Two tough nuts to crack: did Shakespeare write the 'Shakespeare' portions of *Sir Thomas More* and *Edward III*? Part I[1]

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Abstract

Using 'new-optics' stylometric measures of comparative Shakespeare discrepancy we calculate the odds that the 'Shakespeare' scenes in *STMO* and *Edw3* could have come by chance from a person of Shakespeare's writing habits. For *STMO*, if written in the 1600s, the 'Shakespeare' Hand D-plus verse portion is seven to twenty-six times less likely to be Shakespeare's than Shakespeare's own farthest-outlier baseline threshold block. Shakespeare authorship for it in the 1600s seems to us improbable but not impossible. In *STMO* were written in the 1590s, it would be ten times less probable, and not such a close call. The odds that Shakespeare could have written the entire play at any time are vanishingly low. In terms of Shakespeare discrepancy, we would say that Hand D-plus belongs more in the high Apocrypha than in the Canon. Taken separately, four of the five 'Shakespeare' blocks of *Edw3* fall inside our Shakespeare ballpark. So does a sixth block, scenes 4.05 to 4.09. If we followed the consensus strictly, all five Shakespeare blocks, taken as a group, would not make a probable solo Shakespeare ascription. However, if we switched 4.04 to 'non-Shakespeare,' and 4.05-.09 to 'Shakespeare,' the revised Shakespeare blocks would be a plausible Shakespeare ascription even as a group, justifying the inclusion of *Edw3* in the Canon as partly Shakespeare's: 1.02; 2.01–2.02; and 4.05–4.09. The odds that the 'non-Shakespeare' scenes, collectively, or individually (except for 4.05–4.09) could be his are vanishingly low. This is the first of a two-part series, addressed to Shakespeare's hand in *Sir Thomas More*. Part II, on Shakespeare's hand in *Edward III*, will appear in the next issue. The full article may be found online at http://www.claremontmckenna.edu/facultysites/govt/FacMember/welliott/UTConference/2ToughNuts.pdf

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1 Easy Cases and Hard

In Shakespeare's case, it is now clear that all those old reports of the Death of the Author were grossly exaggerated. It is still big news when a 'new' Shakespeare work gets added to the Canon. Sometimes it is even news when an old one gets subtracted. A number of major contributions to

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authorship studies have appeared in the last few years,[2] and some authorship controversies have generated enough heat to be called the Shakespeare Wars.[3] If *wars* is the right name for these disputes, they are rarely fought over the twenty-odd High Canon of Core Shakespeare plays, such as *Hamlet* or *Romeo and Juliet*, which no one doubts are Shakespeare's, nor over the 300-odd Non-Canon, Non-Apocrypha plays, such as *Volpone* or *Cupid's Whirligig*, which no one believes to be by Shakespeare.[4] Most of the disputes have addressed what we call the Shakespeare Fringe Plays. These are either plays from the Shakespeare Dubitanda, or Low Canon—that is, plays like *Titus Andronicus*, assigned to the Canon, but insecurely or dividedly—or from the Shakespeare Apocrypha—plays like *King Leir*, which some assign to the Canon but which haven't been generally accepted as Shakespeare's.

Drawing on Wells and Taylor's *William Shakespeare: A Textual Companion* (1987), we would further subdivide the Apocrypha between a High Apocrypha of plays they deemed still in contention for the Canon, and a Low Apocrypha, of all the others. By 1987 their High Apocrypha consisted of no more than three plays: four scenes from *Edward III*, perhaps the entire play, and possibly *Edmond Ironside* and *Arden of Faversham*. No other Apocrypha play seemed to them worthy of consideration as Shakespeare's, and we agree with them in rejecting all of the other Apocrypha. Unlike them, we would also reject *Edmond Ironside* and *Arden of Faversham* (Table 2), though MacDonald Jackson has made a recent case that one scene of *Arden* could be Shakespeare's.[5] By our rules, none of the whole Apocrypha plays could be by Shakespeare solo, not even *Edward III*, which everyone, including Wells and Taylor, now places in the Canon, thanks to its four 'Shakespeare scenes.' Some or all of these scenes are close to Shakespeare could-be's by our rules, though not the whole play. If so, it's enough to make the rest of it Canon-eligible by association in the same way that Fletcher's parts of *Two Noble Kinsmen* are Shakespeare Low-Canon-eligible, not because Shakespeare wrote them, but because they are part of a play which Shakespeare could have co-authored. In principle this reassignment could empty our new box, the High Apocrypha, by moving two of its three plays down to the Low Apocrypha and one up to the Low Canon. We would retain the box, however, as a suitable place for the 'Shakespeare' portion of *Sir Thomas More*.

The changing fortunes of plays like *Edward III* and poems like the *Funerall Elegye by W.S.* are examples of how quickly a work can pass into the Canon and out again, even in an era supposedly beyond concern with authorship. Mindful of this boundary-crossing traffic, and cautious about using terms which implicitly assign a work to one side or the other, we regularly use the term *Shakespeare Fringes* to refer to plays or passages which could be either Low Canon or High Apocrypha. We also use the phrase *tough nuts to crack*, borrowed from MacDonald Jackson in connection with *Edward III*, to describe some of the most challenging and interesting works from the Fringes.[6]

This article was originally written for a 2005 *Shakespeare Yearbook* compendium on the Shakespeare Apocrypha. Along with a companion article by Marina Tarlinskaja on the same two plays, it was postponed to the next volume—but the next volume never came, owing to the untimely illness and death of the editor, Douglas Brooks. While alive, he gave us leave to look elsewhere; we have done so; and *Literary and Linguistic Computing* has undertaken to print it in two parts. For us, our *SYB* article also served as a pilot effort to apply our new-optics stylometric methods, which by then had been plentifully validated on what now, in retrospect, turned out to be easy targets—that is, whole, single-authored plays or long, single-authored verse passages—to harder ones—shorter passages from presumptively co-authored Fringe plays. Contrary to our usual practice of working our way from easy cases to hard, we started with what seemed the hardest and most interesting ones for the *SYB*, then spent the next few years working our way through the rest of the Fringes (less *Timon of Athens*), then returned to update our pilot in the light of further advances in our long, draft Fringes

working paper, and to take account of the sudden, universal promotion of *Edward III* into the Canon and several new studies reaffirming the 'Shakespeare' portion of *Sir Thomas More*'s place in the Canon.

We see the elevation of the *Edward III* 'Shakespeare scenes' much more as a change of heart about old evidence than as a response to new evidence, but both we and Marina Tarlinskaja do have new, mostly confirmatory evidence on it after the fact. The recent articles on *Sir Thomas More* do contain interesting new evidence, much of it contrary to ours, plus a valuable, point-by-point rejoinder to our working paper by MacDonald Jackson. Now is a good time (1) to describe our new evidence, which is mostly favorable to the elevation of some (but not all) of *Edward III* to the Canon, but not so favorable to the *Sir Thomas More* passages; (2) to compare it with other new evidence, pro and con; and (3) to start thinking how evidentiary divergences might best be resolved.

Readers interested in a description of our new-optics methodologies may consult the 1996 final report of our Claremont Shakespeare Clinic[7] for a description of all the tests we used, and a long 2004 article in the *Tennessee Law Review* describing how we arrived at measures of composite Shakespeare discrepancy and evaluating our tests for reliability, replicability and accuracy in distinguishing between known Shakespeare and known non-Shakespeare.[8] The bottom line of these articles is that, for whole plays, and for long, single-authored passages, we claim very high accuracy rates, but lower ones for shorter passages, because longer ones average out more variability. Table 1 summarizes these rates.

Table 1 illustrates several key features of our new-optics methodology. Its central task is measuring stylometric discrepancy, using internal evidence. It shows how sensitive our profiles are to sample size. Its asymmetry, with much higher accuracy for Shakespeare (i.e., its low rate of false negatives) than for non-Shakespeare, is intentional. We weigh negative evidence much more heavily than positive and need very wide profiles and low rates of false negatives to make it work.

2 The Apocrypha as Whole Plays: None Could be by Shakespeare Alone

Table 2 shows the power of our new-optics tests in a different way. While all 29 of our core Shakespeare baseline plays clustered tightly into the same tiny statistical ballpark, with two or fewer individual rejections each, all of the 25 Apocrypha Plays we tested were on different statistical planets or galaxies (and so were all 51 plays by Shakespeare 'claimants' like Marlowe, Jonson, Middleton and Fletcher). None had fewer than seven rejections. In almost every case, the discrepancy was so great that the probability of common authorship is far lower than the probability of winning the Irish Sweepstakes or getting struck by lightning. In our view, this more than justifies Wells and Taylor's dismissal of most of the Apocrypha plays as non-contenders for a solo Shakespeare ascription. We would dismiss them all as single-authored Shakespeare. We had something like Table 2 in mind when we bet an insistent, numeroskeptical critic a thousand dollars that he could not find *any* whole play by *any* other author than Shakespeare that would fit within our core-Shakespeare profile. The offer remains open to all and has been raised to a thousand pounds (at the time worth about $2,000) to encourage non-frivolous responses, while discouraging frivolous ones.[9] Our critic wisely declined on the spot, and no one else has taken us up. More important than whether or not we (or others) think we can win the bet—and distinguishing us from most other authorship scholars on offer today—is the bare fact than our standards of comparison are well enough defined that a neutral observer could easily tell who won, who lost, and by how much.

Table 2 tells us, in brief, that, though *Sir Thomas More* and *Leir*, with seven and eight Shakespeare rejections respectively, are closer to Shakespeare than *Locrine* and *The Second Maiden's Tragedy*, with 22 rejections each, no whole play anywhere in the Apocrypha is close enough to our Shakespeare core to pass muster as a plausible,

Table 1 Accuracy of Composite Claremont New-Optics Tests on Passages of Various Sizes by Known Authors

Text	Blocks tested	Shakespeare (%)	Non-Shakespeare (%)
Whole plays, 15,000–30,000 words	79	100	100
Poems, 3,000 words	101	100	100
Play Verse, 3,000 words	120	95	100
Poems, 1,500 words	54	100	100
Play Verse, 1,500 words	183	96	88
Poems, 750 words	82	93	71
Play Verse, 750 words	146	97	75
Poems, 470 words	129	92	73

All figures Discrete; Continuous scores are similar (see text for definitions). Source: Elliott and Valenza 2004, p. 357. Group accuracy for 2007–08 Golden Ear Elite Panel, for 150-word verse passages: Shakespeare: 94–95%; non-Shakespeare: 89% (see Section 5).

Table 2 Twenty-Five Shakespeare Apocrypha Plays Ranked by Shakespeare Rejections

Play	Short title	Discrete rejections	Discrete composite probability	Continuous composite probability
Shakespeare thresholds		2[a]	2.316E–01[b]	3.6895E–03[b]
Sir Thomas More	STMO	7	3.323E–05	<1.0000E–15
Leir	LEIR	8	3.252E–06	<1.0000E–15
Arden of Faversham	ARDN	10	2.072E–08	5.3160E–14
Double Falsehood	FALS	11	1.376E–09	<1.0000E–15
Mucedorus	MUCE	11	1.376E–09	<1.0000E–15
Sir John Oldcastle	OLDC	11	1.376E–09	4.8620E–10
The Birth of Merlin	MERL	11	1.376E–09	<1.0000E–15
The Merry Devil of Edmonton	DEVL	11	1.376E–09	<1.0000E–15
Ironside	IRON	12	8.165E–11	<1.0000E–15
Edward III	EDW3	13	4.355E–12	2.6390E–12
Thomas Lord Cromwell	CROM	13	4.355E–12	3.3650E–11
A Yorkshire Tragedy	YKSH	14	2.092E–13	<1.0000E–15
Contention of York, Part 1	YRK1	14	2.092E–13	3.0600E–10
King John, Part 1	KJN1	14	2.092E–13	2.0630E–11
Richard III	RCD3	15	8.438E–15	<1.0000E–15
Taming of a Shrew	TOAS	15	8.438E–15	<1.0000E–15
Famous Victories of Henry V	FVH5	16	<1.000E–15	<1.0000E–15
King John, Part 2	KJN2	16	<1.000E–15	1.5040E–09
The London Prodigal	PROD	16	<1.000E–15	<1.0000E–15
Contention of York, Part 2	YRK2	17	<1.000E–15	<1.0000E–15
The Puritan	PURN	19	<1.000E–15	<1.0000E–15
Woodstock	WOOD	20	<1.000E–15	<1.0000E–15
Faire Em	FAIR	22	<1.000E–15	<1.0000E–15
Locrine	LOCR	22	<1.000E–15	<1.0000E–15
The Second Maiden's Tragedy	MAID	22	<1.000E–15	<1.0000E–15

Of twenty-five plays in the Shakespeare Apocrypha, ranked by increasing discrepancy from Shakespeare, none has fewer than seven Discrete rejections in 48 individual tests. No Apocrypha play comes close to fitting within core Shakespeare profiles by any of the three composite-probability tests used (the three right hand columns). The probability of single Shakespeare authorship seems extremely low for all Apocrypha plays tested. Source: Elliott and Valenza, 2004, Appendix 1.
[a]Shakespeare maximum; [b]Shakespeare minimum.

single-authored Shakespeare work. It tells us that in three ways. The first, the simple rejections count in Column Three of Table 2, reflects the state of our art in 1994. Core Shakespeare had two or fewer rejections per play; all the Apocrypha had seven or more; and sole Shakespeare authorship of any Apocrypha play seemed extremely improbable, though we could not rule out his partial authorship.

The second two ways, which we introduced in 2004, are registered in the last two columns: Discrete and Continuous Probabilities. Both permit a more sophisticated comparison of the tested plays with the least-probable of Core Shakespeare plays by the tests we used. 'Discrete' asked, in effect, 'what are the composite odds that Shakespeare, at his normal rejection rates, could have produced the number of rejections observed?' 'Continuous' asked, in effect, 'What are the composite odds that the tested play would score as far from Shakespeare's mean, in standard deviations, as it did on each of the 48 tests used?' This is a truncated, non-technical summary for people who are more at home with letters than with numbers. A more detailed, eight-page version, with technical language suitable for numerate people, may be found in our 2004, pp. 348–58.[10]

The new numbers, though they come from different starting points and travel very different analytical paths, one much more reliant on human judgment than the other, have turned out to be remarkably convergent and consistent with each other, and with the old evidence, and remarkably free from glaring inconsistencies with external, documentary evidence. They both say essentially the same thing as the old, but more precisely: that the odds of common authorship with Shakespeare are vanishingly low—so low that we had to use scientific notation to avoid getting lost in the zeroes after the decimal point. In terms of Discrete probability, *Sir Thomas More*, taken as a whole, is about 7,000 times less likely to have come by chance from Shakespeare's pen than the farthest outlier of core Shakespeare, that is, any of the seven of Shakespeare's 29 core plays that got two Discrete rejections. In terms of continuous probability, STMO is 3.7 trillion times less likely than Shakespeare's outlier.[11]

Though we played a small part in the Shakespeare Wars and thereby endured years of persistent and intense assault from a few of our critics, no one has successfully challenged these figures, nor taken us up on our bet. We now consider our evidence the stronger for having survived highly adversary scrutiny.

3. Co-Authored Plays from the Shakespeare Fringe

On the other hand, eliminating Shakespeare as a single author of the Apocrypha, does not necessarily eliminate him as a co-author. When we pushed our analysis to shorter and shorter passages and still got usably high accuracy levels (Table 1), the inviting next step was to look at passages from the Shakespeare Fringes. This we did, fully expecting that our optics would be weaker, and the conclusive rejections by astronomical odds much more rare, since the passages were shorter, and single-authorship of any given passage much less assured and much less clearly demarcated. We were not expecting to place thousand-pound bets on our findings. Would our tests even work at all on passages so far from their sweet spot?

Having now tried them on all the Fringe plays but *Timon*, and on some artificial hybrids of plays by Shakespeare, Fletcher, and Peele [for example, a combination of every text block from Shakespeare's *Richard III* and from Peele's *David and Bethsabe*], we believe they are accurate enough to make clear that no such plays were entirely Shakespeare's, to confirm some theories of dates and disprove others, to yield a clearer, more fine-tuned, block-by-block analysis of Shakespeare discrepancy than was previously available, and to provide a kind of second-opinion on the consensus ascriptions of the various plays. In all, we tested 137 blocks with settled expectations, 57 from hybrids with known authors, 80 with consensus ascriptions. All of these blocks but one, the Hand D-plus passages from *Sir Thomas More*, were in the 1,500-word range, long enough for us to expect 96% accuracy with passages by Shakespeare, 88% with non-Shakespeare, from baseline (Table 1). In every case, we calculated Shakespeare discrepancy for each block, ranked all the blocks in ascending order of discrepancy, and then examined them to see whether the actual or ascribed Shakespeare blocks would float to the top, and the non-Shakespeare to the bottom.[12]

The known-authorship hybrids and half of the consensus blocks, that, is, the ones from late plays with known co-authors: *Pericles, Two Noble Kinsmen*, and *Henry VIII*, turned out to be

surprisingly easy. Of 96 such ranked blocks, all the Shakespeare blocks floated to the top, all the non-Shakespeare to the bottom. It is true that two of the known Shakespeare blocks[13] were close-call false negatives by our rules—in the Shakespeare neighborhood, but not in the ballpark—but that is actually a bit better than we would have expected from baseline, and, again, neither of them overlapped with any non-Shakespeare block. The presence of a few borderline Shakespeare blocks like these in our baseline leaves room to argue that moderately discrepant passages like Hand D-plus are not unknown in Shakespeare and therefore possibly, if not probably his, but the space is cramped. The other 98% of the blocks showed surprisingly high convergence between our three composite measures of Shakespeare discrepancy (Discrete, Continuous, and raw rejections) with each other and with the old-optics consensus.

The remaining 41 consensus blocks were harder calls. They were mostly from early plays, often with unknown or uncertain co-authors and a weaker consensus as to who wrote what: *Edward III, Sir Thomas More, Henry VI, Part I*, and *Titus Andronicus*. Our discrepancy rankings were still largely consistent with each other, but only 34 of them (83%) converged with the old-optics consensus, leaving us, and perhaps also the old-optics authorities, a residue of Tough Nuts to Crack, where everyone has to guess how to weigh one set of evidence against another (see note 6 for our list of the residual blocks we consider most in need of closer scrutiny). Our initial inclination, in making such judgments, was to suppose that we, not the consensus, should bear the burden of proof, and to give quality-matched negative evidence much greater weight than positive, regardless of whether it is new-optics or old (Sections 7 and 8, published in part 2, doi:10.1093/llc/fqp030).

4. *Sir Thomas More*'s and *Edward III*'s Conventional Ascriptions

We now return to our initial subset of Tough Nuts, the 'Shakespeare' parts of *Sir Thomas More* and *Edward III*, and we present our results here for the first time in print. These two subsets are commonly and conveniently (though not quite accurately) referred to as the 'Hand D' scene of *Sir Thomas More* and the 'Countess' scenes of *Edward III*. We shall call them 'Hand D-plus' or 'Countess-plus' or 'Shakespeare' scenes (in quotes) here to try to keep cumbrousness and confusion to a minimum.[14] Almost all of the *Edward III* scenes are in verse. Much of the *Sir Thomas More* scene is in prose, but our focus of comparison is overwhelmingly on the verse part, and we so indicate with names like 'Hand D-plus Verse.' Both 'Shakespeare' selections look to us (as *Edward III* looked to MacDonald Jackson) like 'tough nuts to crack', more than sufficiently challenging, suitable in principle for our kind of analysis, and less firmly settled otherwise than many of the others, either by conventional scholarship or by our whole-play findings.

Hand D of *STMO* vaulted into the Shakespeare Dubitanda in 1871, when Richard Simpson thought its handwriting looked like Shakespeare's.[15] 'Most of the great paleographers of the twentieth century have concurred.'[16] In recent memory, two skeptics have supposed that John Webster was the author of Hand D-plus,[17] and some very distinguished scholars have doubted it was Shakespeare, but have not argued for an alternative author.[18] But we believe, following Wells and Taylor,[19] and recent reaffirmations by our favorite authorities,[20] that most scholars would rate it Low Canon or better—less Canonical than *Hamlet*, perhaps, but more accepted than, say, the other-authored sections of *Pericles*, *Titus Andronicus*, *Timon of Athens*, *Henry VI, Part I*, or *Henry VIII*.

Edward III has had an even longer sojourn than *Sir Thomas More* in the no-man's land between clear Shakespeare and clear non-Shakespeare. Catalogers Rogers and Ley first ascribed it to Shakespeare—along with Marlowe's *Edward II*—in a 'wholly unreliable' playlist published in 1656.[21] Edward Capell made the first serious Shakespeare ascription in 1760; and many others of note, including Tennyson, A.W. Ward, Alfred Hart, Kenneth Muir, Fred Lapides, Eric Sams, Georgio Melchiori, Brian Vickers, Stanley Wells, Gary Taylor, and G. Blakemore Evans, have concluded that at least part of *Edward III* is Shakespeare's. Sams and

Lapides thought it was entirely Shakespeare's. Wells and Taylor did not exclude that possibility in 1986, when they assigned it to the High Apocrypha; it's not clear what they thought when they and everyone else elevated it to the Low Canon.

The challenge of cracking these two 'tough nuts' has elicited impressive displays of ingenuity, learning and technique from old-optics Shakespeare regulars, deploying external evidence—documents, quartos, theater records, fair and foul papers, watermarks, and such—and internal evidence—imagery, parallels, vocabulary, verse tests, handwriting, and such.[22] We would not presume to join in this conventional, external-evidence controversy, other than to note that all of it, like our own, is inferential. Instead, we shall present stylometric evidence that the *Edw3* sections, with a bit of tweaking, seems like a could-be for the Canon, but for us the *STMO* Hand D-plus's claim remains problematic.

5. Was Hand D of *Sir Thomas More* Written by Shakespeare? In 1593?

Let us start with the 832 words of verse from the 'Shakespeare' scene of *STMO*.[23] Appendix A1 gives the score ranges of 90 Shakespeare play verse blocks of about 750 words each. Only ten tests give us good mass discrimination between Shakespeare and non-Shakespeare at this level, and only three of our 90 Shakespeare baseline verse blocks have even two Discrete rejections in ten such tests. This amounts to an acceptably-low 3% Discrete false-negative rate for our Shakespeare baseline.[24] This is less reliable than the results we get for whole plays, or even for 3,000-word verse blocks, but it is enough to give us a rough estimate of the odds that Shakespeare could have written at least the verse portion of Hand D-plus.

A streamlined version of Appendix 1, trimmed of non-rejections and concentrating on rejections only, appears below as Table 3.

The first thing to note about both Table 3 and Appendix A1, from which it is drawn, is that there are many fewer tests available for 750-word samples than for whole plays, only ten instead of 48, and that, for Discrete analysis, only five of these are interesting, because only five could justify a Shakespeare rejection. The second thing to note, very much a function of the first, is that the composite probabilities at issue are not so astronomically low that you have to write them with scientific notation. Smaller samples generally mean more variance, wider Shakespeare profiles, fewer usable tests, and fewer of the astronomical, scientific-notated improbabilities that have made us feel safe offering our thousand-pound wager for whole plays (Tables 1 and 2). This is especially so where we have just one very short sample to compare with baseline. All these factors help explain why we think that Shakespeare authorship for Hand D-plus Verse is a tough nut to crack—that is, we think it is less probable than not, but not impossible—while sole Shakespeare authorship for *Sir Thomas More*, as a whole, seems to us neither plausible nor a difficult question to answer (Table 3).

Nevertheless, the third lesson we may draw from Table 3 is that the verse part of Hand D-plus, about 850 words, still gets two to four Shakespeare rejections in our ten tests, depending on when it was written and whether we used manual or machine counts for feminine endings. This is more rejections than one would expect from our Shakespeare baseline of ninety 750-word play-verse blocks. These average less than half a rejection per block and include only three blocks (3%) with even two rejections. Hand D-plus Verse's grade-level is far too high for Shakespeare. Its hyphenated compound word (HCW) percentage is a trifle too low, and needs to be mentioned as a technical rejection, but not to be counted as a real one for reasons explained below. Its open-line percentage, even after correction for possible *Riverside* underpunctuation, is too high for Shakespeare in 1593 (though not too high for 1603). Its BoB5 score is too high for Shakespeare at any time.[25]

These first-impression numbers make it look doubtful, though not impossible, that Shakespeare could have written Hand D-plus Verse, and especially doubtful that he could have written it in 1593, as some have supposed. By Continuous analysis, the composite odds of Shakespeare authorship of Hand D-plus Verse are twenty-six times lower than

Table 3 Five Shakespeare Tests on *STMO*, 'Shakespeare scene'

Sh. 750-word range (auto)	GRL	HCW/ 20K	Fem. End% auto	Open Line% auto	BoB5	Max Rej's Total	Discrete Prob.	Cont. Prob.
Consolidated ranges	3–10	26–236	3–28	6–51	63–712	1		
To 1600			3–23	6–32		1		
From 1600			12–28	12–51		1		
Sh. threshold block	9	51	17	18	469	1	0.3352	0.1172
Hand D+, to 1600	13	24	13	45	765	3	0.0045	0.0045
Hand D+, 1600+	13	24	13	45	765	2	0.0478	0.0045
Sh. Ranges, manual								
To 1600			3–20	6–32				
From 1600			15–38	12–51				
Hand D+, to 1600	13	24	26	33	765	4	0.0003	0.0025
Hand D+, 1600+	13	24	26	33	765	2	0.0478	0.0025

'Shakespeare' verse from *Sir Thomas More* and one Shakespeare 'threshold block' compared to four Shakespeare 750-word verse profiles: early, late, and with both machine and manual counts of feminine endings. Shakespeare's 'threshold block,' R2vs750-7, has only one rejection (not shown). Hand D-plus, if written before 1600, would get three or four rejections (shaded), depending on whether the comparison uses manual or machine counts of feminine endings. If written after 1600, it would get two rejections by either count. Source: Appendix A1. HCW (lighter shade) are considered a technical rejection only, and are not counted as a rejection in any of our composite numbers.

those for his own 'threshold block,' the least typical in-profile Shakespeare block (in this case Verse Block Seven from *Richard II*, 1.04.01–2.01.39, verse only).[26] By Discrete analysis, the raw composite probability of Shakespeare authorship depends on how many rejections we observed, which, in turn, depends on whether we compared the passage to a pre-1600 Shakespeare baseline or to a post-1600 one, and whether we machine-counted or hand-counted feminine endings.[27] Table 3 and Appendix A1 give all four variants, with three or four rejections for Hand D-plus Verse if compared with Shakespeare's 1590s' profiles, but only two if compared with his 1600s' profiles. Four rejections in ten tests, at Shakespeare's observed 4% rejection rate for 750-word verse blocks, mean that the passage is 1,200 times less likely to have come from Shakespeare by chance than the threshold block. Three rejections means it is 75 times less likely to be Shakespeare's (see Appendix A1). Neither seems to us particularly favorable for a Shakespeare ascription, though they don't quite say it is impossible. Two rejections would mean about seven times less likely than the threshold block, a close call, but one that still, on balance, argues against a Shakespeare ascription.[28] Roughly speaking, at this level, each additional rejection reduces relative Shakespeare probability by one order of magnitude.

We believe that these figures argue strongly against the theory that Hand D-Plus was written in 1592–93, when everyone thinks the original *Sir Thomas More* was first submitted to Sir Edmund Tilney, Master of the Revels. Tilney called for drastic excisions, and the play appears to have been shelved for many years. Hand D-plus Verse's line-ending counts are too high for early Shakespeare, making the early-dating theory, in our view, an order or two of magnitude less likely than the theory that it was written around 1603 in an attempt to revive an old, unperformed play. Correcting for manual feminine-endings counts, as we have seen from Table 3, only makes this problem worse. One could argue that open lines could be more a reflection of the editor's tastes than of the author's, but the rejection persists even after re-editing for possible *Riverside* under-punctuation. We conclude that Shakespeare authorship of Hand D-plus Verse after 1600 is an order or two of magnitude more credible than before 1600.

What about the remaining three rejections, Hand D-plus Verse's too-high grade-level scores, its just-too-low HCW percentage, and its slightly too-high BoB5 score, which match neither early nor late

Shakespeare? One of these we dropped immediately, the low HCW percentage. It is technically a rejection by our rules, but our HCW standard was already loose at this sample-length level and the violation of it was an accident of Hand D-plus Verse, at 832 words, being slightly oversize and coming out with marginally fewer HCW's per 20,000 words than our baseline 750-word samples which, like Hand D-plus Verse, had just one HCW. When we rechecked, we found that 29% of our 90 baseline Shakespeare 750-word play-verse blocks had no more than one HCW.[29] Twenty-nine percent of a population is hardly atypical in the way that 0% or 1% or 5% might be, and, hence, the nominal rejection does not provide a strong foundation for an argument that the odds that that sample belongs to the population are low. Therefore, we decided that the low-looking HCW score was not a real Shakespeare distinguisher, and we have not counted it as a meaningful rejection.

However, the other two rejections fall into the 0% or 1% brackets and still seem to us a real problem, even after a bit of deflation by MacDonald Jackson, who has always been among the most prompt and discerning of our critics (below). Only one of our ninety play-verse blocks has a grade-level score higher than the twelfth-grade observed for Hand D-plus Verse; the next-highest are three eleventh-grade blocks. And, again, it seems unlikely that the difference could be the editor, since both our Hand D-plus sample and our Shakespeare baseline are taken from the *Riverside Shakespeare*.[30] Could there be some other reason that Shakespeare would wander a full standard deviation outside his normal play-verse range of third-to-tenth grade and lengthen his words and sentences to a level often found in his poems (eighth-to-sixteenth grade) but almost never in his play verse? Jackson suggests textual disturbances preserved too faithfully in the *Riverside* may have inflated the grade-level score, and it could be so, but every other version we have tested is even worse, so it is not obviously so. No other plausible explanation has occurred to us, but it is possible that others more wedded to the Shakespeare ascription could think one up. What the rejection means, at bottom, is that grade-level is still a significant prima facie obstacle to a Shakespeare ascription, and seems likely to remain so unless defenders of the ascription can think up more convincing ways to explain it away.

As for the other strong rejection, BoB5, none of our ninety Shakespeare play-verse blocks, nor any of our fifty-four Shakespeare 750-word poem blocks, has a BoB5 reading as high as Hand D-plus Verse's 765. The nearest Shakespeare play-verse block approach is one block with a 712, and four blocks in the 600s.[31] Only three 750-word verse blocks of 84 in our entire non-Shakespeare collection have higher, less Middletonian, more old-fashioned scores than Hand D-plus Verse. Two of these are from George Peele's *David and Bethsabe* (1594), and one is from John Ford's *Fame's Memorial* (1606). Could it have something to do with subject matter that would produce such a surfeit of Shakespeare's favorite-word 'badges' and such a deficit of Middleton's favorite-word 'flukes?' Again, we see no obvious explanation for the decisive Shakespeare rejection, but, of course, that does not mean that there is none. We do believe, as with grade level, that the rejection is too glaring for defenders of the Shakespeare ascription to ignore. The starting point for a critique might be a look at the description of the test, in note 25, and perhaps also a look at a few of the highest-scoring baseline blocks.[32] Do they have anything in common?

It is worth noting that BoB5 contrasts Shakespeare's distinctive, favorite-word 'badges' with Middleton's distinctive, favorite-word 'flukes,' and that Middleton's language was generally more modern and filled with contractions and colloquialisms than Shakespeare's. Could the radically non-Middletonian language of Hand D-plus Verse be whispering '1590s' of the same passage whose many open lines and feminine endings scream '1600s?' We doubt it. It was Hand D's relative frequency of contractions and later usages that led MacDonald Jackson to assign it to the seventeenth century.[33] Could it be a matter of subject matter, such as the presumptively all-male cast of the Hand D mob scene? Hand D-plus Verse has a dozen *he* variants, *he*, *his*, and *him*, but no *she* variants, *she* or *her*. All the former are Shakespeare badges relative to Middleton; the latter are flukes. You would think it could throw off the test—but a crude test of the

first five Shakespeare blocks we could find with many *he* variants and no *she* variants (*Ant*750-8; *Lr*750-6; *R2*750-15, 16, and 19) says the problem is not crippling. None of these *he*-loaded passages had fewer than twelve *he* variants nor any *she* variants, yet their BoB5 scores were all in the 300s, well within our Shakespeare profile, and not in the 700s like Hand D-plus Verse. The reason we bundled badges and flukes was to smooth out such variances in individual word frequencies by aggregating the badges and flukes into sizeable bundles and letting the law of large numbers average out the ripples to help us get a better view of the tides. In this case, it seems to have worked.[34]

BoB5 does show differences between playwrights. For whole plays, Shakespeare's average BoB5 score was 298, lower than older writers Greene (346) or Marlowe (365), but two or three times higher than younger writers such as Fletcher (112) or Middleton himself (109).[35] If there were only two claimant authors for Hand D-plus Verse, Shakespeare and Middleton, its improbably high BoB5 score would be a resounding rejection for Middleton and a 'hyper-rejection' for Shakespeare, 'more Shakespeare than Shakespeare,' and, hence, much more damaging to the case for Middleton than to the case for Shakespeare.[36] Unfortunately, the alternative in this case is not a known Middleton but an unknown 'other-than-Shakespeare,' and the gross departure from Shakespeare's norms, unless somehow plausibly explained, remains damaging to his case.

The problems discussed here, of 'narrow,' 'technical,' and 'gross' rejections, and 'hyper-rejections,' are problems typical of Discrete analysis, Elliott's favorite. They are not problems at all for Valenza's favorite, Continuous analysis. Instead of counting only the tests where the sample score was outside the boundaries of our Shakespeare profile, Continuous analysis aggregates the sample text's composite of statistical *distances* from Shakespeare's composite mean on every test, and compares it with those of Shakespeare's threshold block.[37] *Distances* from the baseline composite mean, not profile *boundaries*, are the issue. Every test is considered; little information is left out, and the task of figuring out what discrepancies have to be explained becomes a bit more quantitative and a bit less qualitative.[38] As we have seen, Continuous analysis, which in our case does not adjust profiles by time and, hence, misses the glaring line-ending rejections against 1590s' profiles, nevertheless says that Hand D-plus Verse is twenty-six times less likely to be Shakespeare's than Shakespeare's own profile-threshold block.

Our bottom-line estimate for Hand D-plus: If it was written in 1603, and its discrepancies are not otherwise explained away, the verse portion of it is seven to twenty-six times less likely to be Shakespeare's than Shakespeare's farthest-outlier threshold block. If it was written in 1593 and its discrepancies are not explained away, the verse portion of it is 75–1200 times less likely to be Shakespeare's than Shakespeare's threshold block. If this is so, prima facie, of the easy-to-test verse portion, we would expect it to be true also of the harder-to-test prose portion, entered in the same addition in the same hand, to all appearances at the same time.

These numbers say that Hand D is a harder call than, say, the whole of *Sir Thomas More* or the *Funeral Elegy*, both of which are statistically on different planets from Shakespeare, while Hand D, under various assumptions, could be in the same town, county or state. But being in the same town, county, or state is not the same as being in the same ballpark with 97% of our pertinent Shakespeare play-verse baseline blocks, if Hand D were written in 1603. No pre-1600 Shakespeare block in our baseline is as Shakespeare-discrepant as Hand D. The available odds still weigh against it under 1603 Shakespeare profiles, and strongly against it under 1593 Shakespeare profiles.[39]

Another way of understanding these odds is this: Shakespeare at his fastest could turn out two plays a year, which means about one block per week the size of Hand D-plus Verse. Only 3% of our ninety baseline Shakespeare 750-word play verse blocks have Discrete probabilities as low as Hand D-plus Verse/1600s. Only 4% have such a low Continuous probability. Only 2% have both Discrete and Continuous probabilities as low as Hand D-plus Verse/1600s. That means Shakespeare, at his best, would have had to write for an entire year to

produce one block as different from the rest as Hand D-plus Verse/1600s—along with fifty-one other, more typical blocks. Not a single block in our baseline is as atypical of Shakespeare's 1590s' writing style as Hand D-plus Verse/1590s. It could have taken him a lifetime or more to have written a block so much at odds with his 1590s' habits.

That said, we should caution that we are not betting a thousand pounds on this one for several reasons: it's a much closer call than whole plays; we don't have the comforting, astronomical safety margins; we haven't heard the rest of our critics' qualitative rejoinders (if any) to our evidence; and the quantitative case is a close enough call that convincing qualitative responses could make a difference. If this is so, subjective judgment could then be the deciding factor, and, unlike our bet on finding a whole play that passes our Shakespeare tests, there might well be no objective way to tell who won or lost the bet. On the other hand, suppose that this were a quiz show, that the quizmaster had perfect knowledge of who wrote the passage and when, and we had to choose between Shakespeare and non-Shakespeare. On present evidence, we would have to bet on non-Shakespeare because the passage is too atypical of Shakespeare's verse in the 1600s, and far too atypical of Shakespeare's verse in the 1590s, and none of the atypicalities have been explained away. Till they are, we think that, on the numbers, the 'Shakespeare scene' of *Sir Thomas More* belongs more toward the top of the Apocrypha than the bottom of the Canon.

How does this conclusion compare with those of other recent examinations of Hand D-plus? It is substantially at odds with those of three of our favorite authorship experts and mentors, two of whom were not simply recapitulating the traditional arguments, but applying important new methods of their own. The first and most famous is Sir Brian Vickers, using mostly traditional arguments.[40] The second, and least famous, but also one with the most intriguing new methods never before applied to Hand D-plus, is Marina Tarlinskaja. She wrote two articles for the same *Shakespeare Yearbook* volume on the Apocrypha as that for which we wrote our pilot version of this article. Like our pilot article, one of these was accepted but postponed for technical reasons, and neither has been published. But she did send us working-paper drafts too pertinent to our work to escape mention here. The first manuscript, 'Munday, Chettle, Shakespeare, and More,' is the more detailed and relevant. In it, after fifty-five pages of detailed versometric analysis of plays by Munday and Chettle, and of other sections of STMO, she applied eight verse tests to Hand D-plus Verse: percentage of *rhymed lines, run-on lines*, and *feminine endings*; *word boundaries*, *syntactic breaks*, *stressing*, *enclitic phrases*, and '*rhythmical italics*'.[41] Most of her tests seemed to rule out Munday and Chettle as arguable authors of Hand D-plus. They also ruled out early Shakespeare, but not Shakespeare as of about the time of *Othello* and *King Lear*, that is, 1603–06. If she found a Shakespeare rejection for Hand D-plus, it would have been the percentage of *word boundaries* after position 4, which she considered too high for Shakespeare, but this might be explainable, she thinks, by Hand D-plus's being an oratorical soliloquy.[42] We think she has made a persuasive case that Hand D-plus is more like later Shakespeare than like earlier Shakespeare, or like Munday or Chettle, and her evidence on these points is consistent with ours and with MacDonald Jackson's. But the many resemblances are only half the case that Shakespeare must actually have written Hand D around 1603. The other half is dealing with contrary evidence, and that, so far, has been more thoroughly addressed by MacDonald Jackson than by anyone else.

As we have seen, Jackson offered both a new affirmative case for Hand D plus as Shakespeare's, using both traditional evidence and LION links, and a probing set of direct rejoinders to our negative evidence.[43] We thought his LION-link evidence was a significant contribution to the case for the affirmative, giving his 'unique quirks' arguments more than just rhetorical support, and at least two of his rejoinder-discounts seemed plausible enough to call for further testing on our part—but not enough, after the further testing, to adjust Hand D-plus into Shakespeare's normal range.[44] His clincher was a Bayesian argument that one-factor probability estimates can mislead where two factors are involved. The principle he invokes is true.

If we knew that the test for West Nile disease is 96.7% accurate, but also that 99.9% of the population doesn't have the disease, the actual odds that someone who tests positive has the disease are not 96.7%, but 2.2%. It would also be true that, even if someone's test is 96.7% accurate in accepting known Shakespeare, getting a rejection on it doesn't mean that Hand D-plus has only a 3.3% chance of being Shakespeare's, if independent evidence makes it otherwise 99.9% certain that it is Shakespeare. In that case, just as with West Nile, there would be only a 2.2% chance that it is not Shakespeare!

The problem with this is the supposed 99.9% Shakespeare certainty, independently arrived at with 'rigor, but also flair, common sense, an acute intuition, a fair dose of expertise, and a refined imagination'[45]—i.e., pulled from an illustrious mentor's proprietary black box. We have no objection to black boxes if they are validated; and Jackson's intuition, from our perspective, has to be one of the best in the world, since it is in 99.9% overall agreement with our own not-so-intuitive, massively validated, new-optics evidence. But the three exceptions are big ones; this is one of them;[46] and we think in this case that the affirmative evidence is still too soft, and the negative too strong, to support such a high level of assurance.

Against our mentors' unanimous opinion, besides our own evidence, must be set that of some major scholarly skeptics,[47] plus another recent, small-baseline, black-box indicator which looks very powerful at first glance, but is so new that no one knows quite how to weigh it: the collective intuition of our twenty-three-member Shakespeare Golden Ear Elite Panel. These sharp-eared intuitives are hardly as famous as our mentors, but they were the highest scorers of 310 tested on our online Golden Ear tests in 2007–08; their group accuracy with texts of known authorship is well-documented and remarkably high, 90%, and three-quarters of them (not including the few who recognized it) thought that a sonnet-length snippet of Hand D-plus did not sound like Shakespeare.[48]

So how does our evidence weigh against that of our mentors and the current consensus? A short answer is that it is consistent on everything but the central question of whether Shakespeare could have written Hand D at any time. Like Jackson, Tarlinskaja, and the rest, we see no way that Shakespeare could have written the whole of *Sir Thomas More*, and no very plausible way he could have written the Hand D-plus section in 1593. We depart from the consensus in doubting that Shakespeare is a likely author of Hand D-plus even after 1600. Our problem is that we have found too much discrepancy to support a likely Shakespeare ascription and, though Jackson has plausibly explained away some of the discrepancy, we don't think that he has gotten it all.

Hand D-plus does bear many soft strands of resemblances to Shakespeare, so many that scholars have supposed that their sheer numbers, in convergence, are enough to harden them. [49] Jackson and Tarlinksaja added yet more such strands. So do we, for that matter, since more of our tests accept Hand D-plus as a Shakespeare *could-be* than reject it. But for us a jigger of hard *couldn't-be*'s is enough to outweigh a gallon of soft *could-be*'s. It is one thing to suppose that convergence hardens all those many strands of soft evidence when they all actually converge. It is another to consider them hardened when there is not-so-soft evidence which does not converge. Six to eight of our own ten tests 'converged' in putting Hand D-plus into Shakespeare's range, but the last two-to-four don't fit, nor does the Elite Panel's verdict. In our view, the many soft could-be's are trumped by the few harder couldn't-be's, and it is the negative evidence that tells the real story: the shoe doesn't quite fit, and it's damaging to the argument that the girl is Cinderella, even if the eyes, the hair, the height, and the blood type are perfect matches.

We don't want to overstate the hardness of our evidence at this level, nor the softness of the positive evidence for Shakespeare. Hand D plus still seems to us an improbable but not impossible Shakespeare ascription. We are not asking anyone to banish it from the Complete Works or taboo further discussion of it, and we aren't betting a thousand pounds on it. But, again, if this were a quiz show and the quizmaster had perfect knowledge of who wrote the passage and when, and we had to choose between Shakespeare and non-Shakespeare, we would

hesitate to bet on Shakespeare. It's too atypical of Shakespeare, even in the 1600s, and far too atypical for the 1590s. Not all the discrepancies have been explained away, and the self-confirming Bayesian arguments haven't fixed it. Till they are, on the numbers, the 'Shakespeare scene' of *Sir Thomas More* is still a Shakespeare longshot which belongs more properly in the High Apocrypha than in the Low Canon. We would also suppose that the newest evidence has done more to weaken the case for Hand D-plus than to strengthen it; that it still should be considered a tough nut to crack; and that, for now, the best resolution of the conflicting evidence would be greater willingness on both sides to confess uncertainty.

[To be concluded in doi:10.1093/llc/fqp030].

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References

Blayney, P. W. M. (1972). The Booke of Sir Thomas More re-examined. *Studies in Philology*, **69**: 167–191.

Chillington, C. A. (1980). Playwrights at work: Henslowe's, not Shakespeare's *Book of Sir Thomas More*. *English Literary Renaissance*, **10**: 439–479.

Dobson, M. and Wells, S. (2001). *The Oxford Companion to Shakespeare*. Oxford: Oxford University Press.

Elliott, W. E. Y. and Valenza, R. (1996). And then there were none: winnowing the Shakespeare claimants. *Computers and the Humanities*, **30**: 191–245.

Elliott, W. E. Y. and Valenza, R. (2004). 'Oxford by the Numbers: What are the Odds that the Earl of Oxford Could Have Written Shakespeare's Poems and Plays?'. *Tennessee Law Review*, **72**(1): 323–454.

Elliott, W. E. Y. and Valenza, R. (2008). ''Shakespeare by Ear: What Can Intuition Tell Us About What He Wrote?''. *The Shakespeare Newsletter*, **57**(Winter 2007/08): 99–117.

Evans, G. B., et al. (eds) (1997 [1974]). *The Riverside Shakespeare*. Boston: Houghton Mifflin Company.

Forker, C. R. (1989). Webster or Shakespeare? Style, Idiom, vocabulary, and spelling in the additions to Sir Thomas More. In Howard-Hill, T. H. (ed.), *Shakespeare and Sir Thomas More: Essays on the Play and its Shakespearean Interest*. Cambridge: Cambridge University Press, pp. 151–70.

Hays, M. L. (1975). Shakespeare's Hand in *Sir Thomas More*: Some Aspects of the Paleographic Argument. *Shakespeare Studies*, **8**: 241–53.

Howard-Hill, T. H. (ed.) (1989). *Shakespeare and Sir Thomas More: Essays on the Play and its Shakespearean Interest*. Cambridge: Cambridge University Press.

Jackson, M. P. (1978). Linguistic evidence for the date of Shakespeare's additions to *Sir Thomas More*. *Notes and Queries*, **223**: 155–6.

Jackson, M. P. (1981). Hand D of Sir Thomas More. *Notes and Queries*, **226**: 146.

Jackson, M. P. (2003). *Defining Shakespeare: Pericles as Test Case*. Oxford: Oxford University Press.

Jackson, M. P. (2006a). The date and authorship of Hand D's contribution to *Sir Thomas More*: evidence from 'literature online'. *Shakespeare Survey*, **59**: 69–78.

Jackson, M. P. (2006b). Shakespeare and the quarrel scene in *Arden of Faversham*. *Shakespeare Quarterly*, **57**(Fall): 249–93.

Jackson, M. P. (2007). Is 'Hand D' of Sir Thomas More Shakespeare's? Thomas Bayes and the Elliott-Valenza authorship tests. *Early Modern Literature Studies*, **12.3**(January): 1–36.

Lake, D. J. (1977). The date of the Sir Thomas More additions by Dekker and Shakespeare. *Notes and Queries*, **222**: 114–6.

Metz, G. H. (1989). 'Voice and Credyt': The Scholars and Sir Thomas More. In Howard-Hill, T. H. (ed.), *Shakespeare and Sir Thomas More: Essays on the Play and its Shakespearean Interest*. Cambridge: Cambridge University Press, pp. 11–44.

Rosenbaum, R. (2006). *The Shakespeare Wars: Clashing Scholars, Public Fiascoes, Palace Coups*. New York: Random House.

Simpson, R. (1871). 'Are there any extant MSS. in Shakespeare's handwriting?'. *Notes and Queries*, **4**: 1–3.

Tarlinskaja, M. (1987). *Shakespeare's Verse: Iambic Pentameter and the Poet's Idiosyncrasies*. New York: P. Lang.

Tarlinskaja, M. (2006a). Shakespeare Among Others in *Edward III* and *Sir Thomas More*: from Meter to Authorship. Manuscript, Seattle, Washington.

Tarlinskaja, M. (2006b). Munday, Chettle, Shakespeare, and More: The Huntington Plays and *Sir Thomas More*. Manuscript, Seattle, WA.

Taylor, G. (1989). 'The Date and Auspices of the additions to Sir Thomas More'. In Howard-Hill, T. H. (ed.), *Shakespeare and Sir Thomas More: Essays on the Play and Its Shakespearean Interest*. Cambridge: Cambridge University Press, pp. 101–29.

Taylor, G. (1995). Shakespeare and others: the authorship of Henry the Sixth, Part One. *Medieval and Renaissance Drama in England*, **7**: 145–205.

Vickers, B. (2002a). *'Counterfeiting' Shakespeare: Evidence, Authorship, and John Ford's Funerall Elegye*. Cambridge: Cambridge University Press.

Vickers, B. (2002b). *Shakespeare, Co-author: a Historical Study of Five Collaborative Plays*. Oxford: Oxford University Press.

Wells, S. W., Taylor, G., Jowett, J. and Montgomery, W. (1987). *William Shakespeare, a Textual Companion*. Oxford: Clarendon Press.

Werstine, P. (1999). Shakespeare, *More* and less: A.W. Pollard and twentieth-century Shakespeare editing. *Florilegium*, **16**: 125–45.

Williams, G. W. (1982). The year's contributions to Shakespearean study: textual studies. *Shakespeare Survey*, **35**: 190.

Notes

1 This essay was originally written for a *Shakespeare Yearbook* symposium on the Shakespeare Apocrypha, but it got postponed several years for technical reasons, and ultimately released for publication elsewhere when the editor's tragic illness and death cast doubt on the future of the *SYB*.

2 For example, Vickers (2002a,b); Jackson (2003); and Taylor (1995).

3 See Rosenbaum (2006).

4 Our 'core Shakespeare' plays are: *Richard III*; *The Taming of the Shrew*; *Two Gentlemen of Verona*; *The Comedy of Errors*; *Richard II*; *Love's Labor's Lost*; *King John*; *A Midsummer Night's Dream*; *Romeo and Juliet*; *Henry IV*, *Parts I and II*; *The Merry Wives of Windsor*; *The Merchant of Venice*; *Julius Caesar*; *Much Ado About Nothing*; *As You Like It*; *Hamlet*; *Twelfth Night*; *Troilus and Cressida*; *Measure for Measure*; *All's Well that Ends Well*; *Othello*; *King Lear*; *Macbeth*; *Antony and Cleopatra*; *Coriolanus*; *Cymbeline*; *The Tempest*; and *A Winter's Tale*. We did not consider the forty-one Middleton 'Hecate' lines in *Macbeth* enough to justify moving the other 98% of the play out of the core. We cut out the forty-one lines and kept the rest of the play in baseline. Like other Core Shakespeare plays, the purged *Macbeth* got only one rejection in our forty-eight tests.

5 Jackson (2006a).

6 After applying our new-optics tests to all of the Fringes except *Timon of Athens*, which is deemed too thoroughly intermingled to tackle at all with our methods, and in no particular order, our top-ten list of still-problematic tough-nut blocks include the following: *Edw3*, 4.04 and 4.05–4.09; *Sir Thomas More*, Hand D-plus; *Titus Andronicus*, 1.01.258 to end; 2.01–2.02, and 4.01; *Henry VI, Part I*, 2.01–2.03, 1.03.69–1.06, 4.02–4.04, and 4.05–.4.07.32. We consider the first three here, the others in our long working paper on the Fringes, which is available on request.

7 Elliott and Valenza (1996).

8 Elliott and Valenza (2004).

9 People who would like to accept our bet are free to pre-test as many untested plays as they wish, using our software, so the only real cost to them would be the time costs of however much pre-testing they had to do to find a match. Our guess is that these would be high,

and that they would still not find a match, but it's only a guess. We have tested more than 80 of the 400 or so single-authored plays of Shakespeare's lifetime, mostly by Shakespeare Claimants. Another 146 are by the same Claimant playwrights we have already tested, leaving a residue of eighty or so where we have tested neither play nor author—but these are the very ones that no one, in 400 years of desperately seeking Shakespeare, has ever associated with Shakespeare. If one of these turned out to match Shakespeare, it would be either a small exception to our known results or the Lost Shakespeare itself found at last. Either of these would be a tremendous bargain for a thousand pounds.

10 For example, '[W]henever we say 'written by chance,' in lay language, we ... refer to the odds that the specific features for which we test could have arisen by chance assuming the statistics and modeling that we have imputed to the baseline.' Our 2004, p. 338.

11 That is, the seven least typical Core Shakespeare plays, including *Hamlet* and *The Tempest*, among others, had a Discrete rejection probability of 2.316×10^{-1}. This probability, divided by *STMO*'s Discrete rejection probability of $3.323 \times 10^{-5} = 6.9696 \times 10^{3} = 6{,}967$ times less likely than *The Tempest* to have come from Shakespeare's pen by chance. For Continuous Composite Probability, the Core Shakespeare threshold outlier is also *The Tempest*, with a probability of 3.6895×10^{-3}. *Sir Thomas More*'s Continuous Composite Probability is less than 1×10^{-15}, too low to compute with standard, double-precision PC software, and far lower than the odds of being hit by lightning. *STMO* is therefore at least $3.7 \times 10^{12} =$ 3.7 trillion times less likely than *The Tempest* to have come from Shakespeare's pen by chance.

12 We also tested sixteen blocks for which we know of no consensus, fifteen from *Henry VI, Part III*, and one from *Arden of Faversham*.

13 Both of the close calls were from High-Canon plays, *Richard III* and *King John*.

14 'Hand D', technically described as 'Addition II' to the *STMO* manuscript, is one of six different hands found in the much-amended manuscript play *Sir Thomas More* (British Library, Harleian MS 7368). The other hands were Hand S (Anthony Munday); Hand A (Henry Chettle); Hand B (probably Thomas Heywood); Hand C (an unidentified scribe); and Hand E (Thomas Dekker). Evans *et al.* (1997, p. 1775). Several respected paleographers have judged that Hand D is Shakespeare's. Vickers (2002a, p. 39). Most Shakespeare scholars think from internal evidence that Shakespeare was not just the scribe, but also the author of the 147-line Hand D section. They also think that 'Addition III,' twenty-one further lines in a different hand (C), and pasted into the MS some lines after the Hand D section, is Shakespeare's. Evans *et al.* (1997, pp. 1775–9); Wells *et al.* (1987, pp. 124–5); Howard-Hill (1989); Gabrieli and Melchiori (1990); Jackson (1981, 2006a, 2007); Vickers (2002b, pp 39–43). Jackson (2007) is particularly useful, both for recapitulating and re-evaluating older 'unique resemblance' arguments for Hand D-plus's Shakespeare authorship (such as handwriting and spelling) and also for adding LION-linked word-echoes of his own, whose uniqueness he could check against the entire LION (Literature Online) database. We take his LION-link-validated uniqueness claims much more seriously than other such claims without such a broad validation.

The 'Shakespeare' sections of *STMO*, Hand D and Addition III, are commonly lumped together as 'Hand D.' If we were Shakespeare regulars, we would probably follow this handy, imprecise convention in preference to using the cumbrous 'Additions II and III.' Everyone would know what it meant. But we are newcomers offering strange new methods for covering sensitive territory, and think it wisest to use terms like ''Shakespeare' scene' or 'Hand D-plus.' Where the reference actually is to Hand D alone, we can call it 'Hand D proper.' Our actual preferred unit of analysis is the verse lines of 'Hand D-plus,' referred to as 'Hand D-plus Verse.'

Something similar may be said of the 'Shakespeare' scenes of *Edward III*, identified for us by G. Blakemore Evans in 1996. These are 1.02 (that is, Act I, Scene 2); 2.01; 2.02; and 4.04. All but 4.04 involve the Countess of Salisbury, being hotly but to all appearances vainly, pursued by King Edward, and most people use the shorthand 'Countess scenes' to describe all four scenes. Since the Countess does not appear in 4.04, where Prince Edward, surrounded by a huge French army, shrugs off their invitations to surrender and prepares to do battle, we shall likewise use something like 'Countess-plus' or ''Shakespeare' scenes' for all of Shakespeare's supposed contributions and 'Countess-proper' for scenes where she appears.

15 Simpson (1871).

16 Wells *et al.* (1987, p. 39).

17 Chillington (1980); *accord*, Williams (1982); but see Forker (1989).

18 Werstine (1999); Hays (1975).

19 Wells *et al.* (1987, p. 125).

20 Vickers (2002b, pp. 39–45); Jackson (2006, 2007); Tarlinskaja (2006a,b).

21 Dobson and Wells (2001, p. 124).
22 Metz (1989); Wells *et al.* (1987).
23 But not the entire 1,394-word verse-and-prose selection of Hand D-plus, since four of our ten validated tests at this block-size level apply to verse only.
24 By contrast, 75% of non-Shakespeare verse blocks of the same size are rejected by the same rules, for a net discrimination rate of 72%. Elliott and Valenza (2004, p. 357, Appendix Eight). 'Net discrimination' is the percentage of true Shakespeare positives, 97%, minus false positives for non-Shakespeare, 25%, which then is 72%.
25 BoB5, based on a Shakespeare-Middleton comparison (between *Macbeth*, 1605, and *The Witch*, 1616), used *the*, *is*, *to*, *you*, *he*, *his*, *your*, *we*, *him*, *as*, and *an* for Shakespeare badges (that is, words more common with him than with Middleton). It used *a*, *sir*, *I*, *now*, *I'll*, *'tis*, *all*, *come*, *her*, and *she* for Shakespeare flukes (words less common with Shakespeare than with Middleton). Our test procedure was to 'bundle' the sums of badges and flukes, subtract flukes from badges, and divide the result by the sum of all badges and flukes. The formula is: badges minus flukes, divided by badges plus flukes, times 1000. BoB5, though derived from a Shakespeare-Middleton comparison, also distinguishes Shakespeare from many other authors (our 1996, p. 196).
26 That is, our Shakespeare threshold-block's Composite probability of 0.1171 divided by observed Hand D-plus Verse's Composite probability of $0.0047 = 24.9$ (see Table 3).
27 A feminine ending is a verse line ending with an unstressed syllable; for example, *coming*; *gotten*; *woman*. We used our generic machine counter for all comparisons, but cross-checked with slower, more accurate manual counts for Hand D-plus Verse, with essentially the same profiles and outcomes. The early ranges were auto: 2–23; manual: 3–20. The late ranges were auto: 12–28, manual, 15–38. The only effect of adding a manual recount was to incur yet another Discrete rejection for Hand D-plus Verse when compared to our early-Shakespeare profile. Our other line-ending machine count, open lines, exactly matches manual counts of the same edition and does not need a manual cross-check.
28 In every case, to find relative Shakespeare probability, we divide the Shakespeare threshold block's raw probability, 0.3352, by the sample block's raw probability, let us say, 0.05815 for two rejections, giving the sample block a probability 5.76 times lower than the threshold. See note 37 for a definition of threshold and boundary blocks. We make no claim that raw probability estimates define absolute authorship odds, but *relative* probabilities, compared with Shakespeare's own threshold blocks, can be very telling. See our (2004, pp. 348–56).
29 See our (2004, Appendix Eight). Ten percent had no HCW's at all.
30 The alternative we chose was to run the same grade-level test on someone else's edition of Hand D-plus, that of Tom Merriam and Lou Ule. Its recorded grade-level score was even higher than the *Riverside*, fourth-grade, four standard deviations distant from Shakespeare's pertinent median of sixth-grade. We also tested the *Riverside* Hand D Proper Verse, stripped of the twenty-one lines in Hand C. The results, summarized in Appendix 1, were essentially the same as those of Hand D-plus Verse. More could be done with grade level, such as a comparison of repunctuations of Hand D-plus by us and its principal Shakespeare ascribers, or, better, further examination of yet other versions—Oxford, Variorum, RSC, Bevington, etc.—by scholars with less of a stake in the outcome than the parties now most involved. Would the resultant ranges be more favorable to a Shakespeare ascription than what we have now? Perhaps. But this kind of analysis is only in its earliest stages.

We also did several follow-on tests in response to Jackson (2007). Jackson's article, based on our earlier unpublished working paper, is the best critique of our methods that we have yet seen. His most powerful argument was that our grade-level and BoB5 tests are 'black boxes' which can't easily be deconstructed and replicated by hand (which is mostly true) and that they must therefore be considered dubious when applied to passages like Hand D-plus with disturbed text and a subject matter, of a confrontation with a male mob, which could give artificially high BoB5 readings by multiplying 'badges,' such as *he* and *you* variants and minimizing 'flukes,' such as *she* variants (see note 25 for a definition of BoB5). Both of these could be so, we think, but probably not enough so to rescue Hand D-plus Verse from being a gross outlier from our Shakespeare baseline. We have already seen that using other editions than the *Riverside* only increased the grade-level discrepancy (above). Our spot check of several Shakespeare passages with many *he* variants, and no *she* variants at all, turned up none with BoB5 scores nearly as high as HDPV's. Our second spot check of seven Shakespeare mob-confrontation scenes did turn up twice as many *you* variants as Shakespeare's average, and significantly higher BoB5 scores, exactly as Jackson

supposed, but only one of the seven had a BoB5 score in HDPV's range, and none had grade-level scores approaching HDPV's level. In the current draft of our ongoing Shakespeare Fringes working paper, available on request, we devote fifteen pages to a fuller exploration of Jackson's points, and the grade-level issue is still to be fully explored, but so far we haven't been able to deflate the passage's Shakespeare discrepancy enough to make HDP an easy Shakespeare could-be. We also addressed several arguments that we consider less convincing: that our Shakespeare data base was too small (ours is twenty times larger than the ones he used); that it didn't have enough histories or tragedies (it did); that it didn't have set-asides (it had several); and that Bayesian analysis would greatly change the outcome (it could, but only if your black-box intuition tells you in advance that it's Shakespeare with 99.9% certainty, and only if you believe it). We are very much in Jackson's debt for his prompt and characteristically genial, thoughtful, and penetrating analysis of our pilot working paper, but, even after due deflation, so far, we still think that Hand D-plus has too much discrepancy to make it a probable Shakespeare ascription, far less a 99.9% probable one.

31 See our (2004, Appendix Eight).

32 See our (2004, pp. 438–46).

33 Jackson (1978, pp. 155–6).

34 See note 30 above for our response to Jackson's argument that BoB5 scores should be higher in mob-confrontation scenes like Hand D-plus. They are, but not enough to make Hand D-plus an easy Shakespeare could-be.

35 Our (1996, p. 219).

36 See our (2004, p. 351, note 61).

37 For Discrete analysis, *boundary blocks* for each individual test are chosen by eye, Elliott's eye, to mark the outer boundary of the Shakespeare baseline profile, and at a level designed to say 'could-be' to at least 95% of the Shakespeare baseline. For Continuous analysis, no boundaries or thresholds are computed for individual tests. What is interesting for Continuous is not *whether a block exceeds a boundary*, but *how far it lies from the test's Shakespeare mean*. For *composite* scores, both Discrete and Continuous, baseline *threshold blocks* are chosen automatically by a formula designed to *maximize discrimination* between Shakespeare and non-Shakespeare. The threshold block introduces a kind of composite working boundary to Continuous, which otherwise does not rely on boundaries. In both cases, the threshold block is the most atypical, least Shakespearean block which is still inside the baseline profile. With its original threshold, used in this article, Continuous rejects 16% of 1,500-word blocks known to be by Shakespeare. In our long Fringes working paper we develop, define, and use a 'detuned' or 'desensitized' version of Continuous which only rejects 5% of known Shakespeare. In this article, it makes a difference for some 'Shakespeare' blocks of *Edward III* and is so noted.

38 See our (2004, pp. 348–356).

39 See Lake (1977, pp. 114–6); Jackson (1978, pp. 155–6, 1981, p. 146); Taylor (1989, pp. 101–29); and Tarlinskaja (2006b) for similar skepticism about a 1590's date of composition; *contra*: Blayney (1972, pp. 167–91). Tarlinskaja agrees with us that the 'non-Shakespeare' parts of *STMO* do not match Shakespeare, and that the 'Shakespeare' parts do not match early Shakespeare, but she concludes from Hand D Plus Verse's many resemblances to late Shakespeare, that it is his work. See her (2006a). From our perspective, the many Shakespeare resemblances make Hand D Plus Verse the more interesting, but do not override our normal presumption that it only takes a few negatives to overcome many positives.

40 Vickers (2002b, pp. 39–43).

41 Tarlinskaja (2006a,b). Oddly, she omitted from both articles a powerful ninth verse test, *proclitic microphrases*, which also would pass Hand D-plus as a Shakespeare could-be (see Appendix 1, which uses her proclitic counts, and our discussion of *Edward III* below, where her low proclitic counts were the principal obstacle to an easy 'could-be' for its 'Shakespeare' scenes).

42 Tarlinskaja (2006b, pp. 56–7).

43 Jackson (2006, 2007).

44 See note 30.

45 Jackson (2007, para 16).

46 *A Lover's Complaint* and the Quarrel Scene from *Arden of Faversham* are the others. In all three cases, he is the generous Santa Claus with Shakespeare ascriptions, and we the tight-fisted Scrooges. Of course, Jackson is a top-of-the line stylometrist, and intuition is only a small part of what he relies on to make an ascription, but it does loom larger in his arguments than it does in ours.

47 See note 18.

48 Elliott and Valenza (2008).

49 Metz (1989, pp. 22–5).