Two Tough Nuts to Crack: Did Shakespeare Write the "Shakespeare" Portions of *Sir Thomas More* and *Edward III*?

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ABSTRACT. 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 1600's, the "Shakespeare" Hand D verse portion is seven to 26 times less likely to be Shakespeare's than Shakespeare's own farthest-outlier baseline threshold block. Shakespeare authorship for it in the 1600's seems to us improbable but not impossible. In the 1590's, it's 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 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 be 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; 2.01-02; and 4.05-.09. The odds that the "non-Shakespeare" scenes, collectively, or individually (except for 4.05–4.09) could be his are vanishingly low.

1. Easy Cases and Hard

To call for a volume on the Shakespeare Apocrypha is to hint that the Author might not be dead after all, and that the long, obsessive quest for the Lost Shakespeare has not been abandoned. Such a call draws attention, not to the easy ascriptions—the great bulk of the 400 or so available Shakespeare-era plays that are clearly Shakespeare or clearly non-Shakespeare—but to the hard ones, the remaining five percent or so of Apocrypha and Dubitanda plays which are still in doubt.[2] The most interesting ones are the toughest nuts to crack.

By our count, at least 29 of the supposed 400 available period plays are easy "core Shakespeare" ascriptions, as plainly canonical as anyone is likely to find. *Hamlet* and *Romeo and Juliet* belong in this category, both in the way they are generally perceived by Shakespeare scholars and in the way they fare under our authorship tests.[3] No Core Shakespeare play got more than two rejections in our 48 tests for whole plays;[4] none in this group seems to offer the kind of authorship uncertainties that you find in the Shakespeare Apocrypha and the Shakespeare Dubitanda.

Most other plays from Shakespeare's lifetime, maybe 330–340 of the supposed 400, are plainly not his. *Volpone, Sir Giles Goosecap*, and *Cupid's Whirligig* are examples of pure, uncontested, non-Shakespeare. We haven't tested all the plays from this group, only around 50 of them by 19 authors gathered from Campbell and Quinn's 1966 list of Shakespeare "Claimants;" that is, we tested *Volpone*, but not *Sir Giles Goosecap* or *Cupid's Whirligig*.[5] But every such play we did test was roundly rejected as a Shakespeare "could-be." No Core Shakespeare baseline play got more than two rejections in 48 tests; no tested Claimant play got *fewer* than ten rejections. In terms of Discrete rejections,[6] every core Shakespeare play tested inside our Shakespeare ballpark, typically in the infield. The nearest Claimant play was on a different planet. Most were in a different galaxy. If the authorial habits we tested are consistent from one play to the next, as they seem to be for the 80 or so single-authored plays we tested, ruling out the 50 plays we tested by 19 Claimant authors probably also rules out another 146 plays by the same Claimants—such as *Sir Giles Goosecap*, supposedly by George

Chapman, whose two plays in our collection tested on a different planet from Shakespeare. We didn't think we had to test all 14 of Chapman's plays, nor all 17 of Fletcher's, nor all 38 of Jonson's, to suspect that none of them are likely Shakespeare matches.

We cannot claim to have ruled out the 80+ plays in LION's collection where we have tested neither the play itself, nor its non-Claimant author, but this residue, exemplified by *Cupid's Whirligig*, is hardly a promising one. These are the very mined-out, passed-over plays and authors for which *no one*, in centuries of Desperately Seeking the Lost Shakespeare, has ever imagined enough Shakespeare resemblance to propose either the author for the Claimants' list or the play for the Apocrypha list,[7] let alone for the core, consensual, Shakespeare list. Whatever scholars may say about the death of the author or the decline of bardolatry, the rewards for striking a new vein of Shakespeare gold are still far higher than those for, say, striking a new vein of whatever baser metal—copper, lead, or fool's gold—that you might assign, say, to a poem or a play by John Ford. As Shakespeare put it, "The blood more stirs to rouse a lion than to start a hare."[8] Striking gold is news. Striking fool's gold is not. If it's anyone but Shakespeare, it might as well be slag.

With such a superpremium on striking gold, it's hard to imagine that these neglected, leftover Shakespeare-era plays are in still on the slag heap just because none of the Shakespeare prospectors were seeking gold as single-mindedly as Ahab sought the White Whale, or because none of these Ahabs could tell gold when they found it. Our guess is that most or all of these plays are on the Shakespeare slag heap because the old prospectors got it exactly right: they seem to us much more likely to be slag than gold.

2. Our Shakespeare Wager

This is only a guess, of course. But we have enough confidence in it that we have already publicly bet one persistent, numeroskeptical critic a thousand dollars that he could not find *any* whole play by *any* author other than Shakespeare that would fit within our core Shakespeare profile. He declined on the spot and was wise to

do so. No one else on the Shaksper news group took us up. We reissued this offer to readers of the *Tennessee Law Review* in 2004, but the one taker, after a defiant initial challenge borrowed from *Richard II*, likewise backed down when invited to prove his case. We would not hesitate to make it yet again to readers of the *Shakespeare Yearbook*, nor, indeed, to raise the ante to a thousand pounds to compensate for the falling dollar, increase the incentive to respond before our VAX dies and our VAX-based tests get stranded, and give the wager a more Shakespearean ring.[9] We believe that it would be an easy win for us, not in the sense that preparing and testing the play wouldn't take work—if that were so, a much smaller bet would suffice—but in the sense that, once the work was done, we think the odds of winning would be heavily in our favor.

Moreover, even if we did lose the bet, we could consider it money well spent. Nobody who seriously wanted to win would just pick out a likely-looking play by ear and ask us to test it, red-faced loser pays a thousand pounds. More likely, they would prepare and screen scores of the likeliest-looking plays from the slag heap, just as we have done with our 100-odd tested Shakespeare, Claimant, and Apocrypha plays, and using the same tests—which we would be happy to supply—and only then, and only if the process produces a winner, sending it to us and/or a third party to be certified. *That* would be a lot of work, especially considering the dim prospects of success, but we would not be the ones doing it. If such a labor actually turned up a play that fit the Shakespeare profile it would be like finding Tutankhamun's tomb in the last, least-expected spot, a fabulous research bonanza for which we would consider a thousand pounds an absurdly low price. If there were a curse attached to it, as has been supposed of Tutankhamun's tomb, it would be someone else's curse, not ours.

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 that our standards of comparison are well enough defined that the bet can even be made, with reasonable assurance that a neutral observer could tell who won, who lost, and by how much.[10]

3. Choosing the Long List

Putting aside the easy plays, the Core Shakespeare and obvious non-Shakespeare plays, leaves up to 35 plays still open to doubt, ten or so from the Shakespeare Dubitanda, 25 or fewer from the Shakespeare Apocrypha. Dubitanda are in the Canon, but doubtfully or dividedly; Apocrypha, the subject of this volume, are out of the Canon, but doubtfully or dividedly. There is no way to avoid considering these two classes together, since the one is often the alternative category to the other. When a possible Shakespeare work graduates to the Canon, it normally moves from the Apocrypha to the Dubitanda. If it gets demoted, it normally moves from the Dubitanda to the Apocrypha or worse. We haven't seen the other articles from this volume, nor made a comprehensive study of the matter, but we have been paying some attention to Shakespeare authorship buffs for 18 years and have gathered some impressions that could shorten the list yet further. These are that:

(1) some plays of the Apocrypha are much more apocryphal than others;

(2) some open-armed, hyperstratfordian[11] optimists think they have a better eye for gold in the slag heap than other, stingy, gimlet-eyed Scrooges who see nothing but slag;

(3) the conventional, qualitative historical and documentary evidence is essentially no different from what it was in E. K. Chambers' time;[12] on hard ascription questions it is often so equivocal, and conflicting that it is hard to say categorically, compactly, and objectively from it whether the text in question actually is gold or only fool's gold;

(4) scholarly consensus on where to draw the line between Dubitanda and Apocrypha can shift drastically from one decade to another—witness the Icarian rise and fall of *Funeral Elegy by W.S.*;[13]

(5) despite such momentary ups and downs, the broad outlines of what is considered obviously Shakespeare, what is obviously not Shakespeare, and what falls into the Doubtful Middle, have changed remarkably little since Chambers' time;

(6) nevertheless, wherever an editor of a new edition of *Shakespeare's Complete Works* is wondering whether to add a new poem or play as "possible gold" or exclude it as "probable slag," his publisher will urge him to go for the gold for marketing reasons—and the editor will not always turn a deaf ear to the plea.

We belong with the Scrooges. Outside of Core Shakespeare, our computer has turned up much more slag than gold. In terms of results, though not of motivation, we have more in common with the Disintegrationists, who think that much of the Canon is co-authored, and very little outside of it is Shakespeare's, than with the Integrationists, who think that Shakespeare wrote almost all of the Canon, and perhaps much more to boot.[14]

We chose 25 plays for our Apocrypha long list for this article (Table 1). This amounts to two less than previous works,[15] or our long manuscript, *Shakespeare by the Numbers*, which we hope will one day became a more comprehensive book on stylometry and Shakespeare authorship.[16] But the actual number of our long-listed Apocrypha plays that most scholars today would put on their short list could be as low as two, or, better, a fraction of two. Most scholars include the "Shakespeare" additions to *Sir Thomas More* in the High Dubitanda, but few, maybe no more than three people, have ascribed the whole play to Shakespeare.[17] *Edward III* has enjoyed a recent vogue, though, as with everything else, the documentary evidence that it is or is not Shakespeare has changed little since Chambers' time. In 1987 Wells and Taylor put it at the very top of their Apocrypha list; they eventually added it to their 2005 *Complete Works*.[18] By 1997, on the strength of its "Shakespeare scenes," G. Blakemore Evans actually admitted it to the Canon in the 1997 *Riverside Shakespeare*.[19] Giorgio Melchiori accepted it as at least partially Shakespeare's in the *New Cambridge Shakespeare*.[20] LION listed it as Shakespeare's. Eric Sams not only accepted the "Shakespeare scenes" but argued that the whole of *Edward III* was Shakespeare's—and many other plays, too.[21] Sams, at his death in 2004, was our polar opposite, a vigorous, outspoken integrationist, a man who "discovered" play after Lost Shakespeare play in the slagpile of Shakespeare-Establishment rejects, and published the results in three vigorously argued books from distinguished presses.[22] His expansive Canon included

not only all of *Edward III* and *Sir Thomas More*, but also *Edmund Ironside* and a long list of Apocrypha plays with Shakespeare-suggestive titles which some have supposed might be early drafts or memorial reconstructions of Shakespeare plays: *The Troublesome Reign of King John*; *The Famous Victories of Henry V*, *The Taming of a Shrew*, *The Contention of York and Lancaster*, and *King Leir*.

A much less expansive overview of the Apocrypha, and a favorite reference with us for its learned, very compact summation of conventional scholarship,[23] is the "Works Excluded from this Edition" section of Wells and Taylor's *Textual Companion to the Oxford Shakespeare* (1987). This, as we have seen, puts the short "Shakespeare" sections of *Sir Thomas More* into the Canon (but not the rest of it). It also puts *Edward III* into a class by itself as the top candidate for probationary entry to the Canon, and further notes that "most recent studies of vocabulary and imagery conclude that the play is of single authorship.[24] Wells and Taylor did not rule out two more Apocrypha plays, *Edmund Ironside* and *Arden of Feversham*—but they dismissed most of the remainder as highly improbable: *The Birth of Merlin*; *Thomas Lord Cromwell*; *Faire Em*; *Locrine*; *The London Prodigal*; *The Merry Devil of Edmonton*; *Mucedorus*; *Sir John Oldcastle*; *The Puritan*; *The Second Maiden's Tragedy*; *The Troublesome Reign of King John*; and *A Yorkshire Tragedy* (1987, pp. 134–141). Our summary of their judgments at the time: *Probably Shakespeare*: 148 lines (6%) of *Sir Thomas More*. *Could well be Shakespeare*: at least four scenes (about 40%) of *Edward III*; possibly the whole play. *Worth a look*: two plays, *Edmund Ironside* and *Arden of Feversham*. *Not worth a look*: 12 other Apocrypha plays and the rest of *STMO*.

Our view of the Apocrypha, analyzed as whole plays, is even more skeptical and exclusory than Wells and Taylor's. In 1996 we published the findings of the Claremont Shakespeare Clinic, a series of student teams using computers to see if they could shorten the list of credible Claimants. The students tested poems and plays by 37 Shakespeare Claimants, including Bacon, Marlowe, and the Earl of Oxford, and succeeded beyond expectations, shortening the credible, testable Claimant list to zero.[25] We were their faculty advisors, and the ones who developed and wrote up their results after they graduated. The students also tested 25

plays of the Apocrypha and ten or so of the Dubitanda, with the same tests that they had run on Core Shakespeare and the Claimants, and with similar outcomes for whole plays, at least for the Apocrypha. As we have seen, all of the core Shakespeare plays clustered in the same statistical ballpark, with two or fewer individual rejections. But Table 1 shows that all of the Apocrypha plays, like all the Claimant plays, were on a different statistical planet or galaxy, with seven or more rejections each (see "Discrete Rejections," Table 1, below). By these numbers, Wells and Taylor were dead right to reject the twelve "highly improbable" plays listed above, and the bulk of *STMO*—and they should also have rejected *Arden of Feversham* and *Edmund Ironside*, and *Edward III* itself as solo Shakespeare creations. Table 1 tells us 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 in the Apocrypha is close enough to our Shakespeare core to pass as a plausible, single-authored Shakespeare work.

Column Three of Table 1 reflects the simple rejection-counting methodology we had worked out by 1996. 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 at this broad-brush level. The last two columns reflect two new methodologies we introduced in 2004: Discrete and Continuous Probabilities. Both permit a comparison of the tested plays with the least-probable of Shakespeare plays by the tests we used. "Discrete" asked, in effect, "what are the 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 slightly more detailed description of Discrete may be found in note 6, and a much more detailed, eight-page version, with technical language suitable for

numerate people, may be found in our "Oxford by the Numbers," sections F through J, pp. 348–58.[26]

Table 1. 25 Shakespeare Apocrypha Plays Ranked by Shakespeare Rejections

Play	Short Title	Discrete Rejections	Discrete Composite Probability	Continuous Composite Probability
Shakespeare thresholds		*2	**2.316E-01	**3.6895E-03
Sir Thomas More	STMO	7	3.323E-05	<1.0000E-15
Leir	LEIR	8	3.252E-06	<1.0000E-15
Arden of Feversham	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

Table 1. Of 25 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 Shake-

speare authorship seems rock-bottom for all Apocrypha plays tested. Source: Elliott and Valenza, "Oxford by the Numbers," Appendix One. * = Shakespeare maximum; ** = Shakespeare minimum.

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: that the odds of common authorship with Shakespeare are so low that we had to use scientific notation to avoid getting lost in the long rows of zeroes after the decimal point. All of our whole Core Shakespeare plays fit snugly within the same ballpark, while none of our whole Apocrypha plays are to be found on the same planet even with the least typically Shakespearean of our Core Shakespeare plays. 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 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.[27]

Our whole-play conclusions seemed convincing in 1994, when first comprehensively introduced, and they seem even more so to us now, having weathered a decade of unrestrained adversary criticism,[28] and having undergone much reexamination of our own with no major changes at the bottom line. We claim high internal and external consistency, exceptional replicability and survivability of adversary scrutiny, and such a superabundance and convergence of negative evidence that, even if half our tests were put aside for any reason, none of the Claimants or Apocrypha would be credible Shakespeare ascriptions. By now, as noted, we are confident enough of our methods to bet a thousand pounds that no one can find a play not by Shakespeare that fits our Shakespeare profile.

4. Choosing a Short List of Co-authored Plays

On the other hand, we should now reissue the five standard warnings that have appeared in most of our dozen or so previous publications on Shakespeare authorship: (1) that our tests work better on long texts than short; (2) that they work better on poems than plays; (3) that they work much better on single-authored than on co-authored texts; (4) that they can be thrown off sometimes by confounding factors: editors, time of composition, genre, and prosody; and (5) that they are novel.[29] These cautions come into play in choosing which of the Apocyrpha and Dubitanda are most worthy of study, and in choosing how to analyze them. However well-settled it may be that Shakespeare could not have been *sole* author of any of the 25 plays in Table 1, it does not follow from our tests that he could not have written *part* of any of the plays listed. That issue seems to us very much alive and worthy of study, particularly where the parts in question are long enough for us to compare them statistically with Shakespeare.

We would suppose that looking for single Shakespeare authorship of part of a co-authored play means that no more than eleven plays are still of interest, all of them from the Dubitanda, unless you share our notion that the "Shakespeare" section of *Sir Thomas More* belongs in the Apocrypha, not the Dubitanda. Of the eleven, most scholars suppose that four are co-authored with Shakespeare: *Two Noble Kinsmen*, *Henry VIII*, *Pericles*, and *Henry VI, Part I*, though a few Integrationist dissenters can be found who argue that Shakespeare wrote every word of these.[30] The same could be said of *Timon of Athens* and *Titus Andronicus*, but with a slightly stronger show of Integrationist dissent.[31] Our whole-play evidence firmly supports the Disintegrationists on all of these, and also on *Henry VI, Part III*, *Sir Thomas More*, and *Edward III*. None have fewer than seven rejections. From abundance of caution, and a strong preference for a clean baseline, we have also set aside four further plays from our Shakespeare baseline, *Henry V* for its long, atypical, and possibly outsourced passages in French, *Henry VI, Part II*, and the Shakespeare sections of *Pericles* and *Two Noble Kinsmen*, for their close perceived association with a co-author. None of these last four have more than four whole-play rejections, and we would guess that most or all of them could well be by Shakespeare solo.[32]

For the moment, for lack of time and space, we have passed over most of this most interesting list of eleven possibly-Shakespeare plays, the first and last four for not being doubtful enough, and *Pericles* for seeming too well done by Vickers and Jackson,[33] for our likely concurrence to have much urgency. *Titus Andronicus* has a suitably challenging-but-crunchable division of parts for our purposes, but it, too, has been too recently and well done by Vickers[34] and Tarlinskaja[35] to clamor for an early second opinion. Skipping over these two plays in favor of *Sir Thomas More* and *Edward III* is a slight departure from our usual preference for working from the easier calls to the harder ones, but it is justifiable both for intrinsic interest and because we have definitive Tarlinskaja verse counts on hand for *STMO* and all *Edw3* scenes, but not for *Pericles* or *Titus Andronicus*. The entire *Henry VI* series needs a look, especially Parts I and III, but we haven't gotten around to it, nor has Tarlinskaja. Gary Taylor and Paul Vincent have provided trial divisions of Part I between Shakespeare and non-Shakespeare as a starting point for us or others to test;[36] but we know of no such conventional-scholarship starting point for Part III and would consider the Taylor-charted *1H6* a more promising starting point than the uncharted *3H6*. We consider *Timon of Athens* too chopped-up and intermingled for our analysis to add much to Vickers' impressive analysis.

Our research priorities for the 11 Shakespeare-possible plays, based on some combination of doing the easiest ones and the ones least conclusively done by others, would look something like this:

1. *Edward III*, all (*Riverside* divisions)
2. *Sir Thomas More*, Hand D-plus (*Riverside* "Shakespeare" subsection only)
3. *Titus Andronicus* (Timberlake/Jackson/Vickers divisions)
4. *Henry VI, Part I* (Taylor divisions)
5. *Henry VI, Part III* (no one's divisions available)
6. *Pericles* (traditional Acts I-II and III-V divisions)
7. *Two Noble Kinsmen* (Vickers' divisions)
8. *Henry VIII* and *Timon of Athens* (Vickers' divisions). These are at the bottom of our list, having too many little pieces too thoroughly intermingled with

non-Shakespeare and boundaries too fuzzy to inspire much hope that our methods would work well.

5. Sir Thomas More's and Edward III's Conventional Ascriptions

We have done only two of these candidate plays so far, the "Shakespeare" parts of *Sir Thomas More* and *Edward III*, and we present our results here for the first time. These two 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.[37] 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 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.[38] "Most of the great paleographers of the twentieth century have concurred."[39] In recent memory, two skeptics have argued for John Webster as the author of Hand D-plus.[40] But we believe, following Wells and Taylor,[41] that most scholars would rate it "high Dubitanda" or better—less Canonical than *Hamlet*, perhaps, but more accepted than, say, the co-authored sections of *Pericles, Titus Andronicus*, *Timon of Athens*, *Henry VI, Part I*, or *Henry VIII*. (See Section 3 above.)

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.[42] 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, 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, as we have seen, resisted the temptation to include *Edward III* in the 1986 *Oxford Shakespeare* but not without pangs of regret: "The stylistic evidence for Shakespeare's authorship of *Edward III* is greater than that for the additions to *Sir Thomas More* (excluding the paleographic argument); if we had attempted a thorough reinvestigation of candidates for inclusion in the early dramatic canon, it would have begun with *Edward III."*[43] With the inclusion of *Edward III* in the *Riverside Shakespeare*[44] the New Cambridge Shakespeare Series,[45] and Wells and Taylor's own 2005 *Complete Works* edition, *Edw3* seems to have graduated from the top of the Apocrypha to about where the "Shakespeare" scenes of *STMO* are now situated, the middle of the Dubitanda.

The challenge of cracking these two "tough nuts" has elicited astonishing displays of ingenuity, learning and technique from Shakespeare regulars, deploying external evidence—documents, quartos, theater records, fair and foul papers, watermarks, handwriting, and such—and internal evidence—imagery, parallels, vocabulary, verse tests, and such.[46] We would not presume to join in this conventional, external-evidence controversy, other than to note that all of it is inferential. Instead, we shall present stylometric evidence that the *Edw3* sections, with a bit of tweaking, probably belong in the Canon, but the *STMO* Hand D probably does not. Both of these "Shakespeare" sections seem to us much closer calls than, say, *Locrine*, *Woodstock*—or the *Funeral Elegy,* which also shared briefly in the inclusionary glow of the 1990's but has since been banished—or even the non-Shakespeare scenes of *STMO* and *Edward III* themselves.

6. Our Methodology

This calls for a brief discussion of our methodology, as applied to texts shorter than a whole play. Our methodology has five distinctive features. We use quantitative, internal evidence, not qualitative external. We greatly prefer clean, single-

author baselines to baselines of doubtful or disputable authorship. We think that the strength of a chain of inferences leading to an ascription is that of its weakest links, not its strongest, and that, therefore, a spoonful of negative "silver-bullet" evidence almost always outweighs a bushel of positive "smoking-gun" evidence. Wherever possible, our Shakespeare profiles and distances, and all authorship odds derived from them, are tied to the length of the texts under study. Wherever possible, we calculate actual comparative authorship odds by the two methods discussed above, Discrete and Continuous.

These distinguishing features are all discussed at much greater length in our "Oxford by the Numbers,"[47] but two of them deserve special mention here: negative evidence and controlling for text length. Conventional identifications rely either on one or two perfect identifiers, like fingerprints or DNA, or on a combination of observable imperfect identifiers like those which appear on a driver's license: sex, height, weight, age, hair color, eye color, etc. For Shakespeare, imperfect indicators are the overwhelming rule, and perfect ones very rare and exceptional. We have yet to find a perfect stylometric identifier like fingerprints that is free from all false positives or negatives. For imperfect identifiers, which are common, one or two negative *couldn't-be's* outweigh dozens of positive *could-be's*. If you have a size-four foot, you could be Cinderella, but your case is anything but conclusive. You could also be Little Miss Muffet or Tiny Tim. To be sure, if your sex, height, weight, age, and enough other measurables all match Cinderella's profile, your case starts to look interesting. But all it takes to destroy your case is just one unexplainable mismatch, such as your size-eight foot. Disproof by mismatch is far more conclusive than any "proof" by match.

Controlling for text length is crucial to all our profiles because of the law of large numbers. Large numbers average out more variance than small, and stylometric profiles for a given author can only be meaningfully drawn with reference to the sample- or block-size in question. The 1,500-word verse samples from *Edward III* should only be matched against other 1,500-word verse blocks from the Shakespeare baseline, not against whole plays or 3,000-word blocks, which have narrower profiles. A 750-word sample from *Sir Thomas More* should be

matched only against roughly like-sized Shakespeare blocks. And so on. The principal difference between the tests we use today and the ones we had in 1996 are that we have much more validation of Shakespeare profiles for 1,500-word and shorter text blocks than we did in 1996, and much more precise ways of computing authorship odds for such shorter blocks. Only with ranges validated for shorter blocks can we tackle samples as short as the ones we take on here.

7. 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*.[48] Appendix One 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 tests. This amounts to an acceptably-low 3% Discrete false-negative rate for our Shakespeare baseline. 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%.[49] 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 One, trimmed of non-rejections and concentrating on rejections only, appears below as Table 2.

The first thing to note about both Table 2 and Appendix One, 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 make us feel safe offering our thousand-pound wager (Section 2 above). This is especially so, as we shall see, 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 (Table 1).

Table 2. Five Shakespeare Tests on *STMO*, "Shakespeare scene"

Sh. 750-wd range (auto)	GRL	HCW /20K	Fem. End % auto	Open Line % auto	BoB5	Max Rej's (Total)	Discrete Prob.	Cont. Prob.
Consolidated	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	0.00027	0.0025
Hand D+, 1600+	13	24	26	33	765	2	0.0478	0.0025

Table 2. "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 One. Hyphenated compound words (HCW, lighter shade) are considered a technical rejection only, and are not counted as a rejection in any of our composite numbers.

Nevertheless, the third lesson we may draw from Table 2 is that the verse part of Hand D-plus, about 850 words, still gets two to four Shakespeare rejections in 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 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.[50]

These first-impression numbers make it look doubtful, though not impossible, that Shakespeare could have written Hand D-plus, 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 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).[51] 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.[52] Table 2 and Appendix One give all four variants, with three or four rejections for Hand D-plus Verse if compared with Shakespeare's 1590's profiles, but only two, if compared with his 1600's 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 One). 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.[53] 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 2, 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 underpunctuation. 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 far-too-high grade-level scores, its just-too-low hyphenated compound word (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 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.[54] 29% of a population is hardly atypical in the way that zero percent or one percent or five percent might be, and, hence, the nominal rejection does not provide a strong foundation for an argument that the odds that that the sample belongs to the popu-

lation are low. Therefore, we decided that the low-looking HCW score was not a real Shakespeare distinguisher, and have not counted it as a meaningful rejection.

However, the other two rejections fall into the zero- or one-percent brackets and still seem to us solid evidence against inclusion with Shakespeare's works. Only one of our 90 play-verse blocks has a grade-level score higher than the 13th-grade observed for Hand D-plus Verse; the next-highest are three 11th-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*.[55] 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? No plausible explanation has occurred to us, but it is entirely possible that others more wedded to the Shakespeare ascription could think one up. What the rejection means, at bottom, is that grade-level is now a significant prima facie obstacle to a Shakespeare ascription, and seems likely to remain so unless defenders of the ascription can think up some convincing way to explain it away.

As for the other strong rejection, BoB5, none of our 90 Shakespeare play-verse blocks, nor any of our 54 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 600's.[56] 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 an unequaled 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 50, and perhaps also a look at a few of the highest-scoring blocks.[57] 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 "1590's" of the same passage whose many open lines and feminine endings scream "1600's?" 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.[58] Could it be a matter of subject matter, such as the 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 where we could find with 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 300's (Appendix One), well within our Shakespeare profile, and not in the 700's 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.

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).[59] 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.[60]

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.[61] *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.[62] 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 1590's profiles) nonetheless says that Hand D-plus Verse is 26 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 26 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 to 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 much 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, or with any such Shakespeare block at all, if Hand D were written in 1592–93. The available odds still weigh against it under 1603 Shakespeare profiles, and strongly against it under 1593 Shakespeare profiles.[63]

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 three percent of our ninety baseline Shakespeare 750-word play verse blocks have Shakespeare's own Discrete probabilities as low as Hand D-plus Verse/1600s. Only four percent have such a low Continuous probability. Only two percent have both Discrete and Continuous probabilities as low as Hand D-plus Verse/1600's. 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/1600's—along with 51 other, more typical blocks. Not a single block in our baseline is as atypical of Shakespeare's 1590's writing style as Hand D-plus Verse/1590s. It could have taken him a lifetime or more to have written a block so at odds with his 1590's 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 our critics' qualitative rejoinders (if any) to our evidence; and the quantitative case is such a close 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 1600's, and far too atypical of Shakespeare's verse in the 1590's, and none of the atypicalities have been explained away. Till they are, we think that, on the numbers, the "Shake-

speare scene" of *Sir Thomas More* belongs at the top of the Apocrypha, not the middle of the Dubitanda.

8. Edward III: Is Any of It Shakespeare's?

What about the "Shakespeare scenes" from *Edward III*? We have had a longer involvement with it than with Hand D-plus, starting with observing its fatal thirteen rejections as a whole play in 1996 (Table 1) and responding to G. Blakemore Evans' request to analyze its "Shakespeare scenes" separately, also in 1996, before we had validated profiles for 1,500-word Shakespeare blocks, as we do now. Fortunately for us, *Edw3* is almost all verse. No one that we know of dates it later than 1595. It has an abundance of Shakespeare ascribers, including quite a few who think that all of it could be by Shakespeare. It offers much more material to analyze than Hand D, and that, we shall see, can make a big difference. Its "Shakespeare scenes," taken one by one, in statistical terms are vastly more Shakespearean than its "non-Shakespeare scenes" and are hard to rule out individually by our tests. Taken as a group, their anomalies rise and their Shakespeare plausibility falls to unlikely levels. On the other hand, if the group were revised slightly, by reclassifying the pre-battle scene, 4.04 as "non-Shakespeare," and the battle scenes, 4.05-.09 as "Shakespeare," the discrepancy falls, and the aggregate becomes and arguable, though still not an easy Shakespeare could-be. Table 3 gives the highlights.

Table 3. Highlights of 13 Shakespeare Tests on All-Verse Blocks from *Edward III*

Scene	Grade Level	Procli-tic	Rare Words	Total Rejects.	Discrete Probability	Composite Probability
Shakespeare range/threshold	4-9	235-561	(-40) - 116	0-1	2.52E-01	2.03E-01
"Shakespeare" scenes or blocks						
1.02	7	192	-12	1	2.90E-01	3.85E-02
2.01a	8	271	23	1	2.90E-01	3.06E-02
2.01b	9	212	82	1	2.90E-01	1.07E-01
2.02	7	199	48	1	2.90E-01	5.57E-01
4.04	12	200	8	2	4.36E-02	1.29E-03
"Non-Shakespeare"						
1.01	10	89	-73	4	2.71E-04	5.17E-06
3.01	11	171	-101	4	2.71E-04	6.43E-08
3.03	11	118	-49	3	4.13E-03	4.20E-06
3.02, 04, 05	8	167	-65	2	4.36E-02	3.13E-03
4.01-03	9	75	18	2	4.36E-02	7.44E-04
4.05-09	7	246	3	0	1.00E+00	2.97E-01
5.01	10	223	-51	3	4.13E-03	5.46E-03

Table 3. Five all-verse "Shakespeare" blocks get a total of five Discrete rejections (darker shading, left)—but only one of these has more than one Discrete rejection and gets a composite Discrete rejection (lighter shading, right). But four of the five get composite Continuous rejections (lighter shading, right). Only 2.02 looks like a Shakespeare "could-be" by both tests. Of seven "Non-Shakespeare blocks, six get composite "couldn't-be's" by both Discrete and Continuous analysis. 4.05–09 passes both Discrete and Continuous. It is the least Shakespeare-discrepant block in the play.

To get to Figure 3, and Appendices Two and Three, we put aside our old Lou Ule-edited *Edward III* and scanned the 1997 *Riverside Edward III* from scratch, seeking the closest match we could find to the spelling and punctuation practices of our 1974 *Riverside* baseline. Beyond that, we actually changed 17 words to

spellings more in conformity with the *Riverside*, for example, "loath" in place of "loth." We also corrected it for possible underpunctuation. This sounds a bit presumptuous, but we have been communizing spelling for 20 years with out-of-baseline texts and have gotten good at it. Moreover, since in this case we were acting as Evans' research consultants, we saw no good reason to leave editorial artifacts in *Edward III* that could make it look less Shakespearean than it actually was; and we dutifully reported our extra precautions to him. We then divided or aggregated "Shakespeare" and "non-Shakespeare" scenes into easily comparable all-verse blocks, each roughly 1,500 words in length, and gave each block the thirteen tests we had validated for such blocks. *Edw3* offered more and longer blocks and more usable tests than Hand D. It yielded some probabilities low enough to require scientific notation.

For example, it showed that, apart from one block, 4.05 to 4.09, the "non-Shakespeare" blocks have too low Shakespeare probabilities to pass as Shakespeare's. Table 1 already makes a macrocase that the odds that Shakespeare could have written the whole of *Edward III* by himself are 53 billion times lower than those for Shakespeare's own most discrepant baseline block, not a close call. Table 3 and Appendix Two show that the collective odds of Shakespeare authorship of the non-Shakespeare blocks are absurdly low, even including the Shakespeare-conforming 4.05–4.09. Six of these seven "non-Shakespeare" blocks fall outside Shakespeare's range for proclitic microphrases. The odds of this, at the regular 3.7% rejection rate found in the Shakespeare baseline for 1,500-word blocks, are about eleven billion to one, many orders of magnitude worse than the "Shakespeare" blocks. This is not a close call either.

The "Shakespeare" blocks and 4.05–4.09, taken by themselves, are not so easily dismissed. Four of the five "Shakespeare" blocks have just one rejection each, not enough for a composite Discrete rejection. 4.05–4.09, though not conventionally ascribed to Shakespeare save by those who give Shakespeare the whole play, has no Discrete rejections at all. 4.04 gets two Discrete rejections and is outside the Shakespeare ballpark, but in the same city. Every "Shakespeare" block but one, 2.02, and every "non-Shakespeare" block but one, 4.05-.09, gets a Continu-

ous rejection, the "Shakespeare" ones narrowly, most of the "non-Shakespeare" ones decisively. Of all the scenes, only 2.02 and 4.05-.09 get a composite pass by both tests. This means that four out of five "Shakespeare" blocks pass Discrete Composite, and four out of five fail Continuous Composite, three narrowly.

On this evidence, in the hypothetical quiz show, we would not hesitate to bet our thousand pounds that most of the non-Shakespeare scenes are, in fact, non-Shakespeare. We would not bet big money against the "Shakespeare scenes," taken individually, because all but one of them are Shakespeare could-be's, or close to it, by our rules. We would guess that the one exception, 4.04, is probably not pure Shakespeare, and that 4.05-.09, counter to scholarly consensus, probably is pure Shakespeare, and we would be troubled by the large number of Shakespeare rejections in the consensus aggregate, large enough to argue that the conventional aggregate probably has some non-Shakespeare in it somewhere.

Where the call is close, the quality of the disqualifying evidence needs closer scrutiny, especially here, where just one test, proclitic microphrases per thousand lines, accounts for four of the six rejections found for the five "Shakespeare" blocks. If this test is misconceived or misapplied, the case against the five blocks, which we think could be made a close one by reclassifying 4.04 as non-Shakespeare and 4.05-.09 as Shakespeare, could collapse. We think the test is neither misconceived nor misapplied and need briefly to explain why.

In any kind of verse, iambic pentameter, for example, the poet seeks to fit words with their own natural, spoken syllabic stress into lines with their own natural metric stress. The two stress patterns don't always coincide. If they did, the lines would look like neat rows of bricks with each brick's heavy end placed exactly where it belongs in the row, ta *DAH* ta *DAH* ta *DAH* ta *DAH* ta *DAH*, where italics indicate natural spoken stress and capitals indicate metric stress. Where they don't coincide, metric stress prevails over natural; some of the bricks lose their natural stress for metric reasons; and their naturally heavy ends get bent out of stress by meter and treated as if they were light: ta *DAH* <u>*ta DAH*</u> ta *DAH* ta <u>DAH *ta*</u> *DAH* . To see an actual example of the two odd bricks in the last line, consider the underlined microphrases in the following line: "Or WHAT <u>*strong*</u>

HAND could HOLD his SWIFT *foot* BACK.[64] *Strong* and *foot* are "clinging monosyllables" which lose their natural stress for metric reasons. Where the stress-losing monosyllable precedes the word to which it clings, for example, *strong* HAND, it is called a *proclitic* microphrase, from the Greek προκλινειν, "leaning forward." Where it follows the word to which it clings, for example, SWIFT *foot* , it is *enclitic*, from ενκλινειν, "leaning backward." Every poet we know uses at least a few such odd, stress-losing bricks, but some use them much more abundantly than others. For example, Shakespeare seems to have had three to five times as many enclitic phrases per thousand lines of iambic verse as Marlowe or Pope, and perhaps half, or a quarter, as many as Beaumont, Fletcher, Chapman, or Massinger.[65]

A short, low-tech explanation of why we find Tarlinskaja's proclitic counts persuasive would go straight to our baseline and comparison charts for all tests at 1,500 words.[66] These show very high Shakespeare consistency in proclitic frequencies and exceptionally high discrimination between Shakespeare and non-Shakespeare. Of 100 Tarlinskaja-counted 1,500-word Shakespeare verse blocks in our records, only three (3%) have proclitic scores under 235. Of 38 such blocks not by Shakespeare, 58% scored lower than 235, just like 80% of *Edward III*'s "Shakespeare" blocks and 86% of its "non-Shakespeare" blocks. 83% of our *Edward III* blocks fall below 97% of our Shakespeare baseline blocks on this test, not a strong support for a Shakespeare ascription for most of *Edward III*. All these counts are Tarlinskaja's own counts.

A longer, more technical discussion would note that enclitics and proclitics are just two of many verse tests on offer from the leading authority, Marina Tarlinskaja. See her *Shakespeare's Verse*, and her forthcoming articles in these pages, for examples of others. Enclitics and proclitics are the ones we tried hardest to replicate and validate for samples of varying sizes, including those at issue here. Shakespeare's rates did not change during his lifetime; they did not vary between his poems and plays, and they are not sensitive to editorial variances. Both tests are slower, more complicated and judgmental than our other tests, and harder than our other tests to replicate perfectly.[67] But rough replicability is enough for most

purposes, and tight replicability was often available for critical counts, such as those cited here, simply by our asking for Tarlinskaja's help, which she has given us generously.[68] We acknowledge that three quarters of the "Shakespeare-scene" rejections are from one test only, proclitic microphrases per thousand lines, and that for *Edward III*'s many Shakespeare-ascribers, the quickest way to put *Edward III* more firmly in the Shakespeare could-be column would be somehow to distinguish or discredit the test. But we are doubtful that they will find this an easy task, not only from our own twelve years of experience with the test, but also from our successful efforts to validate it against scores of text samples of varying size. As always, we are open to alternative views, but, from what we know now, these tests, and the rejections they show, seem to us solid ones.

That brings us to aggregate analysis of the Shakespeare and non-Shakespeare sections. Again excepting 4.04–4.09, the last three columns of Table 3 offer too many rejections per block, and too many zeroes after the decimal for even the individual non-Shakespeare blocks to have much Shakespeare plausibility. The odds that six out of seven of them would have proclitic scores lower than 97% of Shakespeare's baseline blocks are worse than daunting. The odds of this happening by chance, at our normal 3.7% overall baseline rejection rate for all 13 tests on blocks of this size, are about two in a hundred million, many orders of magnitude lower than the "Shakespeare" blocks. Bottom line: except for 4.05–4.09, the per-block probabilities are too low for Shakespeare, and the aggregate odds for all the blocks are far too low.

What about the five "Shakespeare" blocks? We have seen that, individually, four of the five are narrow Shakespeare could-be's by Discrete analysis and mostly narrow couldn't-be's by Continuous analysis (Table 3). We are in process of "detuning" Continuous to reduce its baseline false negatives to less than 5 percent, like Discrete; had we done this for *Edw 3 Sh*, all the Shakespeare blocks but 4.04 would be easy Shakespeare could-be's.[69] As it is, with no detuning, 2.02 is a could-be by both methods; 4.04 is a couldn't-be by both, but with only one or two zeroes after the probability decimal. All of these "Shakespeare" blocks but 4.04 seem to us no worse than close calls, taken separately, and all seem to us much

more likely Shakespeare than any of the non-Shakespeare blocks except 4.05–4.09. On the other hand, the consensus is that *all five* of these blocks are Shakespeare's work. What are the odds that *all five* of them would have six rejections between them, bearing in mind that only a third of our 140 Shakespeare baseline 1,500-word play verse blocks have even one rejection? The aggregate Discrete odds are about seven in a thousand—millions of times more likely than the seven "non-Shakespeare" blocks, taken as a group, since these have 18 rejections among them, but 36 times less likely than our Shakespeare threshold block on this test, which is closer to 2.5 in a hundred (Appendix Two). By this test, the "Shakespeare" blocks, as a group, are outside Shakespeare's ballpark by an order or two of magnitude—that is, out of the ballpark and city, but still in the same county. We would guess that they contain some non-Shakespeare, but it is a much closer call than the "non-Shakespeare" blocks.

Aggregate Continuous probability is an even closer call. Taken as a group, the "Shakespeare" blocks have composite Continuous probability five times lower than our Shakespeare threshold block (Appendix Two).

To recur to our earlier calendar image, Shakespeare at his peak could have produced a 1,500-word text block every fortnight. From his typical style habits, specifically from the proclitic microphrase counts discussed above, we could expect about one block a year that tested like most of his *Edward III* "Shakespeare" blocks,[70] and two to six years to produce four such blocks by chance. From this we would conclude that the consensus "Shakespeare" blocks are much closer to Shakespeare than the "non-Shakespeare" blocks but still not convincingly Shakespeare as an aggregate.

What about 4.05–09? These scenes have not been traditionally ascribed to Shakespeare except by those who think, contrary to our evidence, that the whole play is Shakespeare's. But, aggregated into one block of 1,963 words, they have no Discrete rejections at all and a Continuous composite probability which is within Shakespeare's range with no detuning. On the numbers, this block and 2.02 are the most Shakespearean on the chart, certainly more Shakespearean than Hand D-plus. Could they be gold? It is not our part to say that they *are* Shakespeare's.

We are the silver-bullet people, not the smoking-gun people, the ones whose main stock in trade is disproof, not proof. Moreover, we have five live examples of false composite positives, among our 43 like-sized blocks of known non-Shakespeare, four Discrete only, one both Discrete and Continuous. The lucky double-pass is Block 4 of Anthony Munday's *John a Kent and John a Cumber*.[71] We are confident enough in our negative evidence to believe that Shakespeare probably could not have written the *other* blocks of *JKJC*, but not so confident in our positive evidence, absent suitable corroboration beyond pure stylometrics, to suppose that Shakespeare could have, let alone must have, written Block 4. Nor is it our part to lead the hunt for qualitative resemblances to Shakespeare; after all, we are the crunchers, not the readers. But, if we were readers, we would be strongly tempted to take another look at 4.05–09 to see whether a Shakespeare ascription could be argued. Could this be Shakespeare?

> A flight of ugly ravens
> Do croak and hover o'er our soldiers' heads,
> And keep in triangles and cornered squares,
> Right as our forces are embattled.
> With their approach there came this sudden fog
> Which now hath hid the airy flower of heaven
> And made at noon a night unnatural
> Upon the quaking and dismayed world.
> In brief, our soldiers have let fall their arms
> And stand like metamorphised images,
> Bloodless and pale, one gazing on another. (4.05.28–38)

If we departed a bit from the consensus, by switching 4.04 to non-Shakespeare and 4.05-.09 to Shakespeare, it would greatly alleviate the problem of aggregate Shakespeare discrepancy. The revised *Edw3 Sh* would then be only two or three times more discrepant than our Shakespeare thresholds; that is, it would be in the ball park, if not on the field, by both composite tests, and close enough to suppose that it is already a more

arguable could-be. A bit of further tweaking might well make it an easy could-be by our rules, as is already true of the individual blocks. We probably have not squeezed every last bit of non-Shakespeare from the "Shakespeare" portions of *Edw3*, but switching the two blocks gives *Edw3 Sh* 0.8 rejections per block, higher than 93 percent of the 4-5-block aggregates in our Shakespeare baseline, but lower than any such aggregate in our non-Shakespeare baseline.

9. Conclusions

How close have we come to cracking the tough nut of *Edward III*? The odds seem overwhelmingly against the whole play being Shakespeare's work. But they are quite favorable to most of the "Shakespeare" scenes individually, and they now seem to us, with a couple of blocks reattributed, closer than not to an aggregate Shakespeare could-be. This is a much more hopeful prognosis for *Edw3 Sh* than we had from following the strict consensus, and we consider this tough nut much closer to being cracked. We are relieved to have gotten this a bit more ironed-out after many years of struggling with *Edward III*, and sorry we couldn't get it done before the death of G. Blakemore Evans, who started us on this quest, to let him know that he, and the other scholars of the 1990's and since who included *E3* in the Canon seem to have done the right thing.

Like *Edward III*, we thought that *Sir Thomas More* was an easy nut to crack as a whole play. It has far too many rejections and composite Shakespeare probabilities far too low for Shakespeare to have written it. Whether the Hand D addition was written in 1592–93 also seems to us an easy nut to crack. It likewise has too many rejections and too low composite Shakespeare probabilities to have come from Shakespeare in the 1590's. Whether it was written by Shakespeare in the early 1600's is a closer call, and not such an easy nut to crack, but, by our best calculation, the odds against Shakespeare authorship seem to be seven to twenty-six times stronger than the odds for it. Blocks as discrepant from the rest of Shakespeare as Hand D/1600's are not unknown, but they are very rare.

10. Cautions and Caveats

How would you go about attacking evidence like this? The first and most important thing to say about methods like ours is that they don't actually measure authorship. All they measure is discrepancy from Shakespeare. We think that, with proper safeguards, measuring such discrepancy adds greatly to the powers of conventional analysis and makes more crackable many nuts that have defied conventional analysis. But the discrepancies have to be real ones, good ones, not factitious or misleading ones. Our writing has always been full of cautions about where we think our analysis is at its strongest—where our baseline and sample blocks are clean and single-authored, our sample size is ample, our evidence is the kind that comes from authors themselves, more than from the influence of editors, times, and co-authors, and where the task at hand is weighing negative quantitative evidence. By the same token our analysis is at its weakest when these elements are not present. All you have to do to make the nut uncrackable again is to cut it into pieces so small that they can't be tested with our methods, or show that the scenes we thought were single-authored were, in fact, double- or multiply-authored, or that we picked the wrong starting and stopping points to test. We can rule out Shakespeare in pounds, but not in ounces.

A favorite last-ditch argument with Oxfordians has been the "caterpillar" argument, that, yes, the candidate's verse might not match Shakespeare's, but neither do caterpillars match butterflies. Couldn't the young Shakespeare have had a Blue Period of drastically different style, like the young Picasso, but never recorded? There is also the "magpie" or "chameleon" argument that some authors are clever and compulsive mimics picking up bits and scraps from other writers and never developing a style of their own. We don't think these notions are a good fit with Shakespeare, most of whose stylistic quirks by our tests were quite constant during his lifetime,[72] but they are better than nothing, and there are probably ways to explore them further.

Could there be a plausible "co-author chameleon" argument that collaborators, in particular, tend to blend their stylistic habits to match each other? This seems to us at least a conceivable, perhaps testable possibility. You often hear qualitative

assertions that it could be so, at least of features like feminine endings, open lines, and midline speech endings, traits of which Shakespeare and his contemporaries were probably well aware. One would think it less plausible for features like enclitic and proclitic microphrases, which were unthought of till the 20th century, or for our novel, computer-based tests like hyphenated compound words, grade-level, bundles of badges, rare words, new words, and so on. How could anyone have imitated traits then which you can't count now without a computer?

Above all, is there any quantitative evidence to back this theory up for tests like ours? If so, we would like to see it. It could add an asterisk to some of the low Shakespeare probabilities we have found here. How big an asterisk? We would like to know that, too. We have looked for it in vain in our first-cut analysis of *Pericles*, and we expect to be on the lookout for it when we analyze *Titus Andronicus*. If our tests confirm that both of these could be co-authored, as our whole-play tests say is probably so of both plays, and our scene-by scene analysis says is likely for *Pericles*, are the Shakespeare sections less typical of Shakespeare than those of Core Baseline plays? If so, is it because the co-authors were imitating each other, or because the divisions between them were less exclusive and watertight than stylometrists might like to suppose? If anyone pays attention to our evidence, we would expect to hear more such arguments in the future—and we might even hope to see some effort to back them up.

When we first announced our results in the 1990's, one of our cautions was that our methods were novel, needed further checking by us or by our critics for internal consistency and for correspondence with other kinds of evidence. We thought we needed to go through some probing and auditing from our critics before concluding that our case was sound. This need was more than met by some whose oxen were gored by our findings. We endured a decade of harsh critiques, first by Oxfordians, then Marlovians, and finally by Donald Foster. These adversary goings-over did turn up some errors on our part—such as failing to count three *whenas*'s, one *whereas*, and an *I'm* from the Folio which had not been carried over to the *Riverside*—but these errors turned out to be trivial and made no difference in outcomes when we fixed them. The other 99.9% of our findings and

methods survived these heavy audits with no damage discovered.[73] Foster has since conceded that our position on the *Funeral Elegy*—that John Ford could have written it, but not Shakespeare[74]—is correct,[75] and he has also since abandoned Elizabethan authorship studies. For our own part, we have spent ten years in further validation of our once-novel methods. We have found no glaring inconsistencies in our own methods, nor any glaring inconsistencies between our internal-evidence findings[76] and available external evidence. We are now, understandably, less timid about the novelty of our methods than we were before they weathered these mighty, fruitless, probings.

Many tough nuts remain to crack. There's the rest of the Dubitanda, discussed in Sections 3 and 4 above. And there is this further question about Hand D and the non-Shakespeare scenes of *Edward III*: if not Shakespeare, who? We are not among those who feel that, if you can't find any other author to fit a passage that might be Shakespeare, it therefore must be by Shakespeare by a process of elimination. But we do hope to have a small role in examining one or two of these questions, and we hope that others will try some of our methods before we or our platforms evaporate. We don't claim to have solved forever the question of whether Shakespeare wrote Hand D or the "Shakespeare part" of *Edward III*, but we hope we've helped narrow the possibilities a bit, as to *when* Hand D could have been written, *how likely* it is to be Shakespeare's, and *which parts* of *Edward III* could be Shakespeare's.

Quite a few supposedly tough nuts are not so tough once you are willing to look at their sheer discrepancy from Shakespeare's baseline. These numbers say that many of the ones we *have* tested are on a different planet from Shakespeare, and that the odds of his authorship are in many cases lower than those of getting struck by lightning. We acknowledge that our methods are still novel to most literature-department regulars, and, indeed, that our latest findings on shorter, co-authored passages are still new territory for us. But we hope the net result is a much clearer notion of what you can bet on, and with what degree of confidence. Where the passages are many and long, our confidence is high enough to support our thousand-pound wager. We have yet to find a taker.

Notes and References

1. Ward E. Y. Elliot is Burnet C. Wohlford Professor of American Political Institutions at Claremont McKenna College and founder and former co-advisor of the Claremont Shakespeare Clinic. Robert J. Valenza is Dengler-Dykema Professor of Mathematics and the Humanities. He was co-advisor to the Shakespeare Clinic and is now director of the Questions of Civilization Program at Claremont McKenna College.

We would like to thank G. Blakemore Evans for embarking us on our original analysis of the "Shakespeare scenes" of *Edward III* in 1997, and Marina Tarlinskaja for doing authoritative enclitic and proclitic counts not only for our *Edward III* and *Sir Thomas More* sections, but for our entire 150,000-word Shakespeare verse baseline as well. We also thank MacDonald Jackson, Brian Vickers, Gary Taylor, and David Bevington for comments and suggestions on previous drafts of this article. Tom Merriam provided critiques of our various conclusions on *Sir Thomas More*. All surviving errors are ours alone. The Shakespeare text we used for our baseline is the 1974 *Riverside Shakespeare*, except for *Edward III*, which is from the 1997 *Riverside Shakespeare.* G. Blakemore Evans, et al., *The Riverside Shakespeare* (Boston: Houghton Mifflin Company, 1997 [1974]). All Shakespeare references used in this article are based on these two editions.

2. The number 400 is a guess, but an informed one. We found 361 plays in Literature on Line (LION) judged to have been written between 1550 and 1620. We have another 19 plays in the Claremont Text Archive which we could not find in the LION search; and we would be surprised if there were not another 20 out there which LION missed.—but probably not 100 or 200, and, whatever the number, probably not including many plays that would support a serious claim of Shakespeare authorship.

3. 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 41 Middleton "Hecate" lines in *Macbeth* enough to justify moving the other 98% of the play out of the core. We cut out the 41 lines and kept the rest of the play in baseline. Like most other Core Shakespeare plays, the purged *Macbeth* got only one rejection in our 48 tests.

4. See Ward E.Y. Elliott and Robert Valenza, "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) (2004): 323–454, Appendix One. This 132-page document is our fullest available explanation of how we calculate relative authorship odds. It will be much invoked in the pages that follow.

5. O. J. Campbell and E. Quinn (1966). *The Reader's Encyclopedia of Shakespeare* (New York: Crowell, 1966), 115; Elliott and Valenza, "Oxford by the Numbers," Appendix One, Claimants.

6. Discrete analysis, described more fully in our "Oxford by the Numbers," 348–49, counts every individual test score outside our pertinent Shakespeare profile as a Shakespeare rejection and makes no distinction between gross rejections, narrow ones, "easy" non-rejections, and narrow non-rejections. Discrete profiles are normally set by eye to reject no more than five percent of pertinent Shakespeare blocks as Shakespeare "could-be's." The simplest form of Discrete composite analysis is simply counting rejections and noting, say, that the average Core Shakespeare play has one rejection in 48 tests, while the average Claimant play has seventeen. More precise composite Discrete analysis calculates the relative odds, under specified working assumptions, that the observed number of rejections, might have occurred by chance in a typical Shakespeare play. For non-Shakespeare plays we have tested, these odds have always been astronomically low.

7. Elliott and Valenza, "Oxford by the Numbers," 363–65.

8. *Henry IV, Part I*, 1.03.197–98.

9. See *Hamlet*, 3.02.286–87, just after the play-within-a-play has been given o'er and the ashen-faced King fled the room : "O good Horatio, I'll take the ghost's word for a thousand pound. Didst perceive?" At this writing, June 2005, a thousand pounds was worth more than 1,800 dollars.

10. See our "Oxford by the Numbers," 363–65.

11. Stratfordians think that Shakespeare wrote most or all of the Canon; anti-Stratfordians think that he wrote little or none of it. Hyperstratfordians think that he wrote all of it and then some.

12. E. K. Chambers, *The Elizabethan Stage* (Oxford, Clarendon Press, 1923); Elliott and Valenza, "Oxford by the Numbers," 333–35.

13. Donald W. Foster, "A Funeral Elegy by W(illiam) S(hakespeare)'s 'Best-Speaking Witnesses,'" *PMLA* 111 (1996): 1082–1105. Evans, *Riverside Shakespeare*, 1997; Brian Vickers, *'Counterfeiting' Shakespeare: Evidence, Authorship, and John Ford's Funerall Elegye* (Cambridge and New York: Cambridge University Press, 2002).

14. However, our motivation is hardly what E.K. Chambers was condemning when he coined the word "Disintegrationist." E. K. Chambers, *The Disintegration of Shakespeare* (London: Reprinted from the Proceedings of the British Academy, vol. 11, 1927). Chambers was chiding J. M. Robertson for trying to cleanse the Canon of its less polished lines simply by saying that Shakespeare could not have written such rubbish. Distinguishing good Shakespeare from bad is not our concern; distinguishing Shakespeare from non-Shakespeare is very much our concern, and our tests

say that, on the numbers, the Disintegrationists, including Robertson, are much more in line with the internal evidence than the Integrationists.

15. Ward E.Y. Elliott. and Robert J. Valenza. "And Then There Were None: Winnowing the Shakespeare Claimants." *Computers and the Humanities* 30 (1996): 191–245. This is the most complete description of our authorship tests. See also Elliott and Valenza, "Oxford by the Numbers."

16. Ward E.Y. Elliott. and Robert J. Valenza. *Shakespeare by the Numbers: New Evidence on What he Wrote and What he did Not Write* (Claremont, CA: manuscript in progress). The missing plays are *Horestes* and *Guy of Warwick*, each identified in the 1980's by Oxfordians as possibly by Edward de Vere, 17th Earl of Oxford, and, hence, if Oxford wrote the Canon, possible early Shakespeare as well. Neither the Oxford connection nor the Shakespeare connection has caught on for these plays, and we have dropped them here.

17. Thomas Merriam, "The Authorship of Sir Thomas More." *ALLC Bulletin* 10 (1982): 1–8; S. McMillin, "The Book of Sir Thomas More: dates and acting companies," in T. H. Howard-Hill, *Shakespeare and Sir Thomas More: Essays on the Play and its Shakespearean Interest* (Cambridge: Cambridge University Press, 1989); Eric Sams, *The Real Shakespeare: Retrieving the Early Years, 1564–1594* (New Haven: Yale University Press, 1995). See G.H. Metz, "'Voice and Credyt': The Scholars and Sir Thomas More," in Howard-Hill, *Shakespeare and Sir Thomas More*, 11–44.

18. Stanley Wells, Gary Taylor, et al., *William Shakespeare, a Textual Companion* (Oxford and New York: Clarendon Press; Oxford University Press, 1987): 136–37; *William Shakespeare, the complete works* (Oxford and New York: Clarendon Press; Oxford University Press, 2005).

19. Evans et al, *Riverside Shakespeare*, 1997.

20. Giorgio Melchiori, ed., *King Edward III* (The New Cambridge Shakespeare. Cambridge: Cambridge University Press, 1998).

21. Eric Sams, ed. *Shakespeare's Edward III*. (New Haven: Yale University Press, 1996).

22. Eric Sams, ed. (1985). *Shakespeare's lost play, Edmund Ironside*. (New York: St. Martin's Press, 1985); Sams, *The Real Shakespeare*; Sams, *Edward III*.

23. Other fuller, more targeted favorite references are Brian Vickers, *Shakespeare, Co-author: a Historical Study of Five Collaborative Plays*. (Oxford and New York: Oxford University Press, 2002) and almost anything by MacDonald Jackson.

24. Wells and Taylor, *Textual Companion*, 136–37.

25. Elliott and Valenza, "And Then There Were None."

26. For example, "[W]henever we say 'written by chance,' in lay language, we are actually talking about something more technically qualified for numerate readers. 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." From our "Oxford by the Numbers," 338.

27. That is, the seven most distant 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. *STM* 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.

28. See our "Oxford by the Numbers," 362–63.

29. See our "Oxford by the Numbers," 358–59

30. See references in Vickers, *Shakespeare, Co-Author*, Ch. 5 and 6.

31. See Vickers, *Shakespeare, Co-Author*, Ch. 3 and 4.

32. Elliott and Valenza, "Oxford by the Numbers," 335–37.

33. Vickers, *Shakespeare, Co-Author*; MacDonald Jackson, *Defining Shakespeare: Pericles as Test Case* (Oxford and New York: Oxford University Press, 2003). We believe that most scholars would classify *Pericles*, Acts 3–5 as "high dubitanda" or better, and *Pericles*, Acts 1–2 as "low dubitanda," or worse, "high" meaning "closer to Shakespeare." Acts 3–5 test like Shakespeare, but most scholars think that Acts 1–2 do not. Jackson, *Defining Shakespeare*; Vickers, *Shakespeare Co-Author*, Ch. 5. Our own first-cut analysis of *Pericles* is consistent with this analysis. On the other hand, see D. Del Vecchio, and A. Hammond, eds.. *Pericles, Prince of Tyre* (Cambridge, Cambridge University Press, 1998), vii, 37: They argue that denying the Shakespeare ascription to Acts 1–2 is "hostile and disintegrative," "perverse, old-fashioned, and unproductive." From the "old-fashioned," but prevailing, viewpoint, Acts 1–2 belong in the Canon only by their link to Acts 3–5, which appear to be Shakespeare's. Of themselves they are far less likely Shakespeare ascriptions than such "high Apocrypha" possibilities as *Edward III*, despite their derivative inclusion in the Canon.

34. Vickers, *Shakespeare, Co-Author*.

35. Marina Tarlinskaja, *Shakespeare's Verse: Iambic Pentameter and the Poet's Idiosyncrasies* (New York, P. Lang, 1987), Ch. 6.

36. Gary Taylor, "Shakespeare and Others: The Authorship of Henry the Sixth, Part One." *Medieval and Renaissance Drama in England* 7 (1995): 145; Paul J. Vincent, *When harey Met*

Shakespeare: The Genesis of the First Part of Henry the Sixth, Doctoral Dissertation, University of Auckland, 2005: 338.

37. "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, *Riverside Shakespeare*, 1997, 1775). Several respected paleographers have judged that Hand D is Shakespeare's (Vickers, *Shakespeare, Co-author*, 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," 21 further lines in a different hand (C), and pasted into the MS some lines after the Hand D section, is Shakespeare's. Evans, *Riverside Shakespeare*, 1997, 1775–79; Wells and Taylor, *Textual Companion*, 124–25; Howard-Hill, *Shakespeare and Sir Thomas More*; V. Gabrieli and Giorgio Melchiori, eds. *Sir Thomas More: A Play by Anthony Munday and Others* (Manchester and New York: Manchester University Press, 1990); MacDonald P. Jackson, "Hand D of Sir Thomas More." *Notes and Queries* 226 (1981): 146; Vickers, *Shakespeare, Co-Author*, 97–90.

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.

38 Richard Simpson, "Are There Any Extant MSS. in Shakespeare's Handwriting?" *Notes and Queries* 4 (1871): 1–3.

39. Wells and Taylor, *Textual Companion*, 124; see Vickers, *Shakespeare, Co-Author*, p. 39.

40. Carol Chillington, "Playwrights at Work: Henslowe's, not Shakespeare's Book of Sir Thomas More," *English Literary Renaissance* 10 (1980): 439–79; *accord*, George W. Williams, "The

Year's Contributions to Shakespearean Study: Textual Studies." *Shakespeare Survey* 35 (1982): 190; but see Charles Forker, "Webster or Shakespeare? Style, Idiom, vocabulary, and spelling in the additions to Sir Thomas More," in Howard-Hill, *Shakespeare and Sir Thomas More*, 151–70.

41. Wells and Taylor, *Textual Companion*, 125.

42. Michael Dobson and Stanley Wells, eds., *The Oxford Companion to Shakespeare* (Oxford: Oxford University Press 2001), 124.

43. Wells and Taylor, *Textual Companion*, 137.

44. Evans et al., *Riverside Shakespeare* (1997).

45. Giorgio Melchiori, ed., *King Edward III* (The New Cambridge Shakespeare. Cambridge, Cambridge University Press, 1998).

46. G. H. Metz, "'Voice and Credyt,'" 11–44; Taylor, *Textual Companion*.

47. Elliott and Valenza, "Oxford by the Numbers," 332–65.

48. 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.

49. Elliott and Valenza, "Oxford by the Numbers," 357; see Appendix Eight, "Others' Play Verse." "Net discrimination" is the percentage of true Shakespeare positives, 97%, minus false positives for non-Shakespeare, 25%, which then is 72%.

50. 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 fluke. The formula is: badges minus flukes, divided by badges plus flukes, times 1000. See our "And Then There Were None," 196, and note the difference between our use of *badges* and *flukes* as an author's preferred words, and Donald Foster's as words either exclusive to an author or never used at all by the author. Donald W. Foster, *Elegy by W.S.: a study in attribution*. (Newark and London: University of Delaware Press, Associated University Presses, 1989).

51. 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 2).

52. A feminine ending is a verse line ending with an unstressed syllable; for example, *coming*; *gotten*; *woman*. Our default feminine-ending counter is Textcruncher 1, which finds and counts generic feminine-ending words, such as words ending in *–ing*, but excluding *bring*, *king*, *sing*, etc. We found that Textcruncher counts fairly closely matched manual counts of Shakespeare's poems and his earliest plays (through 1596) but undercounted his later plays, probably owing to their

relative abundance of non-generic, non-programmed feminine-ending proper nouns: *Brutus*, *Octavia*, *Hector*, *Priam*, *Achilles*, *Caesar*, *Antony*, *Pompey*. We found it a useful test, nonetheless, being a hundred times faster and more consistent than manual counting. We noted that "its usability for our purposes is less a function of its consistency with manual counts than of its consistency with its own other counts (our "And Then There Were None," 199)." However, just to be on the safe side, we manually counted Hand D-plus Verse, doubling its machine count with less-generic words like *hurly*, *luggage*, *trespass*, and *pattern*, which the machine did not pick up. Then we manually recounted the Shakespeare baseline for 750-word play-verse blocks, *lowering* the 1590's profile maximum from 23 to 20, and *raising* the 1600's maximum from 28 to 38. That is, 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 and does not need a manual cross-check.

53. 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 61 below for a definition of threshold and boundary blocks. We make no claim that raw probability estimates tell absolute authorship odds, but *relative* probabilities, compared with Shakespeare's own threshold blocks, can be very telling. See our "Oxford by the Numbers," 348–356.

54. See our "Oxford by the Numbers," Appendix Eight.

55. In fact, we ran the same grade-level test on a different edition of Hand D-plus, that of Tom Merriam and Lou Ule. Its recorded grade-level score was even higher than the *Riverside*, 14th-grade, four standard deviations distant from Shakespeare's pertinent median of 6th-grade. We also ran the Riverside Hand D Proper Verse, stripped of the 21 lines in Hand C. The results, summarized in Appendix One, were essentially the same as those of Hand D-plus Verse.

56 . See our "Oxford by the Numbers," Appendix Eight.

57. See our "Oxford by the Numbers," 438–46.

58. MacDonald P. Jackson, "Linguistic Evidence for the Date of Shakespeare's Additions to Sir Thomas More," *Notes and Queries* 223 (1978): 155–56.

59. Our "And Then There Were None," 219.

60. See our "Oxford by the Numbers," 351, note 61.

61. 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. In practice, this formula typically says "could-be" to at least 95% of the baseline blocks, but there is nothing in the formula which requires it to, and in some cases it doesn't. 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.

62. See our "Oxford by the Numbers," 348–356.

63. See David J. Lake, "The Date of the Sir Thomas More Additions by Dekker and Shakespeare," *Notes and Queries* 222 (1977): 114–16; MacDonald Jackson, "Linguistic Evidence for the Date of Shakespeare's Additions to Sir Thomas More," *Notes and Queries* 223 (1978): 155–56; MacDonald Jackson, "Hand D of Sir Thomas More," *Notes and Queries* 226 (1981): 146; Gary Taylor, "The Date and Auspices of the additions to Sir Thomas More," in Howard-Hill, *Shakespeare and Sir Thomas More* (1989): 101–29; and Tarlinskaja's essay in this collection for similar skepticism about a 1590's date of composition; *contra*: Peter Blayney, P. W. M. (1972). "The Booke of Sir Thomas More Re-Examined." *Studies in Philology* 69 (1972): 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 "Munday, Chettle, Shakespeare, and More: The Huntington Plays and *Sir Thomas More*." (forthcoming in this journal). 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.

64. Sonnet 65: 11; see Tarlinskaja, *Shakespeare's Verse*, 203.

65. Tarlinskaja, *Shakespeare's Verse*, 215–16.

66. See our "Oxford by the Numbers," 431–37, including both poems and play verse.

67. Among the restrictions listed in Tarlinskaja, *Shakespeare's Verse*, Ch. 6 are these:

a. Leaning microphrases include clinging monosyllables (c.m.) only, monosyllabic words stressed in normal speech which lose their stress in verse for metrical reasons. If a c.m. comes before the stressed syllable, it is *proclitic*, leaning forward. Example: "sweet" in "sweet HEART." Only the stress-losing c.m., and not the stress-taking word, need be a monosyllable. "Sweet HEARTed" is a countable enclitic phrase. If a c.m. comes after the stressed syllable, it is *enclitic*, leaning backward, for example: "heart" in "SWEET heart."

b. Only *notional* (or "lexical") words are counted. "Notional" means words which carry meaning: nouns, verbs, adjectives, adverbs, impersonal pronouns, "this" as object.

"Grammatical" or "form" words are not counted. Articles, prepositions, personal pronouns, possessives, conjunctions, indefinite pronouns, such as "some." Some examples: *no*, *all*, *such*, *each*, *as*, *but*, *'tis*, *some*, *yet*, *both* (as conjunctive or pronoun), and *since*.

c. Only eight categories of phrase are counted, with examples as shown:

i. subject and predicate (*love thrives*)
ii. modifier and modified (*sweet heart, love's pains*)
iii. verb and adverb (*sink down*)
iv. adverb and verb (*well said*)
v. adverb and adverb or adjective (*more strong*)
vi. verb and object (*give ear*)
vii. adverb modifier not connected with first word (*so then, whore still*)
viii. apposition—title (*Lord Sands*)

d. Where two or more two-word combinations are possible, count only the two words most tightly linked. For example, in the phrase "how slow time goes," count "time goes," not "slow time."

e. Some actual examples of leaning microphrases appear in the following passage from Sonnet 29. Counted microphrases are in small caps. The metrically stressed, clung-to syllable is in larger type, the stress-losing c.m. in smaller type. The passage has two proclitic microphrases, SINGS HYMNS, and SWEET LOVE. It has one enclitic microphrase, SUCH WEALTH, *such* being considered more tightly linked to *wealth* than *wealth* is to *brings*.

Like to the lark at break of day arising
From sullen earth, SINGS HYMNS at heaven's gate;
For thy SWEET LOVE remembered SUCH WEALTH brings
That then I scorn to change my state with kings.

See Marina Tarlinskaja, *Shakespeare's Verse*, Ch. 6, for a fuller exposition of these rules. In the case of *Edward III*, our most recent opportunity to compare independent counts, our total proclitic counts for the play exceeded hers by 2%, enclitics by 4%.

68. Further technical discussion of her methods may be found in our "And Then There Were None," 201, and in her *Shakespeare's Verse*, 208–22.

69. We have also detuned our Continuous composite scoring for aggregates of several blocks, from the direct raw scores indicated in the Appendices to a score based on geometric means, which is less sensitive to selection bias.

70. That is, 26 fortnights a year times a no-better-than 3-percent rate of occurrence in Shakespeare's baseline = 0.78 expected occurrences a year of proclitic rates as low as those observed in *Edward III*'s "Shakespeare" scenes.

71. See our "Oxford by the Numbers," 437.

72. See our "Oxford by the Numbers," 390–96.

73. See our two rejoinders, Ward E.Y. Elliott and Robert J. Valenza (1998). "The Professor Doth Protest Too Much, Methinks: Problems with the Foster 'Response,'" *Computers and the Humanities* 32 (1998); and Ward E.Y. Elliott and Robert J. Valenza, "So Much Hardball, So Little of it Over the Plate: Conclusions from our 'Debate' with Donald Foster," (2002), available online at http://govt.claremontmckenna.edu/welliott/hardball.htm.

74. Ward E.Y. Elliott and Robert J. Valenza. "Glass Slippers and Seven-League Boots: C-Prompted Doubts about Ascribing *A Funeral Elegy* and *A Lover's Complaint* to Shakespeare," *Shakespeare Quarterly* 48 (1997): 177–207; Ward E.Y. Elliott and Robert J. Valenza, "Smoking Guns and Silver Bullets: Could John Ford Have Written the Funeral Elegy?" *Literary and Linguistic Computing* 16 (No. 3, 2001): 205–32.

75. Donald Foster and Richard Abrams "Abrams and Foster on 'A Funeral Elegy,'" available online at http://www.shaksper.net/archives/2002/1484.html (2002); see Gilles Monsarrat, "A Funeral Elegy: Ford, W.S. and Shakespeare." *Review of English Studies* (2002): 186–203; Brian Vickers, *Counterfeiting Shakespeare*.

76. See also Marina Tarlinskaja, "Two hands in *Edward III,* Anonymous. Discussion of Some Preliminary Results," *Shakespeare Yearbook*, (forthcoming in these pages). She used a very different system of estimating authorship probability in *Edward III,* but arrived at some conclusions similar to ours: that two hands are found in *Edward III*, the traditional "Shakespeare" scenes "not unlike early Shakespeare," the traditional "non-Shakespeare" scenes very unlike Shakespeare.