

# 1 “Mingled Yarn”: The State of Computing in Shakespeare 2.0

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The web of our life is of a mingled yarn, good and ill together.

— *All's Well That Ends Well*, 4.3

Ian Lancashire reflected on the state of computing in Shakespeare for the second volume of this journal in 2002.<sup>1</sup> In the decade since his ten year review, much has happened in the web of “digital Shakespeares”—experiments in editing and publishing, paradigm shifts in research and pedagogy, new tools and methods for analyzing a growing and varied multimedia archive—all with their share of successes and failures, a veritable “mingled yarn” of “good and ill together.” This special section on *Digital Shakespeares* is an opportunity to reflect on these developments and achievements, highlight current research in the field, and speculate on future directions.

The first half of our introduction pays homage to Lancashire’s original article, following the same basic outline of individual sections surveying developments in the computational tools, criticism, and texts of Shakespeare. After consideration of the shape of things to come, we introduce the essays comprising this special section and the diverse topics they engage with, intersecting with the overarching themes of innovation, intervention, and mediation.

## DIGITAL TOOLS

In order to give a fuller account of the computational tools produced over the past decade, and to point to others currently in development, this introduction—

to appropriate Dickens' *A Christmas Carol*—briefly surveys the digital tools of Shakespeare studies “past,” “present,” and “yet to come.”

## Past

The rate at which electronic tools, texts, and media can become technologically obsolete is steadily increasing, as the hardware and software on which they depend continue to change. For digital Shakespeare studies, the tasks of preserving and sustaining such materials remain the most pressing critical, technological, and administrative challenges. However, any discussion of computational tools must acknowledge the dynamic and iterative nature of the digital medium, as well as its ephemeral and technologically dependent aspects. The varied fates of a number of digital tools and resources originally surveyed by Lancashire in 2002 bears this out. Larger resources, both commercial and semi-commercial, have since superseded (or subsumed) earlier and (relatively) smaller tools. Lancashire's *Early Modern English Dictionaries Database* (EMEDD), originally hosted on his University of Toronto server space and freely available to any researcher obtaining a username from him, indexed some 200,000 word-entries in October 1999.<sup>2</sup> On April 12, 2006, *Lexicons of Early Modern English* (LEME) superseded the EMEDD, indexing some 1,200 lexical words from the period 1480–1702 and incorporating over 596,000 word-entries, co-published by the University of Toronto Libraries and the University of Toronto Press in both public and licensed versions.<sup>3</sup> Similarly, the *English Verse Drama* and *English Prose Drama Databases*, produced by Chadwyck-Healey in 1995 and previously available for library purchase on two CD-ROMs or 2,400 feet of half-inch magnetic tape, were in 1996 subsumed into the Web-based subscription service, *Literature Online* (LION), now owned by ProQuest.<sup>4</sup>

Other tools, tethered to media formats with fixed dependencies of hardware and software, have not fared as well. As the Web superseded the CD-ROM and other portable media as the preferred method of electronic publication, a boom in Shakespeare tools published on CD-ROM in the 1990s and early 2000s—among them the *Voyager Macbeth* (1994), the *Arden Shakespeare CD-ROM* (1997), and the *Cambridge King Lear on CD-ROM: Text and Performance Archive* (2000)—was short-lived.<sup>5</sup> By the close of the twentieth century, it was clear to academic presses that many experiments in such fixed media had foundered. In their 1999 piece for *The Chronicle of Higher Education*, Niko Pfund and Nancy Lin of New York University Press remarked that the CD-ROM “is all but dead and buried, save for reference works and games,” acknowledging that “constant change is likely to be our technological future,

and that we must prepare our titles in multiple formats.”<sup>6</sup> The Web has all but replaced the CD-ROM as the primary medium for the electronic distribution of both games and reference works, and fewer manufacturers now produce personal computers with CD-ROM devices built in.

While Web-based tools and services, unlike those delivered on fixed-media like CD-ROM, are updatable and therefore able to maintain compatibility with the latest developments in hardware and software, this does not guarantee against technological obsolescence or commercial failure. A number of Web-based services surveyed by Lancashire in 2002, such as *ArdenNet* (an open-access portal for Shakespeare research and teaching) and *ArdenOnline* (a commercial subscription service offering electronic texts of the Arden Shakespeare third series), both published by Thomson Learning, in 1997 and 1999 respectively, no longer exist.<sup>7</sup> Others, such as Donald W. Foster’s *SHAXICON* (a database of rare words infamously used by Foster in 1995 to attribute *A Funeral Elegy* to Shakespeare) or H. Joachim Neuhaus and Marvin Spevack’s *Shakespeare Database Project* (linked databases for literary and linguistic analysis of Shakespeare’s works), both anticipated by Lancashire as forthcoming back in 2002, remain unavailable.<sup>8</sup>

As with a number of their counterparts in print, notable electronic journals and series in our field have come and gone. *Renaissance Forum*, launched in 1996 and hosted by the University of Hull, ceased publication in 2005 after its Winter 2004 special issue.<sup>9</sup> Similarly, *Renaissance Electronic Texts* (RET), launched in 1994 under the general editorship of Ian Lancashire and published by the University of Toronto Library’s Web Development Group, apparently ceased publication after the 1998 edition of Shakespeare’s *Sonnets*, co-edited by Lancashire and Hardy M. Cook.<sup>10</sup> While the RET no longer publishes new content, the encoding guidelines developed by Lancashire for the series live on, adopted into the editorial guidelines used by the *Internet Shakespeare Editions* (ISE), the *Queen’s Men Editions* (QME), and the *Digital Renaissance Editions* (DRE).<sup>11</sup>

To return to Dickens, if the Ghost of Digital Tools for Shakespeare Studies Past has a message for would-be Scrooges, it is this: adapt or perish. Fixed media formats threaten digital tools with fossilization, while reliance on proprietary software and standards for their production renders developers hostage to commercial companies for ongoing support. Adaptation is therefore key to the survival of a digital tool in an ever-changing landscape of hardware devices and software environments on which it relies. Such adaptation requires a combination of vigilance, resilience, and—of course—funding and ongoing scholarly-consumer interest to stave off an otherwise inevitable technological

obsolescence, as well as a commitment to multiple and flexible media formats, open standards and software to promote the widest possible interoperability with current (and backward compatibility with previous) systems. The adaptability of digital tools and the associated tasks of continually preserving, maintaining, and updating them to ensure they remain usable on multiple, changing platforms over time has given rise to what Julia Flanders has characterized as a “culture of perpetual prototype,” in which finality and completion is resisted.<sup>12</sup> To sustain this complex, dynamic, and ongoing adaptability and support associated processes of reproduction, revision, redesign, remediation, and perhaps even remixing, successful digital tools must also be iterative.

## Present

The decade since Lancashire’s 2002 survey has also witnessed an explosion in the development of new digital tools for Shakespeare studies. These include applications for computer-assisted text analysis, databases for bibliographical and lexicographical research, resources for theatre and performance histories, platforms for research publication, archives of digitized materials in various media, and virtual environments for mapping and visualization.

Born-digital journals in the field, once comprising solely the pioneering efforts of *Early Modern Literary Studies* and *Renaissance Forum*, now count among their number *Appositions*, *Borrowers and Lenders*, *Early English Studies*, *Early Modern Culture*, *The Hare*, the *Journal of Early Modern Studies*, and *This Rough Magic*, opening up new avenues for open-access research publication and dissemination.<sup>13</sup> Previously viewed as suspect and a poor alternative to print publication, this dramatic increase in numbers reflects a growing scholarly—as well as, importantly, administrative—acceptance and valuing of refereed electronic journals within and beyond our field. Electronic journals highlight the technological shortcomings of their print counterparts, particularly in their ability to embed multimedia content such as audio and video footage of Shakespearean performances.<sup>14</sup> Some electronic journals occupy a niche in Shakespeare scholarship not otherwise sufficiently addressed in print outside of dedicated book series and the occasional edited collection: for example, *Borrowers and Lenders* on Shakespearean appropriation—more commonly a topic for edited collections—and *This Rough Magic* on pedagogy—typically the domain of the MLA Approaches to Teaching World Literature series. *The Hare*, which exclusively publishes short notes and critical interventions, similarly fills a gap in scholarly publishing by virtue of this format.

Computer-aided textual analysis, Stéfan Sinclair and Geoffrey Rockwell observe, is “no longer an exotic preoccupation of digital humanists and computational linguists: humanities students need to understand automated methods if only because we are surrounded by their use—in everything from our email to the news.”<sup>15</sup> Tools for such analysis, such as *Intelligent Archive* (developed at the University of Newcastle’s Centre for Literary and Linguistic Computing) for computational stylistics and authorship attribution tests, *WordHoard* (developed at Northwestern University) for statistical analysis, and *Juxta* (developed at the University of Virginia’s Applied Research in Patacriticism lab) for textual comparison and collation, now join the ranks of *DocuScope* (developed at Carnegie Mellon University; not publicly available), *TACT* (developed under the IBM–University of Toronto Cooperative in the Humanities), and *The Versioning Machine* (developed at the Maryland Institute for Technology in the Humanities).<sup>16</sup> As detailed in later sections of this introduction, this increasing number of cross-platform, open-access and/or open-source tools, coupled with an ever-growing archive of available digital texts, is democratizing the computer-aided quantitative and statistical analysis of Shakespeare’s works and those of his contemporaries, broadening the potential for new discoveries.

Just as Lancashire’s LEME succeeded his earlier EMEDD as an indispensable digital tool for early modern lexicographical research, the past decade has witnessed the emergence of important electronic resources to support bibliographical scholarship in Shakespeare studies. First distributed in print and later by CD-ROM, the *World Shakespeare Bibliography*, under the editorship of James L. Harner, migrated to its current Web-based incarnation as the *World Shakespeare Bibliography Online* (WSBO) in 2001. With over 131,800 annotated entries covering worldwide Shakespeare-related scholarship and theatrical productions since 1960, the WSBO’s electronic database facilitates cross-linking between entries by author, reference, and subject, allowing users to quickly locate related works. As a near-exhaustive electronic record of Shakespeare studies, the WSBO also serves as an ideal corpus for computer-aided quantitative analysis. At the time of writing, Dominic Klyve and his student Kate Bridal (Department of Mathematics, Central Washington University) are conducting descriptive and time-series statistical analysis on the bibliographical records of the WSBO, uncovering trends in Shakespeare scholarship over the last 50 years.<sup>17</sup> Other digital bibliographical tools, now essential resources in their own right, build upon the legacy of their predecessors in print. The *Non-Shakespearean Drama Database* (NSDD), edited by Gabriel Egan and released in 2002, is a database tabling the 710 extant dramatic works

catalogued in LION supplemented with additional information (dates and limits of first performance, genre, and auspices) drawn from the first and third revised editions of Alfred Harbage's *Annals of English Drama 975–1700*.<sup>18</sup> On its public launch in 2007, Alan B. Farmer and Zachary Lesser's *DEEP: Database of Early English Playbooks* superseded the NSDD. DEEP is a database of playbooks produced in England, Scotland, and Ireland from the dawn of print through to 1660, aggregating and supplementing data from printed reference works to provide details about the publication, printing, and marketing of early English drama.<sup>19</sup> Both NSDD and DEEP are freely accessible online.

Coverage of tools for theatre and performance histories in Lancashire's 2002 survey was limited to "digitized performance libraries" (89), primarily Shakespeare performance materials commercially distributed on CD-ROM. Since then, a new generation has emerged, characterized by a commitment to open-access, Web-based distribution, international collaboration, and a concomitant focus extending beyond canonical, Anglophone performances and adaptations of Shakespeare. This new breed of digital performance archive began with the 2009 launch of *Shakespeare Performance in Asia* (SPIA), co-directed by Peter S. Donaldson and Alexa Huang, which offers an extensive collection of digitized video of Asian performances of Shakespeare, accompanied by critical essays, interviews, and biographies of artists and acting companies.<sup>20</sup> With the help of editors responsible for particular geographical and cultural regions, Donaldson and Huang launched *Global Shakespeares Video & Performance Archive* in 2010, extending the SPIA model to include performances of Shakespeare from around the globe.<sup>21</sup> Like SPIA, newly transformed into the project's "Asian wing," *Global Shakespeares* offers streaming videos, in whole or as selected highlights, of recorded stage and screen performances of Shakespeare, alongside essays and interviews, scripts and subtitles, company information and a growing bibliography of critical resources.<sup>22</sup>

While theatre companies, libraries, museums, and other cultural heritage institutions continue to digitize their performance materials in various media—from streaming video of the 2012 "World Shakespeare Festival" and "Globe to Globe" season on *The Space*,<sup>23</sup> to the ever-expanding collection of stage and screen artifacts in the ISE's *Shakespeare in Performance* database<sup>24</sup>—these "digitized performance libraries" are now joined by a suite of innovative, open-access digital research tools. Since 2003, the important work of the Records of Early English Drama (REED) project to broaden and enrich existing theatre and performance histories through the transcription of documentary evidence of performance continues with the development of digital resources. The first of these, the *Patrons and Performances* site (launched in 2003 and co-directed

by Sally-Beth MacLean and Alan Somerset), provides a searchable database of provincial touring performance records of all kinds in England, Scotland, and Wales before 1642.<sup>25</sup> Records are searchable by patron, event, venue, or troupe, or by location on interactive or antiquarian maps. The site also features a section on “Shakespeare in the Provinces,” tracing Shakespeare’s potential exposure to provincial theatre performances before leaving for London. The most recent addition to the REED arsenal of electronic resources is *Early Modern London Theatres* (EMLoT), released in 2011 and directed by Sally-Beth MacLean, which charts the extant transcriptions of pre-1642 documents relating to professional performance in purpose-built theatres in and around London.<sup>26</sup> The database provides a catalogue of these documents, with abstracts and information about their users, evidence of that use, and the location of original copies.

Dubbed “the single most important document of early modern English theatre history,” the diary of Philip Henslowe—containing daily performance receipts for the Rose Playhouse from 1591 through 1609, with payments to playwrights and actors, and expenses for props and costumes—provides unique insight into the financial workings of the playhouses in Shakespeare’s time. The 2010 launch of the *Henslowe-Alleyn Digitisation Project* brought the diary, along with other important documents relating to the theatrical affairs of Henslowe and his erstwhile business partner and son-in-law, the actor Edward Alleyn, online.<sup>27</sup> The project, directed by Grace Ioppolo, catalogues the Henslowe-Alleyn Papers at Dulwich College, providing high-resolution digital scans of the collection alongside critical essays on its various contents. But the history of early modern English theatre and performance is as much informed by the scant documents and evidence that have survived, as by the traces of those now lost. The *Lost Plays Database* (LPD), under the coordinating editorship of Roslyn L. Knutson and David McInnis since 2009, provides a refereed Wiki-style forum for the accumulation and exchange of information about lost plays in England, 1570–1642, with the aim of revising our assumptions about the plays, players, dramatists, and companies of the period.<sup>28</sup> It is the first electronic resource dedicated to this neglected topic, and the number of books, articles, and notes on revisionist theatre histories arising out of research conducted for the LPD steadily rises.

Interest in mapping and other forms of data visualization has steadily increased in the humanities over the last decade, and a number of inspired digital projects in Shakespeare studies reflect this broader scholarly trend. The *Map of Early Modern London* (MoEML), under the general editorship of Janelle Jenstad, offers an open-access atlas, encyclopedia, and library of the literature and culture of Shakespeare’s London, linking primary literary sources

and historical information to geographical reference points and areas on an interactive, digitized map of London from the 1560s.<sup>29</sup> While MoEML produces a cultural map, richly layering historical-geographical data with primary and secondary literary-historical materials, other projects are experimenting with visualizing spatial data in three dimensions. With Jennifer Roberts-Smith as its principal investigator, the *Simulated Environment for Theatre* (SET), which is the subject of an article in our collection, offers a 3D environment for reading, exploring, and directing plays using scale models of historical and contemporary theatre spaces.<sup>30</sup> In development since 2008, the current release of SET—a desktop application built on the Unity game engine, compatible with Windows and Apple OS X—comes with Shakespeare’s *Julius Caesar* pre-installed, with the entire play blocked for performance. With its multiple views, customizable scripts and performance spaces, and ability to annotate the simulated action, SET moves beyond earlier software packages for blocking Shakespearean scenes, such as Michael Best’s *Scenario*, distributed on CD-ROM in 2003.<sup>31</sup>

The past decade has also witnessed a growth in the use of virtual reality and computer modeling for theatre history research, as highlighted in a 2004 special issue of *Early Modern Literary Studies* on the topic.<sup>32</sup> More recently, Joanne Tompkins and the team at Ortelia Interactive Spaces have built interactive 3D models of the Rose and Boar’s Head playhouses, with additional early modern theatres planned. With scale models of playing spaces, props, and actor-driven avatars (using motion capture) built within the Ortelia virtual reality environment, users can simulate the effects of weather and lighting on performance, assess lines of sight and visibility, and test scholarly conjectures about architectural design.<sup>33</sup> While such digital tools and virtual environments offer new methods for theatre history research, they also enable experimental forms of Shakespearean performance. For example, the online virtual world *Second Life* boasted working models of both Globe and Blackfriars playhouses, which hosted abbreviated performances of Shakespeare’s plays produced by the Metaverse Shakespeare Company (formerly the Second Life Shakespeare Company). After productions of selected scenes from *Hamlet* (1.1 in February 2008, 3.2 in April 2008) and the entire first act of *Twelfth Night* (February 2009), the company dissolved in 2011 due to lack of funding, with its virtual home, the *Second Life* Globe Theatre, deleted.<sup>34</sup>

### Yet to Come

As the collapse of the Metaverse Shakespeare Company suggests, in real life as in *Second Life*, funding remains a significant issue for digital Shakespeare.

However, crowd-sourcing and crowd-funding—new paradigms of global, distributed social action ushered in under the banner of Web 2.0—offer exciting future possibilities. Consider the recent example of Canadian comic-book writer Ryan North’s *To Be or Not To Be: That is the Adventure*, a project to produce “the greatest work IN English literature” in “the greatest format OF English literature: a chooseable-path adventure.” North sought US \$20,000 to subsidize production of this Shakespearean adaptation, using the crowd-funding site *Kickstarter*, which offers a platform for creative projects to attract financial pledges online. The project listing went live on 21 November 2012, offering potential backers a range of inducements—from free electronic and print copies to limited edition plush Yorick skulls—in order to reach the funding goal within the month deadline.<sup>35</sup> This “choose-your-own-adventure version of *Hamlet* featuring jokes, ghosts and the previously unseen pirate fight scene,” as reported in *The Guardian*, “raised more than six times its goal on *Kickstarter* in less than a week.”<sup>36</sup> On the deadline, with pledges starting at as little as \$15 each, the project received \$580,905 in pledges from 15,352 backers around the world. The Puppet Shakespeare Players, seeking US \$1,000 to create a DVD of their *Puppet Romeo & Juliet* production, offer another example, securing \$3,898 in *Kickstarter* pledges from 90 backers in 21 days.<sup>37</sup> These successes reflect not only the enduring popularity of Shakespeare and a continued global interest in seeing his works creatively adapted for modern audiences, but also the global outreach—and potentially substantial financial rewards—of such crowd-funding ventures.

To return to Dickens a final time, the visitation of the “Ghost of Digital Tools for Shakespeare Studies Yet to Come” is, by necessity, a brief excursion, since development of the projects under discussion remains contingent on funding for timely completion. Even so, the projects described promise new evidence, as Lancashire termed it in 2002, “that computing has found fresh ore in tired mines” (89).

Compositorial studies of Shakespeare’s early printed editions offer one such mine. By determining which compositors set particular parts of each play and identifying their characteristic habits, modern editors are better able to weed out textual errors introduced in the printshop. Such studies hitherto relied on manual counts of typographical and orthographical features—such as distinctive spellings and preferred placing of stage directions—in order to distinguish one compositor and his “stints” from another. Gabriel Egan recently proposed a software tool to trace latent compositorial habits and identify individual compositors computationally, with more accuracy than ever before. Egan’s proposal includes an additional method using stand-off XML markup of encoded Shakespeare texts to test competing scholarly hypotheses about

where each compositor began and finished his “stint.” There was agreement at the conference session at which Egan presented the project that this represents a major step forward in compositor studies.<sup>38</sup>

Shakespeare’s early modern readers routinely copied selections from his plays (and those of his contemporaries) into manuscript, often in the form of commonplace books and verse miscellanies. Frequently adapted, retitled, and recontextualized in the process, these dramatic extracts reveal not only which plays were read and copied, but also how early modern readers responded to and engaged with them. When complete, Laura Estill’s *Database of Dramatic Extracts* (DEX) will present full transcriptions of the dramatic extracts that survive in seventeenth-century manuscripts, alongside text from the original printed sources, indexed by play, playwright, character, manuscript, and author. As such, it promises to offer scholars of early modern drama and the history of the book an exciting range of material for further study.

As a response to Heather Dubrow’s call for a new methodology of historical formalism in early modern studies, one against the critical tendency “to separate literary history and generic analysis,”<sup>39</sup> Elizabeth Scott-Baumann and Ben Burton propose *Forms Online: Renaissance to Modern* (FORM), a database of early modern poetry catalogued by rhyme scheme, meter, genre, and other formal characteristics. The project, currently in development, aims to “provide a framework in which scholars can find unprecedented ways of answering their research questions and, crucially, a tool that will provoke them to ask new questions.”<sup>40</sup> In mapping and visualization, Hannah Crawforth’s *Mapping Shakespeare’s London*, in development at King’s College London since 2009, promises—apparently in ignorance of the *Map of Early Modern London*—to offer “the first online resource detailing the important ways in which the early modern city provided a context for [Shakespeare’s] plays.”<sup>41</sup> If the reader will indulge one of the present authors describing his own project, Brett D. Hirsch is developing the *Bibliography of Editions of Early English Drama* (BEEED), a comprehensive bibliography informed by archival research, comprising detailed bibliographical, editorial, and publishing information about editions of early English drama published since the eighteenth century. When complete, the project’s open-access Web interface will enable editors to easily compile a bibliography of historical editions to consult for collation, scholars to identify and explore trends and patterns in editing and publishing, and educators to discover suitable editions for teaching.

## COMPUTATIONAL CRITICISM

Empirical research in literary studies, though still peripheral, gathered strength in the 1980s, exemplified by the work of Pierre Bourdieu in the wider area of literary sociology and John Burrows in the more focused domain of computational stylistics.<sup>42</sup> The last decade saw such computational and quantitative approaches enter the mainstream of literary studies under various guises such as “distant reading,”<sup>43</sup> “literary macroanalysis,”<sup>44</sup> and “algorithmic criticism.”<sup>45</sup> Differences in label aside, these methods share the common goal of testing literary judgments—about authorship, genre, and style more generally—against empirical data, and an interest in the new hypotheses about literature that quantitative study can generate.

**Shakespeare, Stylometry, and Authorship Attribution**

In an email to the SHAKSPER list (SHK 13.1514) on June 12, 2002, Donald Foster conceded that he had been wrong in attributing *A Funeral Elegy* to Shakespeare. So ended the most celebrated confrontation to date between stylometry, relying on quantitative measures, and readers drawing on intuitive responses.<sup>46</sup> Foster had insisted that though the poem did not “sound” like Shakespeare, the numbers showed that it must be, and readers would just have to change their ideas of what authentic Shakespeare was. Foster and most other supporters of the case for Shakespeare were persuaded by an article by Gilles Monsarrat with an entirely conventional array of parallels between the poem and the work of John Ford.<sup>47</sup> The *Elegy*, which had been appearing in many editions of Shakespeare’s complete works, even if in an appendix, promptly started disappearing again.

In the years since, there has been nothing so spectacular in Shakespearean stylometrics. Methods have probably converged, with the large online text collections (which Foster lacked, relying on his own textbase, which, as noted in the previous section, was never made public) as common ground. In a reversion to the methods of the “parallelographic school,”<sup>48</sup> researchers find unusual words or phrases in a disputed text, determine which of them are truly unusual by searching one of the text collections, and then count how many of them appear in a candidate author, or a number of candidate authors. MacDonald P. Jackson is the most committed and rigorous of the exponents of this method, distinguished by his willingness to adduce quantitative evidence from other realms such as metrics and spelling.<sup>49</sup> Alongside a reversion to the methods of the “parallelographic school,” the last decade has witnessed the emergence

of the attribution “meta-study,” reviewing—and in some cases re-running—older studies in authorship, exemplified by the work of Brian Vickers in his fine books on the *Elegy* and “Shall I Die” attributions and on Shakespeare’s collaborative playwriting.<sup>50</sup> Computational stylistics, deriving from Burrows, continues to work at the more purely quantitative end (and has been roundly criticized by Vickers for doing so at the expense of the readerly response).<sup>51</sup> In this vein, the contributors in *Shakespeare, Computers, and the Mystery of Authorship* (2009), edited by Craig, one of the editors of this special section, and Arthur F. Kinney, use frequencies of function words—that is, words with syntactical functions rather than semantic ones—in combinations as well as newer methods with lexical words, and present a mixture of controversial and non-controversial claims. Briefly, these include: Marlowe has a hand in *1 and 2 Henry VI*; Shakespeare has a hand in *Edward III* and *Arden of Faversham*; the 1602 *Additions to The Spanish Tragedy* are by Shakespeare and *Edmund Ironside* is not; and, the Folio *Lear* is a revision by Shakespeare.

With the Shakespearean canon at stake, authorship attribution studies have understandably tended to arouse debate and attract broader public attention, and continue to do so. The muted but persistent argument over Shakespeare’s authorship or otherwise of *A Lover’s Complaint* offers a current example. Vickers has published a book relying mainly on perceived parallels with John Davies of Hereford and a perceived mismatch with Shakespeare’s practice.<sup>52</sup> Jackson has produced a stream of articles with evidence from manifold quarters supporting Shakespeare’s involvement.<sup>53</sup> Craig has offered statistically based comparisons, which tend to rule Davies out and accept the possibility of Shakespeare.<sup>54</sup> The most recent authorship dispute to attract public attention is the suggestion by Laurie Maguire and Emma Smith in an article for the *Times Literary Supplement* that Thomas Middleton co-authored *All’s Well that Ends Well*—findings challenged by Brian Vickers and Marcus Dahl in a response piece.<sup>55</sup>

### **Beyond Attribution**

Even in its more interpretive guise, contemporary Shakespeare research relies upon digital tools and methods. Their use is so embedded and widespread as to render them invisible. For example, scholars routinely buttress their qualitative findings by instantaneous searching for words and phrases across electronic corpora.<sup>56</sup> However, positive advances in the analysis of style that explicitly rely on the digital are harder to find. Jonathan Hope and Michael Witmore are among those who present such rare findings.<sup>57</sup> They look for larger patterns in Shakespeare across genres and phases, informed by close attention

to the special qualities of early modern English. Their tool is *DocuScope*, originally developed to analyze students’ writing in composition courses, but giving access though inbuilt stranding of various linguistic features to elusive qualities of style like “stance.”

A recent collection, *Stylistics and Shakespeare’s Language: Transdisciplinary Approaches* (2011), showcases Shakespearean stylistics of a more familiar type, with local studies of the deployment of the expressive tools of language. In addition to chapters on verse, wordplay, and other formal stylistic features, the collection includes an essay establishing that Shakespeare’s vocabulary was not especially large after all, echoing the results of a separate essay published in *Shakespeare Quarterly* that year.<sup>58</sup> The coincidence is probably because it is only now that the works of Shakespeare’s peers, and not just those of the Bard himself, are also readily available in searchable, electronic formats (see next section). As such, an earlier, intensive and exclusively Shakespearean phase in digital Shakespeare studies is giving way to a more wide-ranging perspective. Typical of this new trend is Lene B. Petersen’s recent book, *Shakespeare’s Errant Texts* (2010), which investigates oral patterns in early modern drama texts and relies upon a large collection of digital texts and statistical methods combining multiple variables.<sup>59</sup> While her case studies are somewhat difficult to follow, Petersen’s core argument—that researchers using digital texts of the plays need to better understand how they came about, and engage with the manifold questions surrounding their production and transmission—is highly pertinent.

## ELECTRONIC EDITIONS

Whether encoded in the form of a digital photo-facsimile of a print edition, a diplomatic transcription prepared in one of several markup languages, or a critical text (in old or modern spelling) with scholarly apparatus using the same, the number of electronic editions of Shakespeare continues to grow at a staggering rate.

### Facsimiles

John Overholt observed that “New facsimiles of the Folio have always followed the introduction of new technologies for reproduction,”<sup>60</sup> and a decade of increasingly wider access to digital photography and scanning equipment has ensured that digital photo-facsimiles of Shakespeare’s early

printed quartos and folios are now readily available in a variety of image formats and resolutions.

As was the case with digital tools, CD-ROM remained the primary medium for the distribution of digital photo-facsimiles during the early 2000s until online delivery became mainstream. For example, the California-based Octavo Corporation prepared high-resolution digital photographs of a copy of the First Folio held in the Folger Shakespeare Library, released in 2001 on a single CD-ROM for US \$75 and a 20-disc “research facsimile” edition for US \$1,250.<sup>61</sup> After 10 years and some 400 titles digitized, John Warnock, co-founder of Octavo, closed down the company and remained its only (non-paid) employee. In 2006, Warnock launched the *Rare Book Room*, an open-access online repository making lower-resolution versions of the Octavo images—and images of other books he scanned himself—freely available. In addition to the First Folio, the *Rare Book Room* offers photo-facsimiles of Shakespeare’s Quartos from the British Library, the Bodleian Library, the University of Edinburgh Library, and the National Library of Scotland.<sup>62</sup> The same year, Gale (an imprint of Thomson Learning) launched *The Shakespeare Collection*, a commercial online database of Shakespeare criticism, reference works, digitized primary and secondary materials, and the full text of the *Arden Shakespeare* editions, incorporating the commercial, high-resolution PDF versions of the Octavo scans.<sup>63</sup>

In 1998, University Microfilm Incorporated (UMI; now a division of ProQuest) began digitizing its *Early English Books* and *Thomason Tracts* microfilm series, covering a substantial archive of works printed in England and its dependencies between 1473 and 1700. Since 2003, Chadwyck-Healey (also a division of ProQuest) provides access to these digitized facsimiles through its *Early English Books Online* (EEBO) interface, available by institutional subscription, including works by (or attributed to) Shakespeare.<sup>64</sup> Derived from microfilm scans, the digital facsimiles offered by EEBO are available to view on-screen or to download as PDF documents and TIFF images, though low-resolution, poor quality, and in black-and-white. If EEBO has revolutionized the study of early modern England, the revolution has not been quiet, with scholars variously lauding the ability to access “what were once elite and inaccessible international resources” on their desktops and to examine “some of the rarest and most impressive works of a global collection by a few clicks of the mouse,”<sup>65</sup> and critiquing its image quality, bibliographical choices and assumptions, and cost.<sup>66</sup>

Commercial interests prompted the earliest ventures to create digital photo-facsimiles and diplomatic transcriptions of Shakespeare’s works. The shift from fixed media to online distribution that followed, alongside a simultaneous

drop in costs and rise in availability of high-quality digital photography and scanning equipment, subsequently enabled libraries and other cultural heritage institutions to digitize their collections and make them freely available to the public. One of the earliest examples is the digitization of the Furness Memorial (Shakespeare) Library by the University of Pennsylvania’s Schoenberg Center for Electronic Text & Image (SCETI) in 2000.<sup>67</sup> Of a much larger scale is the *Shakespeare in Quarto* project, launched in 2004, which includes high-quality photo-facsimiles of 107 copies of the 21 Shakespeare plays printed in quarto, sourced from the British Library, the Folger Shakespeare Library, the Bodleian Library, the National Library of Scotland, and the Edinburgh University Library.<sup>68</sup> In 2009, with funding from the National Endowment for the Humanities and the Joint Information Systems Committee, as well as new collaborations with the Shakespeare Institute, the Huntington Library, and the Maryland Institute for Technology in the Humanities, these cross-Atlantic partners launched the *Shakespeare Quartos Archive*. The pilot *Shakespeare Quartos Archive* offers full cover-to-cover digital photo-facsimiles and transcriptions of 32 copies of the early quarto editions of *Hamlet*.<sup>69</sup> Large-scale projects such as these require and rely upon substantial funding. However, even institutions with limited resources and support are able to digitize, manage, and share their Shakespeare collections online through the use of free publication platforms like *Flickr* or any of a growing number of open-source content management systems like *Omeka*, or by participation in large-scale public digitization projects like the *Internet Archive*.<sup>70</sup>

## Transcriptions

“Before they can be studied with the aid of machines,” adapting an oft-quoted line of C. Michael Sperberg-McQueen, Shakespeare’s “texts must be encoded in a machine-readable form.”<sup>71</sup> When presented with a copy of Michael Neill’s Oxford Shakespeare edition of *Othello*, for example, human readers familiar with the conventions of printed drama will instinctively distinguish between the functions performed by the word “Othello” in different contexts, such as in the play’s title (“*Othello*” and “*Othello, the Moor of Venice*”), as part of the running title (“*Othello, the Moor of Venice*”), as a speech prefix (“OTHELLO”), as an instruction in stage directions (e.g. “*Othello withdraws*”), and as a reference to the character in dialogue (e.g. “Valiant Othello, we must straight employ you”). In order for a machine to interpret or “read” these distinctions—and therefore display, interact with, and search the text intelligently—the text must

be encoded or structured in such a way that its various elements are explicitly described and defined (or “tagged” or “marked up”).

The ongoing work of the Text Encoding Initiative (TEI) Consortium notwithstanding, there is no single, universally accepted standard for the textual encoding of electronic texts of the sort studied by humanities scholars. Textual encoding schemas—the grammar and syntax of the tags and elements used to structure and annotate the electronic text—inevitably vary from project to project, designed to support particular, local applications.<sup>72</sup> Electronic texts of Shakespeare are no different, even when the purpose is the same. Both the *Shakespeare Quartos Archive* (SQA) and the *Internet Shakespeare Editions* (ISE) offer their users diplomatic transcriptions: the SQA structures its electronic diplomatic transcriptions of the *Hamlet* quartos using the latest TEI encoding guidelines (P5), whereas the ISE has developed its own schemas for encoding diplomatic transcriptions of all the early printed quartos and folios. Other applications require different textual encoding altogether: for example, computer-aided linguistic analysis of Shakespeare’s works typically requires that transcriptions include tags for natural language processing (such as annotating parts-of-speech and other linguistic features).

As discussed in the previous section, an earlier, intensive, and exclusively Shakespearean phase in digital Shakespeare studies is fast giving way to a more wide-ranging perspective, as machine-readable texts of works by Shakespeare’s predecessors, contemporaries, and successors become more readily available. Just as with digital photo-facsimiles, much of this shift was initially facilitated by large-scale commercial ventures, such as the Chadwyck-Healey *Editions and Adaptations of Shakespeare*, the *English Verse Drama* and *English Prose Drama Full-Text Databases* released on CD-ROM and magnetic tape in 1995 (and since 1996, delivered via the Web as part of *Literature Online*), and more recently the *Early English Books Online Text Creation Project* (EEBO-TCP), which in 2012 boasted a corpus of 40,188 English Renaissance texts in TEI (first P3, now P5) format. The project aims to reach its goal of 70,000 texts by 2015, at which point 25,000 texts transcribed before 2010 will be made publicly available, with the remaining texts following suit over the next five years.

Large-scale enterprises such as these are “magnificent but flawed,” with critics identifying a growing catalogue of errors in transcription and encoding such that “few of [their] transcriptions fully meet the scholarly standards one associates with decent diplomatic editions in the print world.”<sup>73</sup> However, the transcriptions and textual encoding may be corrected and enriched by third parties. In 2012, the Folger embarked on an ambitious project to create “interoperable editions of some 500 plays by William Shakespeare’s

contemporaries written or performed between 1576 and 1642.” Dubbed *The Folger Digital Folio of Renaissance Drama for the 21st Century* (F21), the project “pilots a model of large-scale crowd-sourcing with undergraduates” tasked with correcting and upgrading 36 out of the 400 transcribed play-texts from the EEBO-TCP corpus. Marked up with character metadata (for example, social status, gender, age, and so on) and other drama-specific tags (e.g. act and scene divisions, stage directions, prose and verse, direct and indirect address), the resulting texts will be suitable for “automated, algorithm-driven, corpus-based queries and comparisons,” and made available for researchers to conduct their own analysis.<sup>74</sup> Similarly, a future public release of the *Intelligent Archive* (detailed above) will also include transcriptions of plays by Shakespeare and his contemporaries, marked up for computational stylistic analysis and authorship attribution testing.

Another recent project promises to greatly increase the number of machine-readable transcriptions of Shakespeare and other early English authors. The *Early Modern OCR Project* (eMOP), directed by Laura Mandell and Richard Furuta at Texas A&M University, seeks to produce an accurate corpus of early modern texts mechanically transcribed using improved Optical Character Recognition (OCR) software packages supplemented by crowd-sourced correction and validation.<sup>75</sup>

### Critical Editions

Since their emergence in the 1980s, electronic critical editions of Shakespeare have fallen under two categories: those adapting existing print editions to an electronic format, and those “born digital.” To date, most electronic critical<sup>76</sup> editions of Shakespeare are of the first kind and typically combine machine-readable texts from printed editions with supplementary multimedia materials (as available and supported by the target medium or platform). The first<sup>77</sup> such edition was the Voyager *Macbeth*, released on CD-ROM in 1994 (US \$49.95), combining A. R. Braunmuller’s New Cambridge text, annotations, and commentary with an audio recording of the play performed by the Royal Shakespeare Company, video clips from selected film productions, and a “karaoke” function. Later ventures in CD-ROM include the *Arden Shakespeare CD-ROM* in 1997 (GB £2,500.00), with Jonathan Bate as consultant editor, which incorporated the texts and apparatus of the Arden second series editions, digitized reference works, and facsimile images of the First Folio and early quartos, and *The Cambridge King Lear CD-ROM: Text and Performance Archive*, co-edited by Christie Carson and Jacky Brotton

in 2000 (GB £325.00/£534.00 LAN/WAN licenses), which incorporated the New Cambridge texts of the play (edited by Jay Halio) as well as a conflated “Finder Text” to facilitate navigation between primary sources, editorial and critical material, and reference material.<sup>78</sup>

Little changed when the Internet overtook the CD-ROM as the preferred platform for electronic publication at the close of the twentieth century, as commercial publishers embraced the emergent medium primarily as a new way to resell old content. *ArdenOnline*, launched by Thomson Learning in 1999 under the general editorship of Peter Holland with Anthony Dawson and Barbara Hodgdon, offered the texts of the Arden Shakespeare second series editions (and of the third, as they became available), supplemented with extensive production materials and newly commissioned articles and performance introductions. As with the *Arden Shakespeare CD-ROM*, libraries balked at the price: annual subscriptions cost up to GB £1200, and “before too long,” as Peter Holland laments, “it became apparent that the libraries were not willing to buy in.”<sup>79</sup> Thomson Learning suspended sales of *ArdenOnline* in mid-2000, withdrawing access to the service pending the results of a market research exercise. A year later, the results were in: *ArdenOnline* was not viable commercially, and Thomson Learning closed the project down in April 2001.

In 2003, under its Gale imprint, Thomson Learning revisited the tantalizing prospect of adapting the Arden Shakespeare texts—still making healthy sales in print—for an online audience. Three years later, *The Shakespeare Collection* was launched.<sup>80</sup> Whereas *ArdenOnline* privileged Shakespeare performance (and invested substantial funds to secure permissions to use production-oriented materials in order to do so), with the *Collection*, Gale instead combined the Arden texts with electronic access to their existing *Shakespearean Criticism* content, along with photo-facsimiles of the First Folio and early quartos (licensed from Octavo), major eighteenth- and nineteenth-century editions, a large collection of prompt books, and the *Gordon Crosse Theatrical Diaries*. An online scholarly portal bringing together primary materials, editions, reference works, and criticism, *The Shakespeare Collection* was more attractive to institutional subscribers than *ArdenOnline*. Gale continues to sell subscriptions to the service as both a stand-alone product and as a package with its other databases.

Other commercial publishers have since followed Gale’s lead. In May 2013, Faber & Faber and Bloomsbury Publishing launched *Drama Online*, which will bring together electronic versions of both publishers’ print editions—including the Arden Shakespeare, Arden Early Modern Drama, and New Mermaids series—with criticism, reference and practitioner works, as well as digitized production stills from the Victoria and Albert Museum.<sup>81</sup> The *Drama Online*

interface includes additional functionality, such as basic text-analysis tools (grids of role sizes by character/scene, word-counts by scene), part books of lines for a given role, as well as note-taking and bookmarking tools. In 2012, Oxford University Press launched *Oxford Scholarly Editions Online*, which offers access by institutional subscription to electronic versions of their printed critical editions published since the early twentieth century, including the original- and modern-spelling *Complete Works* volumes, the *Textual Companion*, and individual play-volumes of the Oxford Shakespeare series.<sup>82</sup> A new edition of the *Complete Works*, in preparation under the general editorship of Terri Bourus, John Jowett, and Gary Taylor, also promises to produce an edition in “multiple volumes, multiple formats, [and] multiple media,” including electronic.<sup>83</sup> Through *Cambridge World Shakespeare Online*, a project co-directed by Bruce R. Smith and Katherine Rowe, Cambridge University Press will incorporate electronic versions of the New Cambridge Shakespeare editions alongside the forthcoming *Cambridge World Shakespeare Encyclopedia* and other relevant critical works published by the press.<sup>84</sup> Unlike previous editions that were based on the Oxford *Complete Works*, the third edition of the *Norton Shakespeare* (under the general editorship of Stephen Greenblatt, with Gordon McMullan and Suzanne Gossett as general textual editors) will offer freshly edited texts supported by revised introductions, glosses, and notes, published in print and online.<sup>85</sup> How each of these projects will grapple with the problem, articulated by Rupert Mann, “of how we make a single digital product from what was originally many print books,” remains to be seen.<sup>86</sup>

The first “born-digital” critical editions of Shakespeare appeared in 2011–12 with the launch of David Bevington’s edition of *As You Like It* and John D. Cox’s edition of *Julius Caesar* for the *Internet Shakespeare Editions* (ISE).<sup>87</sup> Both editions offer diplomatic transcriptions of the First Folio texts, photo-facsimiles of the relevant First, Second, Third, and Fourth Folio pages, critical and textual introductions, performance histories and interlinked media objects, an annotated modern-spelling text with collations, textual analysis tools, and supplementary materials.<sup>88</sup> As with all ISE content, the editions are open-access and freely available.

#### FUTURE DIRECTIONS

In 2001, according to Jonathan Hope, we were “still in the pioneering period of the digital bard.”<sup>89</sup> Work in digital Shakespeare continues in a pioneering spirit, particularly in terms that align with the expansionist impulses that

characterize a number of wider scholarly trends—to explore Shakespeare not in isolation but in dynamic relationship to his peers, predecessors and successors, his readers, audiences, and editors both past and present, and to move from the dominant author-, canonical-, and text-centric critical paradigm to global, performance, and repertory-based analysis.

As the pioneering spirit continues to drive its advances, evidence of increasing professionalization in the field suggests that we are now, in Hope's terms, entering a consolidating period of the digital Bard. The representation of digital Shakespeare studies in seminars, panels, plenary talks, and workshops at major international Shakespeare conferences has steadily grown, reflecting both a rise in awareness and interest from within the broader discipline and in the number of researchers doing digital work. Consequently, new opportunities for publication have opened up, as established journals in Shakespeare studies more readily accept submissions on digital topics or, in the case of a number of guest-edited special issues,<sup>90</sup> actively commission content. More digital Shakespeare projects of various shapes and sizes are being proposed to and funded by granting agencies around the world, as are dedicated institutes and workshops to facilitate formal knowledge transfer in this area.<sup>91</sup> In October 2012 the field also debuted on the academic job market, when Texas A&M University advertised applications for a tenured position in Digital Shakespeare Studies.<sup>92</sup>

If pushed to speculate on the future of digital Shakespeares, we might argue that research and practice in the coming decade will be characterized by two principal impulses that have governed the field to date: expansion and experimentation. As more data becomes available—from machine-readable texts of Shakespeare's works and those of his contemporaries, predecessors and successors to reference and critical works on the same, through to digitized archival and primary materials as well as "born digital" works in various media formats—new opportunities to critically adapt, analyze, explore, historicize, and map it, as well as creatively remix and repurpose it, will arise. Computational methods and tools will allow us to test the critical claims of our forebears and validate those of our contemporaries in ways that are comprehensive, quantitative, and verifiable. Electronic projects and resources will embrace principles of Open Access, collaboration, and interoperability, making Shakespearean materials, performances, and scholarship freely available to a global, networked audience. Educators will embrace new technologies to meet a growing desire to teach digital Shakespeare and an increasing necessity of teaching Shakespeare using digital methods and materials, both locally and globally. Editors will investigate new electronic platforms—such as smart-devices running iOS, Android-like tablets and the iPad<sup>93</sup>—as alternatives or supplements to print

and Web-based publication, and, through experimentation and play, continue to push the boundaries of what constitutes an “edition” of Shakespeare. Like all experiments, some with meet with failure, some with success. The next decade of the “web” of digital Shakespeares, like the last, will continue to be a “mingled yarn” of “good and ill together.”

#### DIGITAL SHAKESPEARES: INNOVATIONS, INTERVENTIONS, MEDIATIONS

The story of Shakespeare in the digital era is one of vast new possibilities and stuttering, all-too-human attempts to realize them, of confident grand predictions unfulfilled and seemingly modest byways bringing unsuspected massive advances. Simple, comprehensive and open-access has made more difference than sophisticated, goal-directed and proprietary. Scholarly users, much like the general run of users, are impatient, impecunious, and irreverent. Change has come quickly, but more to habits of work than to the explicit concerns of disciplines or to the content of publications.

In this special section, we focus on particular innovations, mediations, and interventions in this restless and energetic set of activities. We aim to define the specific, distinctive contribution made by digital Shakespeare. The writers are all true believers in the gains to be had from embracing and stretching the new technologies, but they are conscious also of the continuing claims of traditional materials and methods and that the narrative of the progressive diffusion of the digital is full of twists and turns, of sudden checks as well as triumphant breakthroughs.

Digital Shakespeares have made the Shakespeare canon available for search and re-assembly and challenged the model of the printed critical edition of a single play as the object of study for Shakespeareans of all kinds. They have made quantitative study of Shakespeare’s language—once undertaken by only a few dedicated scholars—a possibility for anyone with an Internet connection, and at its basic level almost effortless. Searching, as in finding other uses of a word or phrase, is still the commonest activity, followed by compiling statistics for authorship questions. Stylistic applications are still rare, and perhaps will remain so, even if the general resistance to things numerical among humanists moderates over time.

Digital Shakespeares also mean the creation and transmission of free-form responses to Shakespeare in digital media, and attempts to understand it and assess its implications. Here there is an overlap with the multifarious appearances of Shakespeare in popular culture, “Schlockspeare,” once

mainly analogue in film and printed fiction, now increasingly digital, DIY, and disseminated through the Internet. Readers can now become composers who repackage and repurpose existing Shakespearean materials, from page images of early printed editions and manuscripts to recorded performances. This is grassroots but globally accessible Shakespearean activity, and invites critical review. Stephen O'Neill's article in our special section explores one intriguing genre within this burgeoning sphere of production, YouTube videos of Shakespeare sonnets, in which individual sonnets are performed or their typography is animated and given a soundtrack. His research points the way to some engaging examples and offers some frameworks for further analysis.

The digital era is a third, overlapping phase for performance, following the first phase when a production lived on only in memory and written record, and the second when audio and then visual recording was possible in analogue formats. Performance captured in digital form can be searched, excerpted, and combined with other material and other media, and thus is textualized in the sense of sharing some of the possibilities of decomposition and analysis of text. The range of performances that have been recorded and shared has exploded, from a handful of Shakespeare films and filmed stage productions to the vast warehouse of miscellaneous materials now posted on the Web. Searching YouTube for "Shakespeare" in January 2013 yielded "About 153,000 results." Technical barriers to recording and sharing Shakespeare performances have become steadily fewer; what remains is the limitation imposed by copyright. Whitney Trettien's invited review of the *Global Shakespeares* project in this special section describes the progress the creators have made in bringing together digital versions of Shakespeare performances from disparate cultures and making them easy to find and to explore.

Digital Shakespeares have a particular application to the vast enterprise of studying and teaching Shakespeare, which, like English studies in general, is booming in developing economies like India and China, even while it may be no more than holding its own in the Anglosphere, as James English points out.<sup>94</sup> There may yet be no iconic MOOC on Shakespeare,<sup>95</sup> but there is a wealth of online tools and resources to use in the classroom—many surveyed in earlier sections of this Introduction—and pedagogical studies published over the last decade attest to and meet a growing desire to teach digital Shakespeare and an increasing necessity of teaching Shakespeare using digital methods and materials.<sup>96</sup>

Communication was one of the unexpected applications of the computer, realized with the implementation of specialized academic networks in the 1960s and the advent of the World Wide Web system of hypertext links in the

1990s. The Internet is essential to Digital Shakespeares, bringing mostly free resources to all, and putting paid to an era of expensive and rarely fit-for-purpose collections of data on CD-ROM. Individual voice and image communication over the Internet is a further extension of its capabilities. Voice-over-Internet Protocol (VoIP) services like Skype have made video-conferencing available without charge once users have installed the software. In their contribution to this special section, Sheila Cavanagh and Kevin Quarmby describe the beginning of their *World Shakespeare Project* (WSP) in Quarmby's suggestion that he Skype into Cavanagh's Shakespeare classes in Atlanta from London. The WSP combines the practice of teaching Shakespeare through performance with linking classes in different parts of the world through Skype, bringing sharply different cultures together in a shared interest in exploring Shakespeare through performance.

Digital Shakespeares make the traditional resources for Shakespeare interpretation—facsimiles of early editions, single or parallel transcribed texts, source materials and performance records—as well as critical commentary, vastly easier to assemble and bring to bear. The traditional tasks can be done in a fraction of the time: what would once have taken months, and would have required travel and special privileges, now can often be done in a morning from a desk anywhere. The *Shakespeare Quartos Archive* (SQA), reviewed in this collection by Christy Desmet, is a fine example. Desmet suggests that it may be too much to hope that the SQA, which offers page images and transcriptions of all the early quartos of *Hamlet*, will be regularly used in classrooms, even university ones; but it can provide those with a special interest in early printed Shakespeare a remarkable “intimate textual experience.”

This new availability of once-rare materials conveniently collected and presented changes the ratios in Shakespeare scholarship. It is bringing different aspects to attention as well as simply speeding up access to them. Rosemary Gaby's essay in this special section makes the case that a well-supported Internet edition of a Shakespeare history play specifically makes the play more historical. The references in a history play to past events (in the historical record or in previous plays), the necessary context of the play in a series (whether that be foregoing and succeeding reigns or parts of reigns), can be explored by the user of an Internet edition on the fly, almost without breaking step with a linear reading of the play. Reading a play with multiple windows of related materials open on the screen moves the attention from the single, self-contained world of the individual play to multiple perspectives that can themselves form into separate clusters of related materials. The plays themselves were performed as self-sufficient works, just enough reference to

what the audience—a reasonably unitary entity whose reactions playwrights and players made a living from predicting—remembered and already knew consciously or unconsciously to trigger the right sort of response. One could argue, then, that the fully networked play text is pulling away from the original audience experience. Yet the modern audience is fragmented and in any case shares little in culture with that original one, and the digital edition linked to an archive of resources can serve as a substitute or prosthesis for the context that early modern playgoers provided for the play without conscious effort.

Shakespeareans counted interesting features in the poems and plays long before computers, whether figures of speech (such as George T. Wright's work on hendiadys<sup>97</sup>) or images (exemplified in studies by Edward Armstrong and Caroline Spurgeon<sup>98</sup>). Electronic text has made this activity much less laborious—more text can be covered in more detail and the results can be processed more intensively. The opportunity then arises to do some close examination of what the numbers say in relation to the critical tradition and produce fresh readings of highlighted passages. Once the text is marked up, the machine will count every instance, weighing them all equally—both its advantage over the forgetful or biased reader and its limitation, since instances do vary in impact and nuance, and the text was meant for that easily distracted and partisan reader in the first place. Marcus Nordlund's essay in this special section gives us a way to think about this sort of analysis—we are studying Shakespeare's habits, and not his intentions; and as the amount and detail of the marked-up text exceeds our capacity to recall and manipulate it, we are giving ourselves the chance to be surprised by findings, rather than predetermining them as we would if we proceeded from a powerful theory or relied on our impressions as readers. He presents some intriguing observations on *Hamlet* and *Timon of Athens* in particular, two plays brought into sharp contrast by patterns in the numbers, which themselves offer two different paths to explanation, one based on Hamlet's depression and the other on general changes in Shakespeare's practice by the time of the later play.

The first printed books were made to look as much like manuscripts as possible, and innovation to make use of the potential of print in the index, mechanically reproduced illustration and decoration and so on followed only gradually. In their turn online texts and e-books generally have tables of contents, numbered pages, and running heads just like printed books. Digital editions, as illustrated by Gaby's discussion of her edition of *1 and 2 Henry IV* for the ISE, are now moving to use the capacity of the computer and the screen to link to other texts and images, serially or through multiple windows. In the presentation of textual commentary the debt to the printed

edition is still evident, and the latter may not yet be surpassed. The glory of the printed variorum edition, as Sarah Neville points out in her review of two ISE editions, is a highly developed economy of presentation. As much information as possible must be packed into a book that can be picked up and rapidly searched. In a well-developed format like the variorum edition, readers are already trained in the conventions of presentation and alert to visual clues, like the big block of notes on a given passage, which implies that this is an important textual crux. The digital edition is freed from space limitations, but this also means losing some of the familiar usability that comes with the page layout. Neville’s review shows that the ISE editions have not yet found an effective replacement—they have not yet overturned an older conviction of “the innate superiority of the codex form”—even if they do, miraculously, make a sound and well-annotated text of Shakespeare freely and instantaneously available to any Internet user on the planet.

Here the aim is in a sense to become a super-book, to be “better at being books than books are” in Jennifer Roberts-Smith’s words. But there are some other possibilities that go beyond the maximal layering, decomposition and networking of the text. These involve more active participation by the user, as in the social edition (such as that proposed for *The Devonshire Manuscript*<sup>99</sup>) and the malleable narrative (such as in Jerome McGann and Johanna Drucker’s *IVANHOE*<sup>100</sup>) and may extend to a game-like modeling of the action implied in a text, or of the action for which the text is a script. The contribution from Roberts-Smith and her colleagues to this special section introduces an electronic edition of *The True Tragedie of Richard the Third*, an anonymous play with an uncertain relationship to Shakespeare’s play on the same topic, in which the play is loaded within the *Simulated Environment for Theatre* (SET), a 3D environment described earlier in this Introduction. Although the essay is illustrated with stills from pre-prepared animations, these are but one realization of possible digital performances, depending on one setting for each of the parameters, and the research and pedagogical potential of SET can only be realized if readers, as Roberts-Smith says, download the software and data and “start playing.” Digital performances like these are a challenge to our pre-conceived ideas about the textuality of drama, and, just as much, to our ideas about drama itself: consider, for instance, that the performances realized on the screen with SET are not ephemeral but can be played over and over again, and passed on to others, as Roberts-Smith points out.

## NOTES

- 1 Ian Lancashire, "The State of Computing in Shakespeare," *The Shakespearean International Yearbook* 2 (2002): 89–110. Important subsequent 'state of the field' articles include Michael Best, "Shakespeare and the Electronic Text," in *A Concise Companion to Shakespeare and the Text*, ed. Andrew Murphy (Malden: Blackwell, 2007), 145–61, and *idem*, "Shakespeare on the Internet and in Digital Media," in *The Edinburgh Companion to Shakespeare and the Arts*, ed. Mark Thornton Burnett, Adrian Streete, and Ramona Wray (Edinburgh: Edinburgh University Press, 2011), 558–76.
- 2 Ian Lancashire, "The Early Modern English Dictionaries Database (EMEDD)," University of Toronto, October 15, 1999, <http://homes.chass.utoronto.ca/~ian/emedd.html>.
- 3 Ian Lancashire, ed., *Lexicons of Early Modern English*, University of Toronto Library and University of Toronto Press, 2006–present, <http://leme.library.utoronto.ca/>. On the development of LEME, see Ian Lancashire, "The Theory and Practice of *Lexicons of Early Modern English*," *Early Modern Literary Studies* 14, no. 2 (2008): 5.1–25, <http://purl.oclc.org/emls/14-2/Lantheo.html>.
- 4 ProQuest LLC, *Literature Online*, 1996–present, <http://lion.chadwyck.com/>. See also David L. Gants's review of the *English Verse Drama Database* in *Early Modern Literary Studies* 2, no. 1 (1996): 15.1–11, [http://purl.oclc.org/emls/02-1/rev\\_gan1.html](http://purl.oclc.org/emls/02-1/rev_gan1.html).
- 5 For a discussion of these ventures in CD-ROM, see Best, "Shakespeare and the Electronic Text," 146–9.
- 6 Niko Pfund and Nancy Lin, "Hedging Bets While Making Grand Plans," *The Chronicle of Higher Education*, June 25, 1999, B9.
- 7 On the commercial failure of *Arden Online*, see Peter Holland and Mary Onorato, "Scholars and the Marketplace: Creating Online Shakespeare Collections," *Shakespeare* 4, no. 3 (2008): 245–53.
- 8 Never publicly released, *SHAXICON*'s existence continues to provoke scholarly comment and criticism. Foster's son Blake, a software developer, announced the belated online publication of *SHAXICON* in the summer of 2007; the proposed site, <http://shaxicon.don-foster.com/>, remains offline and the domain is inactive: Blake Foster, "The Shaxicon Project," *Blake's Conflabitorium*, 2007, <http://www.blake-foster.com/project.php?p=11>. Neuhaus and Spevack's *Shakespeare Database* was initially advertised as a CD-ROM, to be published by Olms in April 1996, but it was never published. The *World Shakespeare Bibliography* erroneously cites the *Shakespeare Database* CD-ROM as if it exists, and *OCLC WorldCat* lists three libraries incorrectly cataloguing the title in their collections (all three are "on order"). As for a promised Web-based version, according to its website (first launched in 1994 and not substantially altered since 2005) the project "does not yet offer interactive database queries or ftp access to database materials": H. Joachim Neuhaus, "Shakespeare Database Project," *Shakespeare Database Project*, Westfälische Wilhelms-Universität, 2005, <http://www.shkspr.uni-muenster.de/>. Both Neuhaus and Spevack have since retired, and a firm release date for the project, if any, is unclear.
- 9 *Renaissance Forum: An Electronic Journal of Early-Modern Literary and Historical Studies*, 1996–2004, University of Hull, <http://www.hull.ac.uk/renforum/>.
- 10 Ian Lancashire, gen. ed., *Renaissance Electronic Texts*, Web Development Group, University of Toronto Library, 1994–98, <http://www.library.utoronto.ca/utel/ret/ret.html>.
- 11 Michael Best, coord. ed., *Internet Shakespeare Editions*, University of Victoria, 1996–present, <http://internetshakespeare.uvic.ca/>; Helen Ostovich, gen. ed., *Queen's*

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- Men Editions*, McMaster University, University of Toronto, and Internet Shakespeare Editions, 2006–present, <http://qme.internetshakespeare.uvic.ca/>; Brett D. Hirsch, coord. ed., *Digital Renaissance Editions*, University of Western Australia and Internet Shakespeare Editions, 2006–present, <http://digitalrenaissance.uvic.ca/>.
- 12 On the issue of “completion” in the context of digital humanities projects, see the special cluster of articles in the Spring 2009 issue of *Digital Humanities Quarterly*, guest-edited by Matthew G. Kirschenbaum, <http://digitalhumanities.org/dhq/vol/3/2/index.html>.
  - 13 *Appositions: Studies in Renaissance/Early Modern Literature & Culture*, 2008–present, <http://appositions.blogspot.com/>; *Borrowers and Lenders: The Journal of Shakespeare and Appropriation*, University of Georgia, 2005–present, <http://www.borrowers.uga.edu/>; *Early Modern Culture*, 2000–present, <http://emc.eserver.org/>; *Early Modern Studies Journal*, Department of English, University of Texas at Arlington, 2008–present, <http://www.uta.edu/english/ees/>; *The Hare: An Online Journal of Brief Essays and Untimely Reviews in Renaissance Literature*, Mary Baldwin College, 2012–present, <http://www.thehareonline.com/>; *Journal of Early Modern Studies*, University of Florence and Firenze University Press, 2012–present, <http://www.fupress.net/index.php/bsfm-jems/>; *This Rough Magic*, Suffolk County Community College, 2010–present, <http://www.thisroughmagic.org/>.
  - 14 A pertinent example is Bruce R. Smith’s “How Should One Read a Shakespeare Sonnet?” *Early Modern Literary Studies* Special Issue 19 (2009): 2.1–39, <http://purl.oclc.org/emls/si-19/smitsonn.htm>, which includes embedded video footage of Sonnet 29 performed in American Sign Language.
  - 15 Stéfán Sinclair and Geoffrey Rockwell, “Teaching Computer-Assisted Text Analysis: Approaches to Learning New Technologies,” in *Digital Humanities Pedagogy: Practices, Principles and Politics*, ed. Brett D. Hirsch (Cambridge: Open Scholars Publishing, 2012), 211–33, at 212.
  - 16 *Intelligent Archive*, Centre for Literary and Linguistic Computing, University of Newcastle, <http://www.newcastle.edu.au/school/hss/research/groups/cllc/intelligent-archive.html>; *WordHoard*, Northwestern University, <http://wordhoard.northwestern.edu/>; *Juxta*, Applied Research in Patacriticism, University of Virginia, <http://www.juxtasoftware.org/>; *DocuScope*, Department of English, Carnegie Mellon University, <http://www.cmu.edu/hss/english/research/docuscope.html>; *TACT: Text Analysis Computing Tools*, IBM–University of Toronto Cooperative in the Humanities, University of Toronto, <http://projects.chass.utoronto.ca/tact/>; *The Versioning Machine*, Maryland Institute for Technology in the Humanities, <http://www.v-machine.org/>.
  - 17 Klyve and Bridal expect to publish their results shortly.
  - 18 Gabriel Egan, ed., *Non-Shakespearean Drama Database*, 2002–present, <http://www.gabrielegan.com/nsdd/>.
  - 19 Alan B. Farmer and Zachary Lesser, eds, *DEEP: Database of Early English Playbooks*, University of Pennsylvania, 2007–present, <http://deep.sas.upenn.edu/>.
  - 20 Peter S. Donaldson and Alexa Huang, dirs, *Shakespeare Performance in Asia*, Global Shakespeares, MIT, 2009–present, <http://web.mit.edu/shakespeare/asia/>. The *Stanford Shakespeare in Asia* initiative, founded by Huang in 2004 with support from Patricia Parker and Huan Saussy, provided the initial impetus for the project.
  - 21 Peter S. Donaldson and Alexa Huang, dirs, *Global Shakespeares Video & Performance Archive*, MIT, 2010–present, <http://globalshakespeares.mit.edu/>. The archive currently

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- offers dedicated portals to performance materials from the Arab world, Brazil, East and Southeast Asia, India, North America, and the United Kingdom.
- 22 For a more detailed review of the project, see Whitney Trettien's contribution to this special section, "Shakespeare's Globe Goes *Global Shakespeares*."
  - 23 *The Space* (<http://thespace.org/>), supported by the BBC and the Arts Council England, provides arts content live, free, and on demand, including streaming video of recorded performances from the Royal Shakespeare Company's "World Shakespeare Festival" and the "Globe to Globe" programme produced by Shakespeare's Globe, London.
  - 24 The *Shakespeare in Performance* database (<http://internetshakespeare.uvic.ca/Theater/dbindex.html>) provides access to digitized performance materials from over 1,000 Shakespeare film and stage productions, dynamically linked to editions of the plays produced for the *Internet Shakespeare Editions*.
  - 25 Records of Early English Drama (REED), *Patrons and Performances*, dir. Sally-Beth MacLean and Alan Somerset, University of Toronto, 2003–present, <http://link.library.utoronto.ca/reed/>.
  - 26 Records of Early English Drama (REED), *Early Modern London Theatres*, dir. Sally-Beth MacLean, University of Toronto and King's College London, 2011–present, <http://www.emlot.kcl.ac.uk/>.
  - 27 Grace Ioppolo, dir., *Henslowe-Alleyn Digitisation Project*, King's College London, 2010–present, <http://www.henslowe-alleyn.org.uk/>.
  - 28 Roslyn L. Knutson and David McInnis, coord. eds, *Lost Plays Database*, University of Melbourne, 2009–present, <http://www.lostplays.org/>.
  - 29 Janelle Jenstad, gen. ed., *Map of Early Modern London*, University of Victoria, 2003–present, <http://mapoflondon.uvic.ca/>. MoEML traces its inception to 1999 as a teaching project at the University of Windsor.
  - 30 SET Research Team, *Simulated Environment for Theatre*, Experimental Reading Workshop, 2008–present, <http://www.humviz.org/set/>. The SET Research Team consists of Jennifer Roberts-Smith (principal investigator), Teresa Dobson, Sandra Gabriele, Stan Ruecker and Stéfan Sinclair (co-investigators), Omar Rodriguez (research associate), and a veritable army of current and previous research assistants from across Canada. For a complete listing, see <http://humviz.org/set/team.html>.
  - 31 *Scenario* was included in the *Shakespeare Suite* CD-ROM, distributed by Insight Media in 2003 for the Internet Shakespeare Editions. It is no longer available. The legacy website for the *Suite* remains online at the ISE: <http://internetshakespeare.uvic.ca/Annex/ShakespeareSuite/>.
  - 32 Gabriel Egan, ed., "Computer Modelling of Performance Spaces," *Early Modern Literary Studies*, Special Issue 13 (2004), <http://purl.oclc.org/emls/si-13/si-13toc.htm>. The issue contains articles from Christie Carson, Christian Billing, Tim Fitzpatrick, and Egan himself.
  - 33 On the 3D models, see "Recreation of the Rose Theatre, London," *Ortelia Interactive Spaces*, <http://ortelia.com/new/portfolio/rosetheatre/> and "The Boar's Head Theatre," *Ortelia Interactive Spaces*, <http://ortelia.com/new/portfolio/the-boars-head-theatre/>. For more information on the motion-capture projects, see Matthew Delbridge and Joanne Tompkins, "Reproduction, Mediation, and Experience: Virtual Reality, Motion Capture and Early Modern Theatre," in *Space–Event–Agency–Experience: Open Access E-Publication of the DREX Project*, ed. Riku Roihankorpi and Teemu Paavolainen,

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- Centre for Practice as Research in Theatre, University of Tampere, 2012, [http://t7.uta.fi/drex/DREX/11\\_TextsAndPublicationsEn\\_files/5\\_DelbridgeTompkins.pdf](http://t7.uta.fi/drex/DREX/11_TextsAndPublicationsEn_files/5_DelbridgeTompkins.pdf).
- 34 The Company’s legacy website remains online at <http://www.slshakespeare.com/>. The Company’s blog from 2009 also remains online, providing insight into the financial and administrative workings of a virtual theatre company during its last season until its closure in 2011: <http://twelfthnight.mshakespeare.com/blog/>. On issues associated with virtual Shakespeare performances and the amateur and professional groups responsible, see Peter Holland, “Performing Shakespeare for the Web Community,” in *Shakespeare in Hollywood, Asia, and Cyberspace*, ed. Alexander C. Y. Huang and Charles S. Ross (West Lafayette: Purdue University Press, 2009), 252–62, and Katherine Rowe, “Crowd-Sourcing Shakespeare: Screen Work and Screen Play in Second Life,” *Shakespeare Studies* 38 (2010): 58–67.
- 35 Ryan North, “To Be Or Not To Be: That Is The Adventure,” *Kickstarter*, November 21, 2012, <http://www.kickstarter.com/projects/breadpig/to-be-or-not-to-be-that-is-the-adventure>.
- 36 Alison Flood, “Hamlet Rewritten as Choose-Your-Own-Adventure Game Book,” *The Guardian*, 27 November 2012, <http://www.guardian.co.uk/books/2012/nov/27/hamlet-rewritten-choose-your-own-adventure>.
- 37 Puppet Shakespeare Players, “Puppet Romeo & Juliet DVD Project,” *Kickstarter*, December 21, 2012, <http://www.kickstarter.com/projects/1014045724/puppet-shakespeare-puppet-romeo-and-juliet-dvd-pro>. Pledges ranged from US \$1 to \$1,000, with backers offered a selection of inducements including signed posters, T-shirts, photographs with the cast (for those attending a live performance), and a custom puppet.
- 38 Gabriel Egan, “Where Are We Now in Determining Folio Compositor Stints?” paper presented at the International Shakespeare Conference, Shakespeare Institute, Stratford-upon-Avon, 6–10 August 2012. A paper on the additional digital tool was delivered earlier as, “Testing Competing Hypotheses About Competing Stints in Early Modern Printed Books Using Stand-Off Markup XML,” paper presented at the 58th Annual Meeting of the Renaissance Society of America, Washington DC, 22–24 March 2012.
- 39 Heather Dubrow, “The Country House Poem: A Study in Generic Development,” *Genre* 12 (1979): 153–79, at 159.
- 40 Elizabeth Scott-Baumann and Ben Burton, “Encoding Form: A Proposed Database of Poetic Form,” *Appositions* 3 (2010), <http://appositions.blogspot.com/2010/05/ben-burton-elizabeth-scott-baumann.html>.
- 41 Hannah Crawforth, dir., *Mapping Shakespeare’s London*, King’s College London, 2011–present, <http://map.shakespeare.kcl.ac.uk/>.
- 42 Representative studies include Pierre Bourdieu, *La distinction. Critique sociale du jugement* (Paris: Les Editions de Minuit, 1979), translated into English and published as *Distinction: A Social Critique of the Judgment of Taste*, trans. Richard Nice (New Haven: Harvard University Press, 1984); and J. F. Burrows, *Computation into Criticism: A Study of Jane Austen and an Experiment in Method* (Oxford: Clarendon Press, 1987).
- 43 Franco Moretti introduced the term “distant reading” in a series of articles for the *New Left Review* published in 2003–04, now usefully collected in *Graphs, Maps, Trees: Abstract Models for a Literary History* (London: Verso, 2005).
- 44 Matthew Jockers introduces the term “literary macroanalysis” in his recent book, *Macroanalysis: Digital Methods and Literary History* (Urbana: University of Illinois Press, 2013).

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- 45 Stephen Ramsay introduced the notion of “algorithmic criticism” in his chapter of the same name for *A Companion to Digital Literary Studies*, ed. Ray Siemens and Susan Schreibman (Malden: Blackwell, 2008), 477–91; it is developed further in his monograph, *Reading Machines: Toward an Algorithmic Criticism* (Urbana: University of Illinois Press, 2011).
- 46 For an overview of the “Elegy” debate, see Lancashire (2002: 92–3), and Hugh Craig, “Authorship,” in *The Oxford Handbook of Shakespeare*, ed. Arthur F. Kinney (Oxford: Oxford University Press, 2012), 15–30, esp. 28–9.
- 47 G. D. Monsarrat, “A Funeral Elegy: Ford, W.S., and Shakespeare,” *Review of English Studies* 53.210 (2002): 186–203.
- 48 Samuel Schoenbaum, *Internal Evidence and Elizabethan Dramatic Authorship: An Essay in Literary History and Method* (London: Arnold, 1966), 94.
- 49 Representative recent examples of Jackson’s use of these methods include *Defining Shakespeare: Pericles as Test Case* (Oxford: Oxford University Press, 2003), and “Pause Patterns in Shakespeare’s Verse: Canon and Chronology,” *Literary and Linguistic Computing* 17.1 (2002): 37–46.
- 50 These include Brian Vickers’ “Counterfeiting” *Shakespeare: Evidence, Authorship, and John Ford’s Funerall Elegye* (Cambridge: Cambridge University Press, 2002), and *Shakespeare, Co-Author: A Historical Study of Five Collaborative Plays* (Oxford: Oxford University Press, 2002).
- 51 Brian Vickers, “Shakespeare and Authorship Studies in the Twenty-First Century,” *Shakespeare Quarterly* 62.1 (2011): 106–42.
- 52 Brian Vickers, *Shakespeare, A Lover’s Complaint, and John Davies of Hereford* (Cambridge: Cambridge University Press, 2007).
- 53 These include MacDonald P. Jackson’s “A Lover’s Complaint, Cymbeline, and the Shakespearean Canon: Interpreting Shared Vocabulary,” *Modern Language Review* 103, no. 3 (2008): 621–38, “A Lover’s Complaint Revisited,” *Shakespeare Studies* 32 (2004): 267–94, “The Authorship of *A Lover’s Complaint*: A New Approach to the Problem,” *Papers of the Bibliographical Society of America* 102 (2008): 285–313, and “Shakespeare or Davies? A Clue to the Authorship of *A Lover’s Complaint*,” *Notes & Queries* 56, no. 1 (2009): 62–63.
- 54 Hugh Craig, “George Chapman, John Davies of Hereford, William Shakespeare, and *A Lover’s Complaint*,” *Shakespeare Quarterly* 63, no. 2 (2012): 147–74.
- 55 Laurie Maguire and Emma Smith, “Many Hands. A New Shakespeare Collaboration?” *Times Literary Supplement*, April 20, 2012: 13–15, and Brian Vickers and Marcus Dahl, “*All’s Well that Ends Well*: An Attribution Refuted,” *Times Literary Supplement*, May 11, 2012: 14–15.
- 56 It remains true that, as ever, the Shakespeare materials are more readily available and supported by better tools than those of his peers.
- 57 Representative examples by Jonathan Hope and Michael Witmore include “The Hundredth Psalm to the Tune of ‘Green Sleeves’: Digital Approaches to Shakespeare’s Language of Genre,” *Shakespeare Quarterly* 61, no. 3 (2010): 357–90, and “The Very Large Textual Object: A Prosthetic Reading of Shakespeare,” *Early Modern Literary Studies* 9, no. 3 (2004): 6.1–36, <http://purl.oclc.org/emls/09-3/hopewhit.htm>.
- 58 Ward E. Y. Elliott and Robert J. Valenza, “Shakespeare’s Vocabulary: Did it Dwarf All Others?” in *Stylistics and Shakespeare’s Language: Transdisciplinary Approaches*, ed. Mireille Ravassat and Jonathan Culpeper (New York: Continuum, 2011), 34–57, and

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- Hugh Craig, “Shakespeare’s Vocabulary: Myth and Reality,” *Shakespeare Quarterly* 62, no. 1 (2011): 53–74.
- 59 Lene B. Petersen, *Shakespeare’s Errant Texts: Textual Form and Linguistic Style in Shakespearean “Bad” Quartos and Co-Authored Plays* (Cambridge: Cambridge University Press, 2010).
- 60 John Overholt, “William Shakespeare: Comedies, Histories & Tragedies, First Folio, London, 1623, Folger Shakespeare Library (review),” *Libraries & Culture* 39, no. 3 (2004): 328–9.
- 61 Copies of the CD-ROM are still available for purchase from Octavo’s website, <http://www.octavo.com/>.
- 62 John Warnock, *Rare Book Room*, 2006–present, <http://www.rarebookroom.org/>.
- 63 Gale, *The Shakespeare Collection*, 2006–present, <http://www.gale.cengage.com/shakespeare/>.
- 64 ProQuest LLC, *Early English Books Online*, 2003–present, <http://eebo.chadwyck.com/>.
- 65 Justin Champion, “Discovering the Past Online,” *JISC Inform* 8 (2005), [http://www.jisc.org.uk/publications/jiscinform/2005/pub\\_inform8.aspx#dtpo](http://www.jisc.org.uk/publications/jiscinform/2005/pub_inform8.aspx#dtpo).
- 66 Representative examples include Ian Gadd, “The Use and Abuse of *Early English Books Online*,” *Literature Compass* 6, no. 3 (2009): 680–92, David Gants and R. Carter Hailey, “Renaissance Studies and New Technologies: A Collection of ‘Electronic Texts,’” in *New Technologies and Renaissance Studies*, ed. William R. Bowen and Raymond G. Siemens (Tempe: Medieval and Renaissance Texts and Studies, 2008), 73–92, Diana Kichuk, “Metamorphosis: Remediation in *Early English Books Online* (EEBO),” *Literary and Linguistic Computing* 22, no. 3 (2007): 291–303, and Matthew Steggle, “‘Knowledge Will Be Multiplied’: Digital Literary Studies and Early Modern Literature,” in *A Companion to Digital Literary Studies*, ed. Ray Siemens and Susan Schreibman (Malden: Blackwell, 2008), 82–105.
- 67 *The Horace Howard Furness Shakespeare Library*, Schoenberg Center for Electronic Text & Image, 2000–present, <http://sceti.library.upenn.edu/sceti/furness/>.
- 68 *Shakespeare in Quarto*, 2004–present, British Library, <http://www.bl.uk/treasures/shakespeare/homepage.html>.
- 69 *The Shakespeare Quartos Archive*, Bodleian Library, Folger Shakespeare Library, and Maryland Institute for Technology in the Humanities, 2009–present, <http://www.quartos.org/>. For a more detailed discussion of the project, see Christy Desmet’s invited review for this special section.
- 70 *Flickr*, Yahoo! Inc., 2005–present, <http://www.flickr.com/>; *Omeka*, Roy Rosenzweig Center for History and New Media, George Mason University, 2008–present, <http://www.omeka.org/>; *The Internet Archive*, 1996–present, <http://www.archive.org/>.
- 71 C. Michael Sperberg-McQueen, “Text Encoding and Enrichment,” in *The Humanities Computing Yearbook 1989–90*, ed. Ian Lancashire (Oxford: Clarendon Press, 1991), 503–5, at 503.
- 72 On issues of textual and character encoding in the context of electronic texts of Shakespeare and other Renaissance plays, see Best, “Shakespeare and the Electronic Text,” 151–53, and Brett D. Hirsch, “The Kingdom has been Digitized: Electronic Editions of Renaissance Drama and the Long Shadows of Shakespeare and Print,” *Literature Compass* 8, no. 9 (2011): 568–91, esp. 579–80.
- 73 Martin Mueller, “Back to the Future, or, Wanted: A Decade of High-Tech Lower Criticism,” presented at the Chicago Digital Humanities and Computer Science

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- Colloquium, November 18, 2012. For other critiques of EEBO-TCP and LION, see Donald Foster, "A Romance of Electronic Scholarship; with the True and Lamentable Tragedies of *Hamlet, Prince of Denmark*. Part 1: The Words," *Early Modern Literary Studies* 3, no. 3 (1998): 5.1–42, Gants and Hailey, "Renaissance Studies," and Steggle, "Knowledge Will Be Multiplied."
- 74 Jim Kuhn, Sarah Werner, and Owen Williams, "F21: Interoperable Digital Editions of Early English Plays," poster presented at EEBO-TCP 2012, "Revolutionizing Early Modern Studies?" Bodleian Libraries, University of Oxford, September 17, 2012.
- 75 Laura Mandell and Richard Furuta, dir., *Early Modern OCR Project*, Texas A&M University, 2012–present, <http://emop.tamu.edu/>.
- 76 Electronic editions of Shakespeare lacking even modest critical apparatus—though the most widely proliferated on a variety of platforms—are outside the scope of the present discussion. Electronic variorum editions are similarly excluded; interested readers are directed to Paul Werstine, "Past is Prologue: Electronic New Variorum Shakespeares," *Shakespeare* 4, no. 3 (2008): 208–20.
- 77 A machine-readable version of the 1986 text of the Oxford Shakespeare *Complete Works* was published commercially in 1989, but it lacked the annotations and collations accompanying the print edition as well as the discursive textual commentary supplied by the separate *Textual Companion*. The *Folger Digital Texts* (launched in December 2012) offers free access to machine-readable versions of the Folger Shakespeare Library texts edited by Barbara A. Mowat and Paul Werstine (completed in 2010), but these similarly lack the apparatus, annotations, and commentary of the print originals; see Folger Shakespeare Library, *Folger Digital Texts*, 2012–present, <http://www.folgerdigitaltexts.org/>.
- 78 On these early electronic editions of Shakespeare, see Best, "Shakespeare and the Electronic Text," 145–50, Whitney Bolton, "The Bard in Bits: Electronic Editions of Shakespeare and Programs to Analyze Them," *Computers and the Humanities* 24, no. 4 (1990): 275–87, and Lancashire, "The State of Computing in Shakespeare," 95–104.
- 79 Holland and Onorato, "Scholars and the Marketplace," 248.
- 80 Gale, *The Shakespeare Collection*, 2006–present, <http://www.gale.cengage.com/shakespeare/>. For discussion of the project's background, see Holland and Onorato, "Scholars and the Marketplace," 250–53.
- 81 Bloomsbury Publishing and Faber & Faber, *Drama Online*, 2013–present, <http://www.dramaonlinelibrary.com/>. Relevant critical and reference works include titles from the Arden Critical Companions, Arden Early Modern Drama Guides (previously Continuum Renaissance Drama), Arden Shakespeare Library, Arden Student Guides, Great Shakespeareans, Screen Adaptations, and Shakespeare Now! series. Since Bloomsbury acquired Continuum in 2011, this list is likely also to include the Continuum Shakespeare Dictionaries series; see "Content List," *Drama Online*, 2013–present, <http://www.dramaonlinelibrary.com/pages/content-list>.
- 82 Oxford University Press, *Oxford Scholarly Editions Online*, 2012–present, <http://www.oxfordscholarlyeditions.com/>.
- 83 Terri Bourus, John Jowett, and Gary Taylor, gen. eds, *The New Oxford Shakespeare*, 2009–present, <http://liberalarts.iupui.edu/shakespeare/>.
- 84 Bruce R. Smith and Katherine Rowe, dirs, *Cambridge World Shakespeare Online*, Cambridge University Press, Bryn Mawr College, and University of Southern California, 2009–present, <http://cwso.blogs.brynmawr.edu/>.

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- 85 Julia Reidhead, private communication, May 17, 2013.
- 86 Rupert Mann, “Preparing Our Editions for Online Publication,” *Oxford Scholarly Editions Online*, November 22, 2011, <http://www.oxfordscholarlyeditions.com/newsitem/12/preparing-our-editions-for-online-publication>.
- 87 David Bevington, ed., *As You Like It*, Internet Shakespeare Editions, 2011, <http://internetshakespeare.uvic.ca/Library/Texts/AYL/> and John D. Cox, ed., *Julius Caesar*, Internet Shakespeare Editions, 2012, <http://internetshakespeare.uvic.ca/Library/Texts/JC/>.
- 88 For a more detailed review of these editions, see Sarah Neville’s contribution to this special section, “Mediating Textual Annotation in the Online Scholarly Edition.”
- 89 Jonathan Hope, “Electronic Media,” in *The Oxford Companion to Shakespeare*, ed. Michael Dobson and Stanley Wells (Oxford: Oxford University Press, 2001), 125.
- 90 In addition to the present special section, these include “Reinventing Digital Shakespeare” (*Shakespeare*, 2008) and “Shakespeare and New Media” (*Shakespeare Quarterly*, 2010).
- 91 For example, in July 2013, supported by an Institutes for Advanced Topics in the Digital Humanities grant from the National Endowment for the Humanities, the Folger Institute will convene “The Early Modern Digital Agenda,” under the direction of Jonathan Hope.
- 92 James L. Harner, “Shakespeare Position Announcement,” *SHAKSPER*, SHK 23.0402, October 5, 2012.
- 93 See Eric Rasmussen’s review of *The Tempest* for iPad in this special section.
- 94 James F. English, *The Global Future of English Studies* (Malden: Blackwell, 2012).
- 95 *Coursera* (<http://www.coursera.org/>) does not list a Shakespeare course, and there is just one listed on *MOOC List* (<http://www.mooc-list.com/>).
- 96 Representative examples include Michael Best, “Seeing the Best of Both Worlds: Online and Off-Line Shakespeare,” in *Teaching Literature and Language Online*, ed. Ian Lancashire (New York: Modern Language Association, 2009), 254–67, Christy Desmet, “Teaching Shakespeare with YouTube,” *English Journal* 99, no. 1 (2009): 65–70, Jeremy Ehrlich, “Back to Basics: Electronic Pedagogy from the (Virtual) Ground Up,” *Shakespeare* 4, no. 3 (2008): 271–83, and essays by Erin Sullivan, Sarah Grandage and Julie Sanders, Sheila Cavanagh and Kevin Quarmby, and Peter Kirwan in *Shakespeare and the Digital: Redefining Scholarship and Practice*, ed. Christie Carson and Peter Kirwan (Cambridge: Cambridge University Press, forthcoming 2014).
- 97 George T. Wright, “Hendiadys and *Hamlet*,” *PMLA* 96, no. 2 (1981): 168–93.
- 98 Edward A. Armstrong, *Shakespeare’s Imagination: A Study of the Psychology of Association and Inspiration* (London: Drummond, 1946), and Caroline F. E. Spurgeon, *Shakespeare’s Imagery and What It Tells Us* (Cambridge: Cambridge University Press, 1935).
- 99 Constance Crompton, Raymond Siemens, and The Devonshire MS Editorial Group, “The Social Edition: Scholarly Editing Across Communities,” paper presented at Digital Humanities 2012, University of Hamburg, Hamburg, July 2012.
- 100 On the development and history of *IVANHOE*, see <http://www.ivanhoe.com/>.

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