

Networking early modern Irish women

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ABSTRACT. *Over the last decade, network analysis has developed as an approach within digital humanities as a wider array of tools has become available to humanities scholars, and these approaches are now beginning to make an impact on the disciplines of history and English. This article presents an overview of different ways of approaching network analysis. It assesses recent projects to see how they accounted for gender in their datasets and what can be learnt about early modern women from these projects. It then looks at how projects in Ireland are engaging with network analysis, discussing the approaches used by RECIRC and introducing MACMORRIS's analysis of the Dictionary of Irish biography (D.I.B.) and the Bardic Poetry Database (B.P.D.), looking at how the latter is attempting to overcome the unconscious gender bias inherent in the D.I.B.'s selection of early modern lives from the period between 1541 and 1660. Finally, it points to some of the wider issues we as scholars face when engaging with this methodology, such as access to the required training and collaboration, arguing that while these are not unique challenges to the study of gender history in Ireland, they are important debates that can enhance scholarship in the field.*

Network analysis — the study of patterns of interconnectedness among a set of things — is a potentially useful method for those studying the lives of early modern women, as it can bring to the fore the agency of lesser-known actors, help raise new questions and open new avenues of research. In *Networks: an introduction*, Mark E. Newman describes a network as a set of relationships between different objects.¹ When visualising a network, the objects are usually referred to as nodes, and the relationships are usually known as edges. For example, the internet could be described as a network, and in this case the nodes would be the device (computer, tablet, mobile phone, for example) and the edges would be the wireless connections between the devices. In historical networks, people tend to be the nodes while their relationships to each other are the edges. These nodes and edges can also convey more than one piece of information, or metadata, in the form of what are known as attributes. In a correspondence network, the nodes contain information on the person, such as their name, date of birth, date of death, sex, religion and role/occupation. The edges contain the letter information, viz. who wrote the letter, to whom was it sent, when the letter was written, where it was sent from and so forth. The attributes in any given network are dictated by the research question, scholarly conventions, the source material, specialist knowledge

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¹ Mark E. Newman, *Networks: an introduction* (Oxford, 2010).

and quite often the timescale of the project.² These attributes are important in that they offer different ways to filter and interrogate the network and so they can influence the way the network is conceived and abstracted, its structure, and how this structure is calculated using different network measurements.

I

Scholars such as Newman, Albert-László Barabási, Duncan J. Watts and Linton C. Freeman have analysed a wide range of real-world networks, arguing that they have an underlying order and can be analysed using mathematical tools and models.³ These tools and models have long been used in various disciplines, such as sociology, mathematics and physics, but are beginning to make an impact on the disciplines of history and English.⁴ While the tools are beginning to be used, this does not mean that the concepts are new to the field. In their recent book, Ruth Ahnert, Sebastian Ahnert, Catherine Nicole Coleman and Scott B. Weingart argue that networks are an abstraction of a concept into a system of nodes and edges, and that these abstract systems are inherently intuitive and are often initially conceived metaphorically — a conceptual framework, they argue, that scholars in the arts and humanities already possess.⁵ This is a point also picked up by Catherine Medici, who has highlighted that as networks were an integral part of the early modern world, ‘work on political and patronage networks is central to historical, art historical, and literary scholarship’.⁶ In terms of women’s networks she points to the work of Susan Broomhall and Stephanie Tarbin, Bernard Capp, Amanda Herbert, James Daybell, Julie Crawford, Micheline White and Julie Campbell among others.⁷

In the Irish context, the starting point has to be Margaret MacCurtain and Mary O’Dowd’s edited collection *Women in early modern Ireland*, which includes

² See also, Catherine Medici, ‘Using network analysis to understand early modern women’ in *Early Modern Women: An Interdisciplinary Journal*, xiii, no.1 (Fall 2018), p. 155.

³ See Newman, *Networks* and Albert-László Barabási, *Linked: the new science of networks* (Cambridge, MA, 2002).

⁴ See, for example, Jenna Townend, ‘Quantitative and qualitative approaches to early-modern networks: the case of George Herbert (1593–1633) and his imitators’ in *Literature Compass*, xiv, no. 3 (Mar. 2017), pp 1–14; Anupam Basu, Jonathan Hope and Michael Witmore, ‘The professional and linguistic communities of early modern dramatists’ in Anthony W. Johnson, Roger D. Sell and Helen Wilcox (eds), *Community-making in early Stuart theatres: stage and audience* (London, 2016), pp 63–94.

⁵ Ruth Ahnert, Sebastian E. Ahnert, Catherine Nicole Coleman and Scott B. Weingart, *The network turn: changing perspectives in the humanities* (Cambridge, 2021), pp 5–7.

⁶ Medici, ‘Using network analysis’, p. 153.

⁷ Medici, ‘Using network analysis’, pp 153–4; Susan Broomhall and Stephanie Tarbin (eds), *Women, identities, and communities in early modern Europe* (Burlington, 2008); Bernard Capp, *When gossips meet: women, family, and neighbourhood in early modern England* (Oxford, 2004); Amanda E. Herbert, *Female alliances: gender, identity, and friendship in early modern Britain* (New Haven, 2014); James Daybell, *Women letter writers in Tudor England* (Oxford, 2006); Julie Crawford, *Mediatix: women, politics, and literary production, in early modern England* (Oxford, 2014); Micheline White, *English women, religion, and textual production 1500–1625* (Burlington, 2011); Julie Campbell, *Literary circles and gender in early modern Europe: a cross cultural approach* (Burlington, 2007).

important work on women's political, cultural, religious and kinship networks by scholars such as Bernadette Cunningham, Phil Kilroy, Katharine Simms, Jerrold Casway and Ciarán Brady.⁸ Consideration of early modern women's kinship and political networks was also central to the 'Agenda for women's history in Ireland', with MacCurtain, O'Dowd and Luddy highlighting the need for more research on 'the political patronage of aristocratic women in sixteenth-century Ireland'; this included the networks of the wives of lords deputy and the networks of literate women 'from wealthy families such as the Butlers of Kilkenny and the Boyles of County Cork'.⁹ Since its publication there has been an impressive response to this call.¹⁰ Both Jerrold Casway and Marie-Louise Coolahan have analysed the political and kinship networks of Rosa O'Dogherty (Róis Ní Dhochartaigh), while Karen Holland has examined the networks of Joan FitzGerald, countess of Desmond.¹¹ The networks of the wives of some lords deputy have been explored by Deirdre Fennell and Catherine Medici, who surveyed the political and kinship networks of the Fitzwilliam women and the Sidney women respectively.¹² The networks of the Butlers of Kilkenny and the Boyles of County Cork have received the most sustained analysis since the publication of the 'Agenda'. Coolahan, Damien Duffy, Naomi McAreavey and Eleanor O'Keefe have explored the lives of the Butler women; while Coolahan, Ruth Connolly, Michelle DiMeo, Clodagh Tait, Betsy Taylor Fitzsimons, Carol Pal, Ann-Maria Walsh, Ramona Wray and Amelia Zurcher have analysed the lives of the Cork Boyle women, with the most sustained attention being given to the political, religious, cultural and kinship networks of Katherine Jones (née Boyle), Lady Ranelagh and Mary Rich (née Boyle), countess of Warwick.¹³ The vast majority of

⁸ Margaret MacCurtain and Mary O'Dowd (eds), *Women in early modern Ireland* (Edinburgh, 1991).

⁹ Margaret MacCurtain, Mary O'Dowd and Maria Luddy, 'An agenda for women's history in Ireland, 1500–1900' in *I.H.S.*, xxviii, no. 109 (May 1992), pp 6, 8, 11.

¹⁰ For a list of work on early modern Irish women since the publication of the agenda, see the appendix in Julie A. Eckerle and Naomi McAreavey (eds), *Women's life writing & early modern Ireland* (Lincoln, NE, 2019), pp 253–80.

¹¹ Jerrold Casway, 'Heroines or victims? The women of the flight of the earls' in *New Hibernia Review*, vii, no. 1 (spring 2003), pp 57–74; idem, 'Rosa O Dogherty: a Gaelic woman' in *Seanchas Ardmhacha: Journal of the Armagh Diocesan Historical Society*, x, no. 1 (1980–81), pp 42–62; Marie-Louise Coolahan, 'Irish women's letters, 1641–1653' in James Daybell and Andrew Gordon (eds), *Women and epistolary agency in early modern culture* (Abington, 2016), pp 167–81; Karen Ann Holland, 'Joan Desmond, Ormond and Ossory: the world of a countess in sixteenth-century Ireland' (Ph.D. thesis, Providence College, 1995).

¹² Deirdre Fennell, 'The reluctant lord deputy: the early life and career of Sir William Fitzwilliam of Milton' (Ph.D. thesis, N.U.I. Galway, 2018); eadem, 'Female presence in the life of Lord Deputy Sir William Fitzwilliam', *Tudor and Stuart Ireland Podcasts 2016* (<https://soundcloud.com/history-hub/deirdre-fennell-female-presence-in-life-of-lord-deputy-sir-william-fitzwilliam?in=history-hub/sets/tudor-and-stuart-ireland-2016>); Catherine Medici, 'To persuade and connect: Mary Sidney's essential role in Henry Sidney's Irish rule' in Laura Aydelotte (ed.), *A mirror for medieval and early modern studies: selected proceedings of the Newberry Center for Renaissance Studies 2012 Multidisciplinary Graduate Student Conference* (Chicago, 2012), pp 61–72.

¹³ Coolahan, 'Irish women's letters, 1641–1653', pp 167–81; Eleanor O'Keefe, 'The family and marriage strategies of James Butler, first Duke of Ormonde, 1658–1688' (Ph.D. thesis, University of Cambridge, 2000); Naomi McAreavey, 'The place of Ireland in the letters

these studies have grappled with the concepts of networks in a metaphorical way, employing specialist knowledge and the array of important skills traditionally in a historian's toolkit — archival research, palaeography, close reading and contextual reading.¹⁴ The demands of painstaking, recovery-based research means that the work has largely been restricted to case studies, which by their nature can be relatively limited in size or scope. Now, the development of new digital tools has the potential to widen this scope and network analysis can be incorporated as a complementary element in the work of historians and literary scholars.

II

As noted, one of the most beneficial aspects of network visualisation and analysis is the ability to interrogate a network using a variety of network measurements. One such measure is degree centrality, which measures the total number of edges connected to a particular node or, in the case of a social network, the total number of separate people to whom a particular person has connections. People that hold a high degree centrality in networks can be described as hubs, as they have the most connections. Degree centrality is a useful measurement as it can be broken down into 'in-degree' and 'out-degree'. As part of the RECIRC project (a project run by Marie-Louise Coolahan that researched and analysed the ways in which women's texts were read and transmitted during the early modern period), network visualisation was used to create reception networks that incorporated both of these measures.¹⁵ In a reception network, in-degree measures how many different people were writing about a given female author. Out-degree, in

of the first Duchess of Ormonde' in Eckerle and McAreavey (eds), *Women's life writing*, pp 159–182; Damien Duffy, *Aristocratic women in Ireland, 1450–1660: the Ormond family, power and politics* (Woodbridge, 2021); Ruth Connolly, "'A wise and godly Sybilla': Viscountess Ranelagh and the politics of international Protestantism' in Sylvia Brown (ed.), *Women, gender and radical religion in early modern Europe* (Leiden, 2007), pp 285–306; eadem 'A proselytising Protestant commonwealth: the religious and political ideals of Katherine Jones, Viscountess Ranelagh' in *The Seventeenth Century*, xxiii, no. 2 (2008), pp 244–64; Michelle DiMeo, 'The rhetoric of medical authority in Lady Katherine Ranelagh's letters' in Daybell and Gordon (eds), *Women and epistolary agency*, pp 96–109; eadem "'Such a sister became such a brother": Lady Ranelagh's influence on Robert Boyle' in *Intellectual History Review*, xxv, no. 1 (2015), pp 21–36; Clodagh Tait, 'Good ladies and ill wives: women on Boyle's estates' in David Edwards and Colin Rynne (eds), *The colonial world of Richard Boyle first earl of Cork*, (Dublin, 2018), pp 205–22; Betsey Taylor-Fitzsimon, 'Conversion, the Bible and the Irish language: the correspondence of Lady Ranelagh and Bishop Dopping' in Michael Brown, Charles McGrath and Thomas Power (eds), *Converts and conversion in Ireland, 1650–1850* (Dublin, 2005), pp 157–82; Carol Pal, *Republic of women: rethinking the republic of letters in the seventeenth century* (Cambridge, 2012); Ann-Maria Walsh, *The daughters of the first Earl of Cork: writing family, faith, politics and place* (Dublin, 2020); Ramona Wray, '[Re]constructing the past: the diametric lives of Mary Rich' in Henk Dragsta, Sheila Ottway, and Helen Wilcox (eds), *Betraying our selves: forms of self-representation in early modern English texts* (London, 2000), pp 148–65; Amelia Zurcher, 'Life writing in the Boyle family network' in Eckerle & McAreavey (eds), *Women's life writing*, pp 99–136.

¹⁴ The main exception is Medici and my work, discussed below.

¹⁵ RECIRC (The Reception and Circulation of Early Modern Women's Writing, 1550–1700) (recirc.nuigalway.ie) (29 Oct. 2020).

contrast, measures how many different female authors a given person was writing about. For example, if you examine RECIRC's network of receptions that occurs in correspondence, Mary Percy (1570–1642), abbess of the Benedictine monastery in Brussels, is a hub and has both the highest in-degree (i.e. she was being discussed in the letters of various different people) and out-degree (i.e. she was writing about many different women in her letters). This is unsurprising, as in her role as abbess she was involved in a controversy that resulted in her writing about many of her fellow nuns and they in turn were writing about her.¹⁶

Another measurement that is important to the examination of networks is eigenvector centrality. A node that ranks highly in this measurement is one that is connected to other nodes that also rank highly. Stephen Borgatti elaborates on this measurement's importance: 'if a node influences just one other node, who subsequently influences many other nodes (who themselves influence still more others)', this measurement will capture the integral role played by the first node in the chain.¹⁷ Thus, in this measurement, a node's own importance is dependent on the importance of its neighbouring nodes. This means that the main hubs of a network often rank highly in this measure, but nodes with a relatively low number of connections could still have a high eigenvector score if these connections are to other important nodes. For example, in my study of women's involvement in the intellectual correspondence network known as the Hartlib circle, Katherine Jones, Lady Ranelagh (1615–91), daughter of the first earl of Cork, ranked highly in this measure. This is because she was socially connected to many of the members of this network who were based in England and Ireland.¹⁸ This included Samuel Hartlib himself, alongside John Dury, Dorothy Moore, John Beale, William Petty and Benjamin Worsley among others. A final measurement of note is that of 'betweenness' which examines a node's ability to bridge diverse parts of the network. Ruth Ahnert and Sebastian Ahnert note that 'for any two nodes in a network, there is a shortest path between them, and betweenness tells us how many of these shortest paths go through a given node'.¹⁹ In their study on Protestant correspondence networks, they found that this measure brought attention to the role played by Anne Smith, wife of the martyr Robert Smith (d. 1555), within the wider correspondence network.²⁰ All of these measures can be invaluable in researching early modern women's lives as, in different ways, they can help reveal the agency of women within larger networks.

While network visualisation is a useful tool for the analysis of various forms of historical documents, it is especially useful in the analysis of correspondence. Gary Schneider describes early modern letters as 'sociotexts': they demonstrate 'material

¹⁶ For more on this, see Emilie K. M. Murphy, 'Exile and linguistic encounter: early modern English convents in the low countries and France' in *Renaissance Quarterly*, lxxiii, no. 1 (spring 2020), pp 132–64; eadem, 'Language and power in an English convent in exile, c.1621–c.1631' in *Hist. Jn.*, lxii, no. 1 (Mar. 2019), pp 101–25; Bronagh Ann McShane, 'Visualising the reception and circulation of early modern nuns' letters' in *Journal of Historical Network Research*, ii (2018), pp 1–25.

¹⁷ Stephen Borgatti, 'Centrality and network flow' in *Social Networks*, xxvii, no. 1 (Jan. 2005), pp 55–71.

¹⁸ Evan Bourke, 'Female involvement, membership and centrality: a social network analysis of the Hartlib Circle' in *Literature Compass*, xiv, no. 4 (Apr. 2017), pp 1–17.

¹⁹ Ruth Ahnert and Sebastian E. Ahnert, 'Protestant letter networks in the reign of Mary I: a quantitative approach' in *E.L.H.*, lxxxii, no. 1 (spring 2015), p. 12.

²⁰ Ahnert & Ahnert, 'Protestant letter networks', p. 12.

evidence of social connectedness'. Thus, social network visualisation is an effective way of highlighting and bringing attention to the social ties that letters 'initiated, negotiated and consolidated'.²¹ Two scholars to pioneer this approach with regard to correspondence are Ahnert and Ahnert.²² In their first study, they used quantitative network analysis to visualise and analyse the Protestant letter network memorialised in John Foxe's *Acts and monuments*, or the Book of Martyrs as it is more popularly known. In order to do this, they analysed 289 letters 'that were written either by or to Protestants residing in England during Mary's reign', finding that female sustainers, such as Joyce Hales and Margery Cooke, played a more central role than had previously been suspected.²³ In their second project, Tudor Networks of Power (TNOP), Ahnert and Ahnert analysed 132,747 letters in the state papers, from the accession of Henry VIII in 1509 until the death of Elizabeth I in 1603, using metadata granted to them by State Papers Online (SPO). They note that given the political nature of the archive, women only make up 4 per cent of their corpus. However, they stress that, as their study examines 20,656 correspondents, this four percent actually accounts for around 826 distinct women, highlighting the importance of this source for the recovery of women's lives and political activity.²⁴

Ahnert and Ahnert's study provides a foundation for further research, allowing scholars to take a perspectivist approach (a network with a particular person placed at the centre) facilitating an examination of the networks of these 826 women. From an Irish perspective, this includes the political networks of Joan FitzGerald, countess of Desmond (d. c.1595); Elinor FitzGerald, countess of Desmond (c.1545–c.1638); Mabel FitzGerald, countess of Kildare (c.1536–1610); and Anne Fitzwilliam (d. 1602).²⁵ There are also several other studies built around correspondence networks that focus on gender as a significant lens of analysis. This includes work by Catherine Medici, who is working on the Sidney family letters in order to analyse the central role of women in the family's political and literary networks; Bronagh Ann McShane, who examined letters written by and about English Benedictine nuns living in Brussels, which shows how the enclosure of the nuns was compromised by lay relatives both in and beyond Spanish Flanders; and my own work

²¹ Gary Schneider, *The culture of epistolarity: vernacular letters and letter writing in early modern England, 1500-1700* (Deleware, 2005), p. 27.

²² Ahnert & Ahnert, 'Protestant letter networks', pp 3–4. See also Ingeborg Van Vugt, 'Using multi-layered networks to disclose books in the republic of letters' in *Journal of Historical Network Research*, i (2017), pp 25–51, which highlights correspondence networks and interrogates the role the sharing of books had in strengthening correspondence ties.

²³ Ahnert & Ahnert, 'Protestant letter networks', pp 3–4.

²⁴ Ruth Ahnert and Sebastian E. Ahnert, 'Metadata, surveillance and the Tudor state' in *History Workshop Journal*, lxxxvii (2019), pp 27–51.

²⁵ Another project to analyse a large corpus of political and state letters is the Mapping the Atlantic Portuguese Empire project, which extracted network data from 170,000 letters of administrative correspondence of the Portuguese Empire, from 1610 to 1833: Agata Bloch, Dernival Vasques Filho and Michael Bojanowski, 'Networks from archives: reconstructing networks of official correspondence in the early modern Portuguese empire' in *Social Networks*, lxi (May 2022), pp 123–35.

which analyses Katherine Jones, Lady Ranelagh and Dorothy Moore's position in the Hartlib circle.²⁶

In general, there are three ways of assembling a dataset, as exemplified by a number of existing projects. First, there are hand-curated datasets that draw on digitised corpora that have incorporated full text transcriptions, such as Medici's study of the Sidney network, which is based on a digitized version of the Sidney family letters edited by Arthur Collins in 1746, and my study of the Hartlib circle, which used transcriptions available on Hartlib Papers Online.²⁷ Secondly, there are the datasets that have extracted and created networkable metadata from meta-archives (digitised calendars and registers); for example, Ahnert and Ahnert's Tudor Networks of Power, which used the metadata generated by the digitisation of the calendars of the state papers; and Błoch *et al.*'s study of official correspondence in the early modern Portuguese empire, which used natural language processing techniques on a digitised register of correspondence created by the Historical Overseas Archive of Lisbon.²⁸ Finally, there is manual transcription and data entry from both print and manuscript sources, as exemplified by Ahnert and Ahnert's study of the correspondence in *Acts and monuments* and McShane's study of the reception networks of early modern nun's letters, which drew on manual transcriptions and metadata collected and curated for the RECIRC project by both Emilie K. M. Murphy and McShane.²⁹ This highlights two issues that I will return to later — access to digitised material and the labour involved in building these datasets. Other forms of life writing also offer opportunities for this kind of analysis. Medici, for example, notes that Melissa Schultheis is working on building networks from recipe books, specifically looking at Lady Ann Fanshawe's book of receipts in order to extract human and ingredient networks, to explore 'how network analysis helps understand the possibility of a royalist palette'.³⁰

Less work has been done on other genres of life writing, and developing network-analysis methodologies for diaries and autobiographies will widen the questions literary scholars and historians can ask. Diaries would be particularly amenable to this method, in that each entry could be treated as a separate element, allowing for the exploration of kinship and familial relationships and how these change over the diarist's writing life. Once a methodology has been developed for working on diaries and autobiographies, we can start to ask wider questions: Are specific ties (links to family, servants, broader kinship networks) emphasised or elided depending on genre? Does the structure of networks produced by a certain genre of life writing change over time? Scholars of early modern Irish women are well placed to engage in the development of these methodologies and examine what they can tell us about early modern women's lives, especially considering the plethora of life writing linked to the Cork Boyle family. For example, the

²⁶ Medici, 'Using network analysis', p. 161. See also <https://catherinemediciphd.org/visualizing-the-sidney-network/> (11 Jan. 2021); McShane, 'Visualising the reception' pp 1–25; Bourke, 'Female involvement, membership and centrality', pp 1–17.

²⁷ <https://catherinemediciphd.org/visualizing-the-sidney-network/>; The Hartlib Papers Online (<https://www.dhi.ac.uk/hartlib/>) (11 Jan. 2021).

²⁸ Ahnert & Ahnert, 'Metadata, surveillance and the Tudor state', p. 2; Błoch *et al.*, 'Networks from archives', p. 2.

²⁹ Ahnert & Ahnert, 'Protestant letter networks', pp 3–4; McShane, 'Visualising the reception', pp 1–2.

³⁰ Medici, 'Using network analysis', p. 160. See also <https://collation.folger.edu/2017/10/report-network-analysis> (11 Jan. 2021).

diary of Mary Rich, which has almost daily entries for a ten-year period of her life (1666–76), is one potential avenue, while an examination of the role of women in the diary of the second earl of Cork is another possibility.

Another useful approach to network analysis/visualisation that has gained traction is the abstraction of networks from biographical sources. One such project is BiographySampo, which drew on 13,100 biographies in the collections of the Biographical Centre of the Finnish Literature Society to create what are known as reference networks. In their case, they built networks from the embedded ‘HTML links and mentions of people in the biographies to create a reference network which is analogous to citation networks’. In these networks, ‘the nodes are people, and when a person A is mentioned in the biography of B, a directed edge is added from B to A’.³¹ Once this process was complete, the transformed network data could be used in applications and queried, allowing perspective networks for an individual or a group to be generated automatically on their website. A better-known project, and more pertinent to early modern studies, is the Six Degrees of Francis Bacon (SDFB) project, which has abstracted a network of early modern England using the *Oxford Dictionary of National Biography (O.D.N.B.)* as its dataset. This project takes a different approach to BiographySampo: instead of creating reference networks, it uses a statistical method for abstracting the network. First, SDFB extracted names from the biographies using Name Entity Recognition (NER) software (excluding names that occur in fewer than five documents). They then designed and implemented a statistical inference algorithm that determined the likelihood of one person knowing another person based on the information in the *O.D.N.B.*, assigning a confidence score for the connection, before using various validation tests on the network.³²

The overall aim of the project was to ‘represent and reinforce the full diversity of early modern social ties’, but they note that historical scarcity and their own editorial decisions prevent this. One such shortcoming is gender, but the SDFB team have noted and addressed this issue in several ways. A figure is present in these networks only if they are already privileged by the wider historiography; absence, therefore, does not indicate non-existence. As networks are abstractions of the data contained in the dataset, someone absent from the dataset cannot be in the network. For SDFB, this led, as they acknowledge, to algorithmic bias against women for two key reasons. The first of these was gender bias within the *O.D.N.B.* itself where, by the time SDFB was finishing up, only 534 of 9,929 (5.4 per cent) of early modern biographies are of women’s lives. The second was where women’s names changed with marriage, causing some women to not reach the project’s threshold for inclusion.³³ Despite these issues, their initial method resulted in 6.6 per cent of

³¹ Minna Tamper, Petri Leskinen, and Eero Hyvönen, ‘Visualizing and analyzing networks of named entities in biographical dictionaries for digital humanities research’, *EasyChair preprint no. 888* (2019) (<https://doi.org/10.29007/zqs5>).

³² Christopher Warren, Daniel Shore, Jessica Otis, Lawrence Wang, Mike Finegold, and Cosma Shalizi, ‘Six degrees of Francis Bacon: a statistical method for reconstructing large historical social networks’ in *Digital Humanities Quarterly*, x, no. 3 (2016), pp 1–15.

³³ Six degrees of Francis Bacon website: Scott Weingart and Jessica Otis, ‘Gender inclusivity in six degrees’, 5 Jan. 2016 (<https://6dfb.tumblr.com/post/136678327006/gender-inclusivity-in-six-degrees>); ‘An entry of one’s own, or why are there so few women in the early modern social network?’, 8 Mar. 2013 (<http://6dfb.tumblr.com/post/44879380376/an-entry-of-ones-own-or-why-are-there-so-few>); ‘Gender and name recognition’, 20 Mar. 2013 (<http://6dfb.tumblr.com/post/45833622936/gender-and-name-recognition>) (all accessed 11 Jan. 2021).

the dataset being women, and these women had a median degree (number of people they were connected to) of 20.3 people, while the men in the dataset had a median degree of 25.7. They then followed this up with ‘addathon’ to manually include women, which drew participants from all over the world to add early modern English women and their connections to the dataset.³⁴ While SDFB’s final dataset is not close in terms of gender parity, it is still an important project. Significantly, the team’s openness to the biases of data and the impact of absent or missing data allows us to think critically about gender in the sources that they used. Since the close of the project, the *O.D.N.B.* has commissioned several series of early modern women’s lives, adding the biographies of women such as Elizabeth Dowdall (*fl.* 1640–42), and Frances Devereux (*c.* 1568–1632) to the dataset, thus attempting to address the biases in their corpus.³⁵

III

While many of the projects mentioned touch on or include early modern Irish women, there are two key digital humanities projects, both based in Ireland, that are interested in the digital recovery of early modern Irish women’s lives through network analysis and networked approaches.³⁶ The first is MACMORRIS (Mapping Actors and Communities: Modelling Research in Renaissance Ireland in the Sixteenth and Seventeenth Centuries), on which I am currently employed as a project manager; the second is RECIRC (The Reception and Circulation of Early Modern Women’s Writing, 1550–1700), on which I previously worked as a Ph.D. and postdoctoral researcher. Led by Patricia Palmer, MACMORRIS is a four-year Irish Research Council-funded project that aims to map the full range and richness of cultural activity, across languages and ethnic groups, in Ireland, from 1541 to 1660. It seeks to present a revised and expanded picture of early modern Ireland, one that goes against the predominantly Anglocentric perspective of literary-historical scholarship by developing an open-access resource that ‘maps significant cultural actors (of whatever ethnicity) writing in, or engaging with, Gaelic, English, Latin, Scots, Spanish, Italian, Portuguese, and Dutch, in late 16th and early 17th century Ireland’.³⁷ Its focus is on ‘cultural actors’, which are defined as both those who produce culture (primary cultural actors), and those who shape the contexts within which cultural practices operate and change over time (secondary cultural actors). The project is developing two interactive visualisations to determine how far the recovery of such cultural actors — and

³⁴ <http://networkingwomen.sixdegreesoffrancisbacon.com>, 23 Jan. 2016 (accessed 11 Jan. 2021).

³⁵ Marie-Louise Coolahan, ‘Dowdall (*née* Southwell), Elizabeth (*fl.* 1640–1642)’, Ioanna Tsakiroplou, ‘Devereux, Frances [*née* Walsingham; other married names Sidney and Burke] (*c.* 1568–1632)’ in *O.D.N.B.* (<https://www.oxforddnb.com>).

³⁶ For an alternative overview of these projects, see Marie-Louise Coolahan, ‘New technologies of research and digital interpretation for early modern Irish Studies’ in *Irish University Review*, 1, no. 1 (May 2020), pp 175–86.

³⁷ David Baker, Willy Maley and Patricia Palmer, ‘What ish my network? Introducing MACMORRIS: digitising cultural activity and collaborative networks in early modern Ireland’ in *Literature Compass*, xv, no. 11 (Nov. 2018), p. 4. See also Patricia Palmer, David J. Baker, and Willy Maley, ‘Enter MacMorris’ in *Dublin Review of Books*, 114 (July 2019) (<https://www.dr.b.ie/essays/enter-macmorris>) (27 June 2022).

cultural acts — can capture the layered complexity of cultural conflict and change over time: 1) a network graph of cultural actors and their connections; and 2) a deep map of early modern Munster. In terms of the network graph, MACMORRIS draws on the metadata of two pre-established projects: the *Dictionary of Irish Biography* (*D.I.B.*) and the Bardic Poetry Database (BPD).³⁸ The project aims to use this metadata to extract the social connections from the *D.I.B.*, alongside the patronage connections evident in bardic praise poetry contained in the BPD and combine them on the same interoperable network graph. This will allow us to explore how the Gaelic-speaking world of the bardic poets was intertwined with the Anglocentric world of Elizabethan conquest, despite the purposeful absence of the Irish language in the Anglocentric sources and its marginalisation within the predominantly Anglocentric perspective of literary-historical scholarship.

The overall aim of MACMORRIS's analysis of the *D.I.B.* is very similar to SDFB, in its use of the *O.D.N.B.*, but MACMORRIS involves a much smaller dataset. In terms of size, for the period 1540–1660 there are 1,068 biographies in the *D.I.B.*, compared to around 10,000 in the *O.D.N.B.*, and in terms of politics, the 1,068 biographies have been chosen for their importance to Irish rather than British history (as defined by the editors of both projects). Thus, rather than employ the algorithmic approach of SDFB, MACMORRIS has followed a similar method to that of BiographySampo. First, the team extracted a reference network, connecting person B to person A when person A was mentioned in the biography of B; this is a semi-automated process, which involves the use of Named Entity Recognition (NER). We then read through the biographies to manually correct errors and compile biographical metadata on the actors extracted from entries in which they are mentioned. We subsequently extracted a co-citation network in that we connected B to A when person A and person B were both mentioned in the same biography. We are in the process of verifying these potential connections, as while two people mentioned together in a number of different biographies is highly suggestive of a connection between the them, it is possible that the co-citation might indicate nothing more than mutual acquaintances.³⁹ In terms of gender, this approach will allow a focus on political, cultural and kinship networks and highlight women who are mentioned in the biographies of men but who themselves often remain on the periphery of scholarship.

MACMORRIS faces many of the same challenges as SDFB, in terms of the biases inherent in our source material and the effect this has on the abstracted network. Much like their network, absence in the MACMORRIS dataset does not equal non-existence. Like the *O.D.N.B.*, the *D.I.B.* has a gender bias in that of the 1,068 early modern lives, only 38 (3.5 per cent) are of women. This represents an even greater bias against women than that found in the *O.D.N.B.* Our smaller dataset and method of manually reading the biographies to verify the connection extracted by NER meant that we were able to disambiguate and deduplicate women mentioned in biographical entries and did not have to employ a threshold for inclusion. As a result, we were able to attempt to address the gender imbalance; by incorporating women mentioned in the biographies, we have been able to ensure that, at the time of writing, 496 of 3,173 (15.5 per cent) people in the dataset are

³⁸ We are thankful to the Royal Irish Academy and especially Turlough O'Riordan for sharing the *D.I.B.* metadata with us, and to Katharine Simms, Michael Hoyne and the Dublin Institute of Advanced Studies for sharing the BPD with us.

³⁹ Warren *et al.*, 'Six degrees of Francis Bacon', p. 4.

women and the open-access version of the dataset will include a perspective and interactive network of every early modern Irish woman mentioned in this article to date. Much like the recent efforts by the *O.D.N.B.* to address biases in their corpus, the difference between the number of women mentioned in *D.I.B.* biographies and those that have their own entries highlights the need for the *D.I.B.* to follow suit and expand its corpus of early modern women's lives, especially as an open-access resource that has the potential to reach a diverse audience.

The second dataset that MACMORRIS has worked with is the Bardic Poetry Database. Bernadette Cunningham has argued that, despite women's apparent exclusion from the bardic schools, we need to attend to the role of 'women as patrons, women as authors and women as subjects of literature'.⁴⁰ In our analysis of the BPD, we were aware of the different roles women could play in the production of culture and we wished to highlight the explicit role of women in bardic poetry. This section of the project is led by Deirdre Nic Chárthaigh, who, when manually extracting and cleaning the dataset, marked up the identity of the poet, the identity of the patron, the gender of the poet and patron, and recorded instances where a wife/mother of a patron was praised in dedicated quatrains of a poem.⁴¹ Overall, we extracted 720 people from the BPD, of which 105 (14.5 per cent) were women — 71 of whom were written about in praise poems dedicated to their husbands or sons. We then extracted patronage networks and reference networks in order to explore the different roles played by women. This has resulted in us extending the understanding of women's role as patrons: we now know that, in a network where both poet and patron of a particular poem can be identified, 32 of the 269 patrons (12 per cent) are women, including Martha Stafford (d. 1678), Nuala Ní Domhnaill (c.1575–1630), and Onóra inghean Uí Bhriain (c.1569), and that of these 32 women, ten of them acted as a patron for two different poets. While the vast majority of the connections extracted from the *D.I.B.* and BPD are male to male (which is to be expected, considering the sources we were analysing), MACMORRIS shows the potential of network analysis to recover elements of the lives of women in early modern Ireland when gender as a category for data collection and analysis is given due consideration, even if the wider aims of the analysis are not exclusively related to gender.

In the case of the second Irish-based project, the RECIRC project, gender is at the heart of its approach to networks. RECIRC (2014–20) was a European Research Council-funded project, run by Marie-Louise Coolahan, which researched and analysed the ways in which women's texts were read and transmitted during the early modern period. RECIRC produced a large-scale, quantitative analysis of the reception and circulation of women's writing from 1550 to 1700, in order to enable analysis of how texts, ideas and reputations gained traction in the early modern period. In its initial phase, the project designed a database for its researchers to store their data in a single online location, using a centralised taxonomy that enabled them to compare findings, even if they were drawn from

⁴⁰ Bernadette Cunningham, 'Women and Gaelic literature, 1500–1800' in MacCurtain & O'Dowd (eds), *Women in early modern Ireland*, pp 147–8.

⁴¹ For more on women mentioned within the poems, see Damian McManus, 'Celebrating the female in Classical Irish poetry: the wife' in *Ériu*, 65 (2015), pp 137–68; idem, 'Female ancestry and mother's kin in Classical Irish poetry' in Caoimhín Breatnach and Meidhbhín Ní Úrdail (eds), *Aon don Éigse. Essays marking Osborn Bergin's centenary lecture on Bardic poetry (1912)* (Dublin, 2015), pp 193–219.

different archives around the world.⁴² The final phase of the project designed a new user interface to share these findings with a wider public and to promote the study of both women's writing and its reception history. Coolahan notes that:

the open-access version enables users to search almost 5,000 instances of reception evidence, filtered by categories that include date, place, and source, as well as reception type, circulation type, and three categories of person: the female author, the receiver, and the owner/compiler/scribe of the volume in which the instance of reception occurs.⁴³

The aim of this platform was to empower users to generate their own results and visualisations, provoking this by displaying the results in visual formats, including network graphs. This enabled users interested in early modern Ireland to search and visualise the reception networks of women such as Katherine Philips (1632–64), Anne Southwell (1574?–1636) and Dorothy Moore (1613–64). For example, in the case of Katherine Philips, it was possible to explore visually who was compiling her work, the types of sources they compiled her work in and who was writing about her.

Like most humanities data, the networks generated by RECIRC are complex and are all either bimodal or multimodal. This means that they are made up of two or more node types. In these networks, the nodes (or actors) can be one of four types: female author; receiver; owner/compiler/scribe; and reception source type. If the network represented has two of these four types (for example, female author and receiver), this means that the network is bimodal; while if the network has three or more of these types, then it is a multimodal network. Scott Weingart has shown that while humanities data is often rich with various node types (such as people, places and things): 'the more complex and multimodal your dataset, the less you can reasonably do with it'.⁴⁴ He argues that in a bimodal network, 'degree centrality is nothing more than a count of affiliations', and that 'the simplest definition of clustering coefficient doesn't work on bimodal networks'. For users with only a beginner-level understanding of network analysis, these issues are then compounded by the limitations of open-source software, such as the software platform Gephi's inability to differentiate between unimodal (one type) or bimodal (two type) networks.⁴⁵ Furthermore, despite being built for unimodal data, if a user asks Gephi to run network algorithms on bimodal data, Gephi continues to use unimodal formulas and 'everything still works as though these metrics would produce meaningful, sensible results'.⁴⁶

To avoid this issue, the approach taken by RECIRC's network visualisations is qualitative in nature and is exemplified by the work of Bronagh Ann McShane.⁴⁷ She draws on a method Van Vugt describes as 'disclose' (a mixture between close and distant reading), and her dataset is drawn from the RECIRC database. McShane's analysis is on data from 405 letters containing reception evidence

⁴² Coolahan, 'New technologies of research', p. 182.

⁴³ Ibid.

⁴⁴ Scott Weingart, 'Networks demystified 9: bimodal networks', *The Scottbot Irregular*, 21 Jan. 2015 (<https://scottbot.net/networks-demystified-9-modality/>) (11 Jan. 2021).

⁴⁵ <https://gephi.org/> (11 Jan. 2021).

⁴⁶ Ibid. This is especially an issue with betweenness centrality and the creators of Gephi are aware of this problem.

⁴⁷ McShane, 'Visualising the reception', pp 1–25.

and written between 1609 and 1693. This data, was gathered from the Archive of the Archdiocese of Mechelen and relates to letters from Lady Mary Percy and other nuns from the English Benedictine Convent of the Assumption of Our Blessed Lady to the archbishop of Mechelen and his secretaries. McShane's analysis of these receptions does not employ structural algorithms, except degree measures, which she uses to count affiliations and bring attention to both female authors and agents of reception with large amounts of edges. Instead, she argues that filtering the network allows for a more nuanced understanding of the types of reception that takes place. She achieves this by highlighting how filtering the network to 'identify receptions that are translations only' reveals alliances between the nuns and their translators that are more complex than scholars previously thought.⁴⁸

McShane's case study points to ways in which RECIRC's broader research questions can be visualised and analysed using a qualitative network approach. Degree measurements such as in-degree and out-degree can be used by users to ask what female authors were read/written about, and who was reading/writing about female authors. Through the use of filters, users can engage with network visualisations to explore the different types of reception that occurred, and by joining McShane's approach with Van Vugt's multi-layering approach, close reading is facilitated as users can explore the types of sources a reception takes place in and even interact with the network in a way that will bring them to a transcript of the reception evidence. Overall, RECIRC's platform highlights the potential for interactive qualitative networks as a way to facilitate close reading of the reception of women authors, while also enabling more experienced users to potentially grapple with the multi-modal networks. Those scholars with the technical capabilities could condense the networks in order to ask new research questions of the data: for example, which female authors were compiled together in miscellanies or auction catalogues; and which types of reception frequently occur together (for example, how many translations also contain a reference to a specific work and/or female author)?

IV

While the work of TNOP, SDFB, MACMORRIS and RECIRC has shown how the approach offers many opportunities for those interested in the recovery of women's lives, it also brings with it many challenges, both for the individual researcher and for the community as a whole. The first issue we face is surmounting the technical learning curve. One of the most pertinent issues in this regard is the black-box effect — 'inputting data and getting results without fully understanding the algorithms through which those results were generated'.⁴⁹ As noted, software like Gephi is unable to differentiate between unimodal (one type) or bimodal (two type) networks. Thus, if a scholar did not know if they were working with unimodal or bimodal data, they would not know that the results being generated might not be reliable. Ahnert, Ahnert, Coleman and Weingart argue that 'use of any of these tools requires a prior mental manoeuvre of translating cultural artefacts into an abstracted form to see whether they are compatible with the input requirements of the available tools'.⁵⁰ This involves taking the time to engage with background

⁴⁸ Ibid., p. 15.

⁴⁹ Ahnert *et al.*, *The network turn*, p. 85.

⁵⁰ Ibid., p. 75.

reading; gaining familiarity with platforms like Gephi, Palladio or Nodegoat through tutorials; experimenting with test data; and experimenting with different ways of structuring data. It may also lead to a need or desire to develop skills further, such as learning how to code or learning how design your own database. This can pose a challenge for potential digital scholars as it can be difficult to tell at an early stage whether the methods offered by network analysis will prove fruitful, which can be daunting for people who have a limited timeframe to complete their projects. However, the benefits of being digitally engaged in a rapidly evolving digital world will for some outweigh the challenges.

This highlights a significant and pervasive issue: autodidacticism, or the self-taught person, is a major feature of digital humanities in Ireland and the reasons for this are both logistical and structural. Logistically, as noted by Coolahan, ‘it is hard to recruit computer science specialists in today’s job market, where the financial rewards are far greater in industry than the humanities’.⁵¹ However, there is also a structural element to this because we are in a moment where research funding bids are more successful if they include a digital component. In the case of a researcher applying for individual funding, this may require the autodidactic acquisition of new skills, but for large research projects, the issues are slightly different. In the absence of computer science specialists, the positions on these projects need to be filled by people who have both domain knowledge of the project’s research area and the digital skills needed to achieve the project’s aims. People who fulfil both of these criteria are a rare breed, so projects must ensure they hire those with the best domain knowledge and potential to gain the relevant digital skillset. This ‘upskilling’ often occurs through autodidactic means, with the provision of some formal support. This is the route that I took, but it is a privileged one. When joining RECIRC as a Ph.D. researcher I had a background in early modern women’s writing and no digital training. As part of the project, I had access to funding, a support network, the space to watch how the project was operating and the time to experiment with different digital methods. I was then fortunate to be able to formalise this training through a training school (funded by the Arts and Humanities Research Council) in the U.K. This ad hoc pathway is not sustainable. Considering the U.K. context, Ahnert, Ahnert, Coleman and Weingart contend that ‘a pressing duty is placed on the university to prepare future generations of academics by offering suitable combinations of courses in humanities subjects, programming, and statistical methods’.⁵² The same is needed in Ireland, and we need to make sure that it can thrive, not just survive. James O’Sullivan has noted that, ‘DH programmes, initiatives and cohorts have had a tendency to implode over the years, suggesting that individuals rather than institutions are driving the digital humanities in Ireland’.⁵³ In order to avoid this continuing, we need to work together as a community and draw on the experience of the institutions and practitioners that have begun to have some success in implementing digital humanities programmes.

Most of the projects discussed in this paper had access to some form of digitised material — digital surrogates of primary sources, metadata shared from other digitisation projects or machine-readable text sourced from biographical

⁵¹ Coolahan, ‘New technologies of research’, p. 184.

⁵² Ahnert *et al.*, *The network turn*, p. 86.

⁵³ James O’Sullivan, ‘The digital humanities in Ireland’ in *Digital Studies/Le Champ Numérique*, x, no. 1 (2020), p. 23.

authorities. Those that did not undertake large data-collection phases, which involved coordinated transcription efforts in conjunction with the recording of metadata in line with a predetermined taxonomy. In terms of material of interest to scholars of early modern women's lives, it is more likely that the material is not available in a digital form and is likely scattered across several archives. This means that interested scholars would need to go down the second route and the effort needed to find, gather, transcribe and pre-process the data for analysis is exponentially higher, and thus the research might not be feasible without some form of research funding.

There are significant challenges with the material that has been digitised or already has metadata. As an extreme example, let us examine the state papers. RECIRC has shown that reading the content of letters for receptions of women writers can reveal new information about early modern women's lives and that receptions of women can far outweigh the number of extant letters to or from a particular woman. However, TNOP has focused exclusively on the senders and recipients of letters and when you consider they analysed 132,747 letters, it is not hard to see why. If a scholar was to attempt this daunting task of reading the state papers for reception evidence of women's lives, it is likely that they would have to run digitised facsimiles of all the letters through a programme like Transkribus in order to transform the manuscript image into machine readable text. They would then have to correct any OCR errors before running the documents through NER to extract names from the documents. What would follow would be an extensive data cleaning phase aimed at deduplicating and disambiguating the various people extracted while also deciding on how they categorise those mentioned within the letters. The final step would be to connect the people mentioned in the letter to the writer to create a reception network, or connect the people mentioned to each other to create a co-citation network. This mammoth task could take years, even if you only examined a small portion of the letters. The alternative would be to read through the letters with a specific question in mind, marking up the mentions in a way that allows you to answer this question, but this would only be possible with a much smaller dataset. This means that a big task for feminist scholars interested in the potential of data-driven networked approaches is the ability to create feasible projects when confronted with the gendered realities of how metadata has been created to date and how/what has been thus far digitised.

One final challenge I wish to highlight was succinctly addressed in a question posed by Dorothea Salo: 'is there a readable, reviewable, (print-) publishable, citable, immutable, preservable text in these data?'⁵⁴ This highly pertinent question raises the need for discussion on issues of sustainability, what work we as humanities scholars privilege and how that work is presented. These are questions too large to grapple with in this piece, but I do wish to discuss the impact that the privileging of print can have on networked approaches. Salo argues that the link between print publication as a marker of humanities career progress can pose a challenge for digital humanists as 'their nontextual research products are usually not printable, if printable at all, without loss of function'.⁵⁵ In terms of the projects

⁵⁴ Dorothea Salo, 'Is there a text in these data? The digital humanities and preserving the evidence' in Martin Paul Eve and Jonathan Gray (eds), *Reassembling scholarly communications: histories, infrastructures, and global politics of open access* (Cambridge, MA, 2020), p. 215.

⁵⁵ *Ibid.*, p. 222.

discussed in this piece, this includes the inter-operable network graphs developed by SDFB, TNOP and RECIRC. The graphs themselves need to be given equitable recognition when compared to the traditional outputs by these projects, as it is these graphs that can reveal things never seen before about the lives of early modern women. As we also privilege what we can see, we can very easily overlook all the collection, cleaning, design and development work that goes into creating these graphs. Thus, the challenge is to move beyond the single author model prevalent in the humanities and ensure that all members linked to a project (such as principal investigators, research assistants, postdocs, research technologists and Ph.D. researchers) are credited for the work they do and that all forms of labour are no longer invisible, in that they are properly valued and equally considered when it comes to career progression.

While these are all huge challenges, they are not unique to the study of women in early modern Ireland, nor even to early modern studies in general. However, at the ten-year celebration of the launch of the 1641 depositions Jane Ohlmeyer noted that feminist scholars were one of the first to use the digitised version of depositions in their scholarship, as seen by the work of McAreavey, Coolahan and Joan Redmond.⁵⁶ If you also consider the ground-breaking work achieved by Perdita, RECIRC and the Pulter Project, it is clear that there is a close connection between the study of women in early modern Ireland and digital humanities. Since the publication of the original ‘Agenda’, advancements in digital technology have meant that the study of Irish women’s history can take new directions that were never envisaged by MacCurtain, O’Dowd and Luddy. These new directions can draw on the success of Perdita, RECIRC and the Pulter Project and can engage with new techniques such as network visualisation and analysis. However, if we want to continue with the tradition started by these projects, we cannot ignore the wider challenges, nor can we be passive observers of these debates. As Catherine D’Ignazio and Lauren Klien have argued, feminism is about power and in our contemporary world, data is power.⁵⁷ As feminist scholars, we need actively to engage with these challenges.⁵⁸

⁵⁶ Coolahan, *Women, writing, and language in early modern Ireland* (Oxford, 2010); eadem, ‘“And this deponent further sayeth”: orality, print and the 1641 depositions’ in Marc Caball and Andrew Carpenter (eds), *Oral and print cultures in Ireland, 1600–1900* (Dublin, 2009), pp 69–84; McAreavey, ‘Re(-)membering women: Protestant women’s victim testimonies during the Irish Rising of 1641’ in *Journal of the Northern Renaissance*, ii (2010) (<https://jnr2.hcommons.org/2010/1120/>); eadem, ‘“This is that I may remember what passings that happened in Waterford”: inscribing the 1641 Rising in the letters of the wife of the mayor of Waterford’ in *Early Modern Women: An Interdisciplinary Journal*, v (fall 2010), pp 77–109; Joan Redmond, ‘Memories of violence and New English identities in early modern Ireland’ in *Historical Research*, lxxxix, no. 246 (Nov. 2016), pp 708–29; eadem, ‘Religion, ethnicity and “conversion” in the 1641 Irish Rebellion’ in *The Seventeenth Century*, xxxv, no. 6 (2020), pp 715–39.

⁵⁷ Catherine D’Ignazio and Lauren Klein, *Data feminism* (Cambridge, MA, 2020), p. 19.

⁵⁸ Research for this essay was funded by the European Research Council under the European Union’s Seventh Framework Programme (FP/2007–2013/ERC Grant Agreement no. 615545) and the Irish Research Council’s Laureate awards (Ircia/2019/116).