repulses whatsoever; she therefore proceeds in her Voyage to *France*, notwithstanding all his intreaties to the contrary.

To the Tune of, *Celia's my Foe.* With Allowance.

The second Part, to the same Tune.

39
12

1 Tis better then so,
Tho' you forgot me to go,
You abuse me,
To accuse me,
of being your foe.
If well understood,
I will be all for your good,
I'me the kinder,
To hinder
the heat of your blood.
You twoye you'd be true,
But I well enough know,
You'd deceive me,
And leave me,
as now I must you,
For with men that are Lewd,
And inclind to be rude,
'tis the fashion,
In passion,
to Swear and beluse.

2 I'de slacken your fire,
Till your flame did expire,
If with Honour,
The Donour
could grant your desire.
But I much were to blame,
To extinguish your flame,
By exposing,
and loosing,
my vertue and fame.
Then take it not ill,
That I do not fulfill,
Your requesting,
Protesting
I honour you still:
But twoye safety I find,
In the waves, or the wind,
To desert ye.
With vertue,
than staying behind.

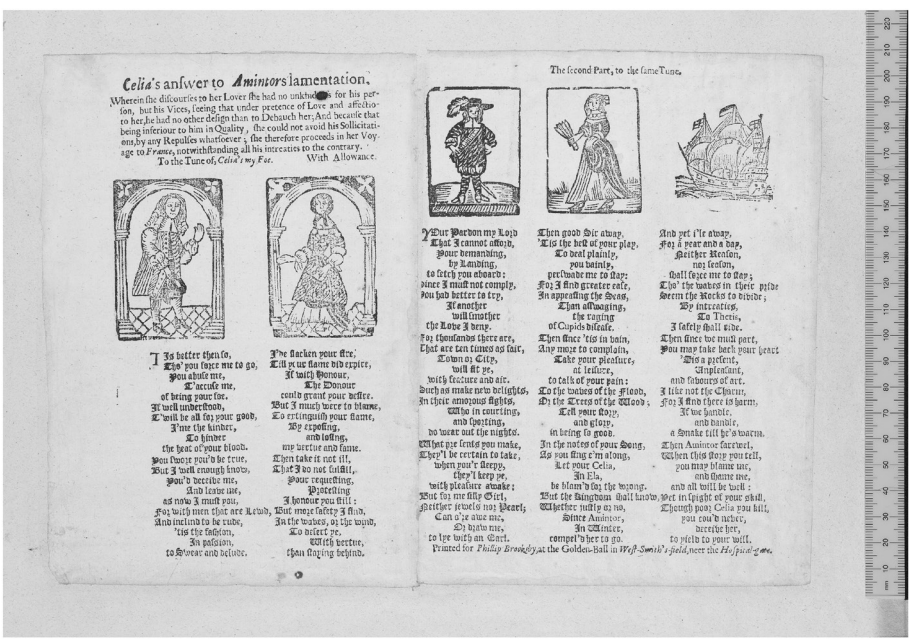
3 Our Pardon my Lord
That I cannot afford,
Your demanding,
by Landing,
to fetch you aboard:
Since I must not comply,
You had better to try,
If another
will smother
the Love I beny.
For thousands there are,
That are ten times as fair,
Down in City,
will fit ye,
with feature and air.
Such as make new delights,
In their amorous sights,
Who in courting,
and sporting,
do wear out the nights.
What ye lentes you make,
They'l be certain to take,
when you're sleepy,
they'l keep ye,
with pleasure awake:
But for me silly Girl,
Neither jewels nor Pearl,
Can o'le awe me,
My brow me,
to tye with an Carl.

4 Then good Sir away,
'Tis the hell of your play,
To deal plainly,
you mainly,
perswade me to stay:
For I find greater ease,
In appealing the Seas,
Than allwaging,
the raging
of Cupids disease.
Then since 'tis in vain,
Any more to complain,
Take your pleasure,
at leisure,
to talk of your pain:
To the waves of the flood,
My the Trees of the Wood;
Tell your Boys,
and glory,
in being so good.
In the notes of your Song,
As you sing e'm along,
Let your Celia,
In Ela,
be blam'd for the wrong.
But the Kingdom shall know,
Whether guilty or no,
Since Amintor,
In Winter,
compel'd her to go.

5 And yet i'le away,
For a year and a day,
Neither Reason,
nor Season,
shall force me to stay;
Tho' the waves in their pride
Seem the Rocks to divide;
My intreaties,
To Thetis,
I safely shall ride.
Then since we must part,
You may take back your heart
'Tis a present,
Unpleasant,
and sadness of art.
I like not the Charm,
For I find there is harm,
If we handle,
and dandle,
a Snake till he's warm.
Then Amintor farewel,
When this Story you tell,
you may blame me,
and shame me,
and all will be well:
Yet in spight of your skill,
Though poor Celia you kill,
you cou'd never,
deceive her,
to yield to your will.

Printed for *Philip Brookby*, at the Golden-Ball in *West-Smith's-field*, neer the *Hospital-gate*.

Figure 3.8 Impression 16, highlighted on 40 Rawlinson 566, fol. 12r.



Celia's answer to Amintors lamentation.

Wherein the discourses to her Lover she had no unkindness for his person, but his Vices, seeing that under pretence of Love and affection to her, he had no other design than to Debauch her; And because that being inferior to him in Quality, she could not avoid his Solicitations, by any Repulses whatsoever; she therefore proceeds in her Voyage to *France*, notwithstanding all his intreaties to the contrary.

To the Tune of, *Celia's my Foe.* With Allowance.

The second Part, to the same Tune.

1 Tis better then so,
Tho' you forgot me to go,
You abuse me,
To accuse me,
of being your foe.
If well understood,
I will be all for your good,
I'me the kinder,
To hinder
the heat of your blood.
You twoye you'd be true,
But I well enough know,
You'd deceive me,
And leave me,
as now I must you,
For with men that are Lewd,
And inclind to be rude,
'tis the fashion,
In passion,
to Swear and beluse.

2 I'de slacken your fire,
Till your flame did expire,
If with Honour,
The Donour
could grant your desire.
But I much were to blame,
To extinguish your flame,
By exposing,
and loosing,
my vertue and fame.
Then take it not ill,
That I do not fulfill,
Your requesting,
Protesting
I honour you still:
But twoye safety I find,
In the waves, or the wind,
To desert ye.
With vertue,
than staying behind.

3 Our Pardon my Lord
That I cannot afford,
Your demanding,
by Landing,
to fetch you aboard:
Since I must not comply,
You had better to try,
If another
will smother
the Love I beny.
For thousands there are,
That are ten times as fair,
Down in City,
will fit ye,
with feature and air.
Such as make new delights,
In their amorous sights,
Who in courting,
and sporting,
do wear out the nights.
What ye lentes you make,
They'l be certain to take,
when you're sleepy,
they'l keep ye,
with pleasure awake:
But for me silly Girl,
Neither jewels nor Pearl,
Can o'le awe me,
My brow me,
to tye with an Carl.

4 Then good Sir away,
'Tis the hell of your play,
To deal plainly,
you mainly,
perswade me to stay:
For I find greater ease,
In appealing the Seas,
Than allwaging,
the raging
of Cupids disease.
Then since 'tis in vain,
Any more to complain,
Take your pleasure,
at leisure,
to talk of your pain:
To the waves of the flood,
My the Trees of the Wood;
Tell your Boys,
and glory,
in being so good.
In the notes of your Song,
As you sing e'm along,
Let your Celia,
In Ela,
be blam'd for the wrong.
But the Kingdom shall know,
Whether guilty or no,
Since Amintor,
In Winter,
compel'd her to go.

5 And yet i'le away,
For a year and a day,
Neither Reason,
nor Season,
shall force me to stay;
Tho' the waves in their pride
Seem the Rocks to divide;
My intreaties,
To Thetis,
I safely shall ride.
Then since we must part,
You may take back your heart
'Tis a present,
Unpleasant,
and sadness of art.
I like not the Charm,
For I find there is harm,
If we handle,
and dandle,
a Snake till he's warm.
Then Amintor farewel,
When this Story you tell,
you may blame me,
and shame me,
and all will be well:
Yet in spight of your skill,
Though poor Celia you kill,
you cou'd never,
deceive her,
to yield to your will.

Printed for *Philip Brookby*, at the Golden-Ball in *West-Smith's-field*, neer the *Hospital-gate*.

Figure 3.9 Impression 628, as shown in Figure 3.7, highlighted on Bodleian Douce Ballads 1, fol. 22r.

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Figure 3.10 An overlay visualization of details of Figures 3.8 and 3.9 in the VGG Image Compare software collator. Prasanna Sridhar, Abhishek Dutta and Andrew Zisserman, VGG Image Compare. https://gitlab.com/vgg/image-compare.

somewhat in the form. Classical bibliography would tend to consider these sheets to be separate states within the same edition or, if the publication dates are known, to also be separate issues (Tanselle 1975). The latter of these two ballads was probably printed from type kept standing between print runs: prohibited by earlier printing ordinances in order to protect typesetters' labour, it was scarcely economical for books composed of many multiple forms, but it could evidently be justified for short ballads for which there was a reliable market; the use of standing type may therefore be an indication that this ballad was popular (Atkinson 2021). Damage to the block under examination might lead one to think that some time had passed between the two impressions, but damage such as warping and cracking can occur between as well as within print runs. At the least, the inferred condition of the blocks does positively indicate the order in which the two sheets were printed: this justifies the conjectured sequencing of the gallery of impressions as a whole. (See Figure 3.11)

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Figure 3.11 Details of Figures 3.8 and 3.9. Note in particular the progressive damage to the bottom frame of the Figure 3.8 woodcut.

All of the methods that this article has described depend on digital imaging, perhaps the most revolutionary but underappreciated bibliographical advance of the last several decades. Preceded by the establishment of in-house imaging studios in libraries and by the funding of large-scale digitization projects, most special collections 'reading rooms' are now ad hoc picture studios (Dunning 2011; Wakelin 2021). The result is that more people can now see a broadside ballad than ever could in their heyday.

Digital photography has been joined by more advanced imaging modes such as hyperspectral and CT imaging, analytical methods based in image processing, and computer vision.[9] While it is not the case that computers can 'see' more deeply than humans, their bandwidth and memory can help us to see more broadly and consistently.

[9]On imaging, see, for example, Edward Potten, 'Dating the Rylands Apocalypse Wood-block: John Bagford and the Earliest Facsimiles of blockbooks,' *Journal of the Printing Historical Society* Third Series, 3 (2022), 14–46; Jana Dambrogio, Amanda Ghassaei, Daniel Starza Smith, Holly Jackson, Martin L. Demaine, Graham Davis, David Mills, Rebekah Ahrendt, Nadine Akkerman, David van der Linden and Erik D. Demaine, 'Unlocking History Through Automated Virtual Unfolding of Sealed Documents Imaged by X-ray Microtomography,' *Nature Communications* 12, no. 1184 (2021): 1–10; Federica Nicolardi, Stephen Parsons et al., 'Revealing Text from a Still-rolled Herculaneum Papyrus Scroll (PHerc. Paris. 4),' *Zeitschrift für Papyrologie und Epigraphik* 229 (2024): 1–13. Beyond block matching, the identification of recurring pieces of type demonstrates computer vision's aptitude for precise recall – see, for example, Christopher Warren, Avery Wiscomb, Pierce Williams, Samuel V. Lemley and Max G'Sell, 'Canst Thou Draw Out Leviathan with Computational Bibliography? New Angles on Printing Thomas Hobbes' Ornaments' Edition,' *Eighteenth-Century Studies* 54, no. 4 (2021): 827–59.

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Many methods within the digital humanities are routinely criticized for merely automating rote tasks rather than providing qualitatively new insights, but analyses such as the above exercise in matching and sequencing impressions can *only* be done with computers, which, if nothing else, are good at storing and retrieving data.

The enhanced visibility of historical books has naturally turned our attention to their less visible aspects. These include the book's interface: its tactile dimensions and histories of ownership and use – an anthropological approach invoked in literary studies under the header of the 'material text'.[10] Textual materialism has been one of the main ways in which book history has been integrated into literary studies of, in particular, the early modern period, when printers' ledgers and publishers' archives are vanishingly scarce (at least in English), and book historians must largely rely on the book alone to account for itself. Early modern material-textualists have drawn attention to typography as, following Donald McKenzie, a means of 'making meaning', and to the interface and affect of the codex and other handheld formats – affordances that digitizations generally fail to communicate. The banner of the material text in this context is a kind of formal poetics: it somewhat resembles New Criticism but is informed by classical bibliography and graphic design, engendered in an age in which almost anyone can choose and manipulate type and page layout on-screen, even if the affordances of digital typography are no less materially bounded than the handpress printer's forme.

The framework of textual materialism can be usefully applied to the digitization of printing surfaces themselves. Digitization normally aims to capture the face of the block on which the design is cut, but this printable surface area can be difficult to capture, as both the relief and the supporting area are often darkened from ink and age. It helps to be able to print from the block, issues of conservation permitting, or else a three-dimensional depth map of the printing face of the block can capture the designed relief with some precision, from which a virtual offprint can be made (Bergel, Franklin and Harris, forthcoming). If standardized, this depth capture would permit the computational matching of undocumented blocks (of which there are many) with their printed impressions. A facsimile generated by a 3D printer could also be made (Hancher 2019), but the simpler and cheaper method of photo-etching (a successor to stereotype) may serve just as well, albeit it will not be as winningly punning as the act of 'printing' a printing surface. A digitization that is cognizant of textual materialism might, however, image not just the block's printing surface but also its back and sides – six faces in all. The reverse and sides of a block may include makers' or owners' marks, trial block designs, shims to raise up the block to type height and other artefacts of the block's material history. This panoptic materialism, analogous in some ways to the

[10]The term 'material text' seems to have been introduced, in distinction to a 'linguistic text', in Peter Shillingsburg, 'Text as Matter, Concept, and Action,' *Studies in Bibliography* 44 (1991): 31–82. Exemplary work includes the Material Texts series from Penn Press: see https://site.pennpress.org/material-texts-2021/material-texts/ (accessed 3 March 2025).

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relief depictions of blocks in the *Encylopédie*, may make a case for photogrammetric capture, which produces three-dimensional facsimiles showing all faces. While useful as documentation, such lustrous facsimiles are also reverential re-enchantments of the original: their weakness is that the state-of-the art of artificial shading and capture technologies is somewhat ephemeral. An arguably more informative imaging mode is Reflectance Transformation Imaging (RTI), which employs a lighting dome to capture a hemispheric, dynamically illuminated view of an object, which the following (non-interactive) image can only hint at. (See Figure 3.12)

RTI's specular enhancement mode, combined with the viewer software's interface in which the angle of light can be arbitrarily changed, provides a powerful simulation of turning a block in hand against the light: tool-marks are sharply revealed against the natural wood grain and tactility is almost made visible. We rarely know the names of makers of blocks, but these tool-marks are sometimes idiosyncratic, revealing the inferred dimensions of cutters' tools, methods or habits, such as their preference (or not) for clearing – Bewick for one is famously indifferent towards the the sub-surface under



Figure 3.12 RTI capture of a Newcastle ballad-printer's woodblock, now in the British Museum. The block was owned and used by John White and his successors, now catalogued at https://www.britishmuseum.org/collection/object/P_2000-0723-10 (accessed 3 March 2025). It can be seen in use on several ballads, including *The Life and Death of the Duke of Berwick*, printed in Newcastle by John White, available at https://ebba.english.ucsb.edu/ballad/31056/album (accessed 3 March 2025). I am grateful to Sheila O'Connell, David Saunders and their colleagues at the British Museum for the RTI imaging work.

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his design; other makers will almost devoutly clear and level the spaces that do not print and which, in most cases, only the printer will see.[11]

A strict textual materialist would object that digital mediations can never replace the original, and this is undeniably true: the proper function of a digital representation such as an image or a cloud of spatial coordinates is not so much to replace the object of interest but rather to provide a viewpoint on it. If done reflectively, appraising a digital facsimile can make us think about what it misses. Digital cataloguers can and do foreground many of the transformations of scale, lighting, tone and affect that photography introduces: digitization can and should therefore show its own workings, and by so doing can allow us to understand the affordances of digitization as well as its object.[12] The commonplace distinction between 'digital' and 'physical' copies of a book or other object is an important one but should turn our attention towards the materiality of the digital itself, including such entirely physical parameters of digital imaging as studio lighting, resolutions, file formats, and the professional and personal contexts of those taking the pictures. It is perhaps revealing of our moment that we lack a generally agreed term for the binary opposite of 'the digital', as is the habit of foregrounding the term 'digital' in any context where it's likely now the norm, such as photography. 'Digital' as a qualifier is unlikely to age particularly well.

Old media can teach us about new media, too. Book history's founding insistence on attending to the industrial economy of the book as closely as literary and textual scholars do for the 'message' and bibliographers for the 'medium' is a natural partner of the digital humanities and cognate fields such as media, communication and software studies. Sometimes narrowly conceived, the digital humanities are not just about humans making things with computers but also critically reflecting on how using computing remakes us (a dialectic that is also at the heart of book and media history); then it would seem important to look for the motives, mechanisms and histories behind the surface of technology. Just as books are made with blocks and type, on printing presses, by skilled operators, software too has a history and a socio-technical environment within which it is executed. Critics of AI as conceived of at the time of

[11]For reproductions of Bewick blocks and a discussion of the importance of press-work in determining results, see Graham Moss, *Thomas Bewick, Engraver and the Performance of Woodblocks* (Charing: Florin Press, 2021).
[12]Critical and historical work on both digital editions and mass digitization projects has foregrounded many of these materialities of the digital: see, for example, Alan Galey, 'The Enkindling Reciter: E-Books in the Bibliographical Imagination,' *Book History* 15 (2012): 210–47; Martin Paul Eve, 'You Have to Keep Track of Your Changes': The Version Variants and Publishing History of David Mitchell's Cloud Atlas's, *Open Library of Humanities* 2, no. 2 (2016): 1–34; Bonnie Mak, 'Archaeology of a Digitization,' *Journal of the Association for Information Science and Technology* 65, no. 8 (2014): 1515–26; Zachary Lesser and Whitney Trettien, 'Material / Digital,' in *Shakespeare / Text: Contemporary Readings in Textual Studies, Editing and Performance*, ed. Claire M. L. Bourne (London: The Arden Shakespeare, 2021), 402–23; and Whitney Trettien, 'The History of the Early Modern Book in the Digital Age,' in *The Oxford Handbook of the History of the Book in Early Modern England*, ed. Adam Smyth, Oxford Handbooks (2023; online edn, Oxford Academic, 18 September 2023). https://doi.org/10.1093/oxfordhb/9780198846239.013.35 (accessed 19 February 2025) and Ryan Cordell, '"Q i-tjb the Raven": Taking Dirty OCR Seriously,' *Book History* 20 (2017): 188–225.

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writing have repeatedly shown how machine learning models are essentially compact indexes of training data, exhibiting all the biases intrinsic to the creation and selection of that data and requiring scrutiny towards how – and by who – that data was gathered (Devlin 2023; Gebru et al. 2021; Crawford and Paglen 2021). Artificial intelligence should properly be understood not in terms of models of thought but as a form of reproductive media, like printing.

Analogies between print and digital technology are commonplace, particularly as a prophecy of revolutionary change (Graham 2016): computers, or the Internet or AI are, we are told, the most disruptive developments since 'the invention' (tellingly and incorrectly singular) of 'the printing press' (also singular). Book history spends a lot of its time arguing otherwise – about the press and increasingly also the computer. As embodiments of labour, web pages or algorithms embedded in software are no less physical than printers' woodblocks, whose materiality unquestionably exists behind the scenes of the images they generate. Websites are built and break no less than blocks and printing presses, or as Friedrich Kittler and John Johnston argued, 'There is no software.'[13] A simple opposition between 'the digital' and the physical – or data and its support – similarly can't fail to define the digital as both secondary to and separate from the real world rather than as a concrete expression of human agency.

The gambit of textual materialism – that no two books are ever quite the same, either by design or from use, and that no facsimiles can quite capture the essence of their original source – in one sense reifies this distinction, but it is wholly congruent with a Kittlerian materialism, that the text cannot be distinguished from its support, perhaps even its environment. The text – or information, or data, or the message – is at best a social convention that allows us all to be literally on the same page as readers of what we agree to consider 'the same' book. Information overload, a supposed pathology of our age that book historians have taught us can be found in earlier ages (Blair 2010), also has information entropy as its materialist counterpart. Texts fall apart: reproductions merely take us farther away from an increasingly attenuated signal, and reading is not so much communication as it is conjectural restoration. While this pessimism makes both psychological and historical sense, it is somewhat one-dimensional as a theory of communications, focusing solely on what we can take from texts to the exclusion of what we can make from them.

We are, then, in a world of entanglement in which matter and meaning appear to intersect as much as do the things we make and that we are. Digital and other reproductions are not trade-offs between text and matter in which 'aura' is only ever diminished: reproduction is additive.[14] It is true that the bargain that Batchelar struck with Hone traded the irreducible original for a modern copy, but his stereotypes were at

[13]Kittler's point was that code is materially instantiated at all times – 'signifiers of voltage differences,' running on hardware: Friedrich A. Kittler and John Johnston. 'There Is No Software,' in *Literature, Media, Information Systems* (Abingdon: Routledge, 2013), 147–55.

[14]I take Benjamin's main meaning of 'aura' to be the artwork's traceable provenance.

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least as good as Hone's woodblocks – or actually better, more durable and able in theory to illustrate new sheets, while Hone's antiquarian stewardship of the originals, along with his learned and loving commentary, sustains and magnifies their traditional value. This should inspire hope that other bargains might be struck between the book's matter and its message, as between agents of change like Hone and the vital forms of life that both he and Batchelar preserved and cherished.

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