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The Digitisation of Irish Manuscripts: Beyond and Beneath the Visible Image

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Abstract:

This paper outlines the indebtedness of current digital capture, processing and display of Gaelic manuscripts to scholarly innovators and pioneers of the nineteenth century. It then reviews highlights of the deep-digitization project, Irish Script on Screen (<http://www.isos.dias.ie>), which was launched in 1999 and continues today. It is shown how current developments in spectroscopy and multi-spectral imaging allow us to complement and build upon traditional digital techniques and display.

Keywords: Lithography, Manuscript Digitization, Multi-spectral Imaging, Photozincography, Spectroscopy

The digital revolution is a relatively recent phenomenon. Yet digital representation and communication are now so all-pervasive, in all their facets, that it is difficult for many of us – not just the digital generations born in the 1990s and the 2000s – to imagine how society coped in the pre-digital era. The comparison with the effect of the advent of moveable type to the West in the fifteenth century is valid, though the speed at which digital technology has advanced has been much greater than that of the printing-press.

With regard to digital reproductions of the written word, it would be wrong to view those representations as a complete break with what went before. As is well known, printed books replicated the style, layout and format of the manuscripts that preceded and that remained in parallel with them until well into the early-modern era. It is worth remembering, for example, that the array of fonts available to today's computer user and document creator is merely a reflex of the scripts of medieval times. Despite their apparently sudden and disruptive nature, all revolutions are to varying extents informed by and derivative of what went before, and their lineage is generally traceable.

In the case of the digitisation of Irish manuscripts this lineage encompasses early efforts to reproduce in print the written word

exactly as it is found in form and appearance in any given source. In the context of the Gaelic manuscript tradition, we can trace this shared motivation back to representations of the Gaelic alphabet and manuscript contractions in early printed books, particularly in the font sponsored by Elizabeth I, from which the first book in Gaelic typeface was printed in 1571 (Ó Kearnaigh 1571). As regards the facsimile reproduction of Gaelic manuscripts, whether individual passages, pages or whole books, there is an important continuity in evidence from the late eighteenth century down to the twentieth century[1]. The employment of the latest technological innovations – lithography in particular – is a feature of this continuity. Such facsimile reproduction was at times accompanied by diplomatic transcripts of some of the 'specimens' of Gaelic script, beginning with the pioneering work of Thomas Astle (1784, facing p. 128) and continuing in the nineteenth century with the work of scholars such as Eugene O'Curry (1861, 649-664 with plates).

Facsimile reproduction took a significant leap forward in the 1870s with the publication of lithographic reproductions of three of the great vernacular manuscripts of the late medieval period: Leabhar na hUidhre (1870), the Leabhar Breac (1872-1876) and the Book of Leinster (1880). These facsimiles were produced by the Royal Irish Academy, initially under the supervision of John Gilbert but after a breakdown in his health the work was supervised by Robert Atkinson. The work of transcription and calligraphy for these facsimiles was carried out by one of the last of the traditional scribes, certainly the last capable of reproducing the script of the medieval manuscripts. This was Seosamh Ó Longáin, of the famous Cork family of poets (Ó Conchúir 1982, 149-158; O'Neill 2018, 161-174), whose work on the facsimiles was described by Standish Hayes O'Grady as "noble monuments of Irish penmanship" (O'Grady 1892, xxvi). Ó Longáin's scribal work for the facsimiles was symbolic of the transition that was now occurring from script to print in the Gaelic tradition, and that would become absolute in the short space of a few decades after this.

Contemporary with these facsimiles was the work of John Gilbert for the *Facsimiles of National Manuscripts* series, in this case the *National Manuscripts of Ireland*, published between 1874 and 1884. Printed on elephant paper and using the reproductive technology of photozincography developed by the Ordnance Survey, this project reproduced, over five parts, images of sample pages of manuscripts from all eras and traditions of the Irish manuscript – monastic, secular, Anglo-Norman, personal and public – most in their actual size. These images were accompanied by commentary, transcriptions and translations. For the transcription and translation of Irish-language material, Gilbert was again indebted to Seosamh Ó Longáin.

The *Facsimiles of National Manuscripts of Ireland* was an enormous undertaking, and while photographic reproductions of Gaelic manuscripts would soon follow, and would continue into the twentieth century, nothing could match the breadth of scope and scholarship in Gilbert's work. When one considers his extraordinary multi-volume output in other areas – for example, the history of Dublin (Gilbert 1854-1859) or the narrative of the 1641 'rebellion' (Gilbert 1882-1891) – one must wonder at how such a figure could be largely forgotten today. There are very good reasons for regarding John Gilbert as the forefather of Irish manuscript digitisation.

1. Irish Script on Screen (ISOS)

ISOS was Ireland's first manuscript digitisation project, and having passed its twentieth anniversary, it can now lay claim to being one of the longest-running projects of its type in

[1] A comprehensive list of pre-1913 publications is given in Best 1913, 63-67.

the world. It drew its remit from the statutory obligation of the School of Celtic Studies at the Dublin Institute for Advanced Studies to investigate, edit and publish extant manuscript material in the Irish language. Building on the techniques and expertise developed by Dr David Cooper at the Celtic Manuscripts project of the Bodleian Library in the 1990s, ISOS was in its planning stages in 1997 and 1998, led by Professor Pádraig de Brún. The project launched in 1999 under the directorship of the present writer, when the first fully digitised manuscript to go on display was the twelfth-century Book of Leinster[2] – one of the three manuscripts that had been reproduced by Seosamh Ó Longáin over 100 years earlier. This was followed shortly afterwards by Leabhar na hUidhre[3], the oldest manuscript to be written entirely in Irish (*c.* 1100) and the first ever Gaelic manuscript to be facsimilised completely. With the digitisation of Leabhar na hUidhre, the lineal connection between ISOS and the nineteenth-century pioneers, Seosamh Ó Longáin and John Gilbert, was secured.

The project uses a 5 x 4 view-camera with a digital back. Manuscripts are scanned at a resolution of 600dpi. Both camera and manuscript are positioned on a specially adapted book-cradle, for minimum handling, optimum calibration and maximum capture capacity. The object of the project has always been the high-resolution digitisation of Gaelic manuscripts, cover to cover, and their display, free of charge, on a dedicated website. Though technology is at its heart, from its inception it was intended to be scholar-driven at all times, which had important consequences for everything from target-selection to quality control. Philosophically, the project's vision was one of the liberation and the democratization of learning as it applied to primary sources for Gaelic literature. In its early days ISOS was regarded as innovative and pioneering, though viewed as disruptive (before that became a positive quality) by funding agencies and a small minority of scholars. The impact that ISOS had on scholarship was immediate, however, and was to grow exponentially over the following years as content continued to be added. In common with all digital technology and resources it has now become a fact of life, to the extent that acknowledgements to ISOS in presentations and publications are now regularly omitted.

A history of the evolution of the ISOS project is of interest in its own right, as a window on early digital activities and attitudes in Ireland and among Irish scholars and academic administrators, and it also has something to contribute to the story of the digital revolution worldwide[4]. Those who worked on the project over the first ten years were ever conscious of the pioneering nature of the work in which they were engaged, as manuscript after manuscript came to life in digital format. When the "alarums and excursions" of the initial stages had passed, and the project eventually came to be recognized as a core-funded activity of the Dublin Institute for Advanced Studies, new targets continued to excite and impress as their codicological, palaeographical and textual properties were captured.

The work of the project was and is collaborative. Partnerships were created between ISOS and repositories that had significant holdings of manuscripts. This included the libraries of the Royal Irish Academy, the National Library of Ireland, Trinity College Dublin, and the National University of Ireland. Partnerships external to Ireland were also created, particularly with the

[2] Trinity College Dublin (TCD), MS 1339, <www.isos.dias.ie/libraries/TCD/TCD_MS_1339/english/catalogue.html> (05/2022).

[3] Royal Irish Academy (RIA), MS 23 E 25, <www.isos.dias.ie/libraries/RIA/RIA_MS_23_E_25/english/catalogue.html> (05/2022).

[4] A framework for such a history is laid out in Ó Macháin 2010a.

National Library of Scotland and, latterly, with the Royal Library in Brussels[5]. Entered into in the true spirit of enquiry and mutual benefit, these partnerships are crucial to the achievement of the goals and the realisation of the vision of ISOS, and have served the project very well over the years.

Each new digitised manuscript was a highlight in itself, as though we were seeing these books for the first time, which in some respects was true. They were certainly being seen in new light, and the benefits to scholarship and to the wider public were immediate. While the precious pre-1600 Gaelic vellum tradition was given priority for digital targeting from the start, paper manuscripts were also included in the programme when the opportunity presented itself. Two of these stand out today for their uniqueness and also for the contribution that their digitisation made to scholarship and public appreciation.

One of these is the book known as Elizabeth's Primer[6]. It is a slight yet elegant oblong manuscript of twelve folios measuring 126 x 168 mm. It is also an eloquent book as it contains an appeal for and description of the Irish language, and is thought to have been prepared for Elizabeth I for her visit to Cambridge University in 1564. The author was Christopher Nugent (1544-1602), Baron Delvin, who was one of a cohort of Irish students at the University at the time. Its creation occurred in the wider context of Elizabethan policy of violent antagonism towards the Irish people and their language, coupled with the precarious position of the author and his family in Co. Westmeath, an Anglo-Norman family immersed in Irish culture as patrons and practitioners and yet expected to uphold loyalty to the Crown (Ó Macháin 2012). The digitisation of this manuscript by ISOS was yet another link with John Gilbert, who had reproduced six pages from it in 1882 (Gilbert 1874-1884, IV.1, xxxiv-xl, Item XXII). The Primer was digitised by ISOS in early 2011 and, in addition to being displayed on the project website, the images were used for the creation of a facsimile of the book that was presented – with no sense of irony – to Elizabeth II during the historic royal visit to Ireland in May 2011.

The Primer had been in private possession until 1999, and the second paper manuscript to be mentioned here remains in private possession. This is the Book of the O'Conor Don, a manuscript written at Ostend between January and December of 1631[7]. At 826 pages, it is the single most important source for the major Gaelic literary genre of the late middle ages, bardic poetry[8]. It is also symbolic of the depth of literary activity among the exiled Irish in the Low Countries in the first half of the seventeenth century. The scribe of the Book was an Irish soldier, Aodh Ó Dochartaigh, and his patron was Captain Somhairle Mac Domhnaill; the same combination is found in another manuscript, Duanaire Finn[9], written at Ostend four years earlier, which was preserved in the Franciscan library at St Anthony's College, Louvain, the centre of much of the literary activity among the exiles[10]. Probably more than any other digitised manuscript, the capture and display of the Book of the O'Conor Don in digital format in 2008 demonstrated the true spirit of the ISOS project, as the manuscript and its contents were immediately accessible by everyone, having previously been only available in photostat form in two libraries, or by appointment with its owners. The digitisation of the Book of the

[5] A full list of collaborating institutions can be seen here: <www.isos.dias.ie/english/index2.html> (05/2022).

[6] Farmleigh House, Dublin. Available at: <https://www.isos.dias.ie/libraries/MARSH/Irish_Primer/english/catalogue.html> (05/2022).

[7] Clonalis House, Co. Roscommon. Available at: <https://www.isos.dias.ie/libraries/CLON/CLON_The_Book_of_the_O_Conor_Don/english/catalogue.html> (05/2022).

[8] See description and discussion by many authors in Ó Macháin 2010b.

[9] University College Dublin MS A 20 (b).

[10] <www.isos.dias.ie/libraries/UCD/UCD_MS_A_20/english/catalogue.html> (05/2022).

O'Conor Don in turn generated an amount of scholarly activity, particularly in the work of published transcriptions, which, whether acknowledged or not, crystalized the impact of the ISOS project on Irish scholarship.

The Irish manuscript tradition is divided between the vellum tradition of the full-time professional scholars, who functioned until the Elizabethan conquest made it impossible for them to do so; and the part-time scholars writing on paper during the seventeenth, eighteenth and nineteenth centuries[11]. As stated already, manuscripts of the vellum tradition formed the core targets of the ISOS project at its foundation, with the intention, now being pursued, of moving into the paper collections when the capture of the vellum targets had been completed. It is in the context of these vellum manuscripts that we can now speak about developments post-digitisation.

Building on the experience of ISOS, and now outside of that project, since 2019 the current writer has been pursuing research enquiring into the materiality of the vellum manuscripts: their make-up, the vellum itself and the inks and pigments employed in writing the texts. This has involved going beyond single-format digitisation and establishing a protocol that uses Multi-Spectral Imaging (MSI), X-Ray Fluorescence analysis (XRF), and Fourier-Transform Infra-red spectroscopy (FTIR), combined with traditional codicological and palaeographical methodologies. This work has been made possible by an Advanced Laureate research-grant from the Irish Research Council, which has allowed collaborative partnerships to be created with scientists in the Tyndall National Institute, Cork, and the Library of Congress, Washington[12]. Partnerships have also been formed with repositories such as the library of the Royal Irish Academy and the National Library of Ireland.

While this research is on-going, and in many respects is still at a relatively early stage, some benefits can be seen already. These promising advances are best explained by linking the work to some of the highlights of the ISOS project among the vellum manuscripts.

2. The Stowe Missal: the Preparation of Vellum

In 2001, Irish Script in Screen digitised the Stowe Missal[13], an eighth-century composite manuscript with ninth-century additions[14]. At 13.5 cm in height, this book is regarded as belonging to the category of Pocket Gospel, relics of the early Church in Ireland that were distinguished by their portable nature and visualised as being carried from church to church by their owners or users (McGurk 1956; Ó Riain 2009). The manuscript contains the Gospel of St John, prayers and litanies for the mass, all in Latin, and, exceptionally, a tract on the mass in Irish, one of the earliest examples of prose in the Irish language.

Many medieval Gaelic manuscripts only reached the sanctuary and security of a library in relatively modern times; prior to that their history was one of endurance and survival, and quite a number never made it past the seventeenth century, during which time it is estimated that the greatest loss of books took place (Ó Corráin 2011-2012). Beyond the fact that it contains a reference to St Maol Ruain, which is interpreted as aligning it with the ascetic traditions of the Monastery of Tallaght and elsewhere, little if anything of the early history of the Stowe Missal

[11] For an excellent overview of the tradition see O'Neill 2014; the interface between vellum and paper is addressed in Ó Macháin 2019.

[12] <www.inksandskins.org> (05/2022).

[13] RIA MS D ii 3.

[14] <www.isos.dias.ie/libraries/RIA/RIA_MS_D_ii_3/english/catalogue.html> (05/2022).

is known, except for one point. That is, that in common with other significant books, it was enshrined within a reliquary – a *cumhdach* or bookshrine – in the eleventh century, confirming its status as a revered object. The shrine was commissioned by the abbot of the monastery of Lorrha, Co. Tipperary, and paid for by a local lord, with the names of two powerful overkings also inscribed on the box (Ó Riain 1991).

We know that the shrine was refurbished in the fourteenth century, but after that we hear nothing of either it or the missal until 1735, when it was discovered in its *cumhdach* (reliquary) at the castle of Lackeen, Co. Tipperary, five miles from Lorrha (O'Rahilly 1926-1928). Although this tradition has since been called into question (Sharpe 2015), it is known that the manuscript subsequently came into the possession of the Dukes of Buckingham at Stowe, England, and was sold with the rest of the Stowe manuscripts to the Earl of Ashburnham in 1849, before being returned to Ireland in the 1880s by the British Government as part of the Ashburnham collection. The Missal is held in the Library of the Royal Irish Academy, while its reliquary has become part of the collections of the National Museum of Ireland.

As was the case with so many other books, up until the digitisation of the Stowe Missal a complete view of this unique relic of the liturgy of the early Irish Church had not been available. In addition, the details of the reliquary that housed the manuscript from the eleventh to the nineteenth century were known only from black-and-white sketches and photographs. ISOS was able to rectify both situations in that, while digitising in the Royal Irish Academy, the reliquary was delivered to our work station by staff of the National Library of Ireland, thus enabling the shrine to be photographed also, and the book to be placed within the reliquary for the first time in over a hundred years. A photograph on the ISOS website records this historic, if temporary, re-unification[15].

Current research allows us to go beyond the visible images of this manuscript and to begin to look at what lies beneath the words and sentences. A simple example will suffice to illustrate this point and to show its application to manuscript history in general. A familiar feature of the preparation of all skins for writing was the scraping of the hair and flesh sides. There is no vellum manuscript that does not bear the signs of this scraping, generally in areas such as the margins that have not been written on. To begin to assess and measure such marks a view beneath the writing needs to be obtained. In the case of the Missal, the vellum and ink respond well to MSI analysis towards the infrared end of the spectrum, producing information as illustrated (Figure 1), revealing the extent of the scrape marks and presenting us with a view of this eighth-century Missal prior to writing[16].

[15] <https://www.isos.dias.ie/libraries/RIA/RIA_MS_D_ii_3/small_jpgs/149.jpg> (05/2022). The results of this digital success were first publicised by the present writer and Colin Dunn (digitiser) at the Roscrea Spring Conference, April 2002.

[16] The potential of infrared photography for the investigation of early-Irish manuscripts was demonstrated many years earlier by Françoise Henry (Henry 1960, Plates I, IV, VI).

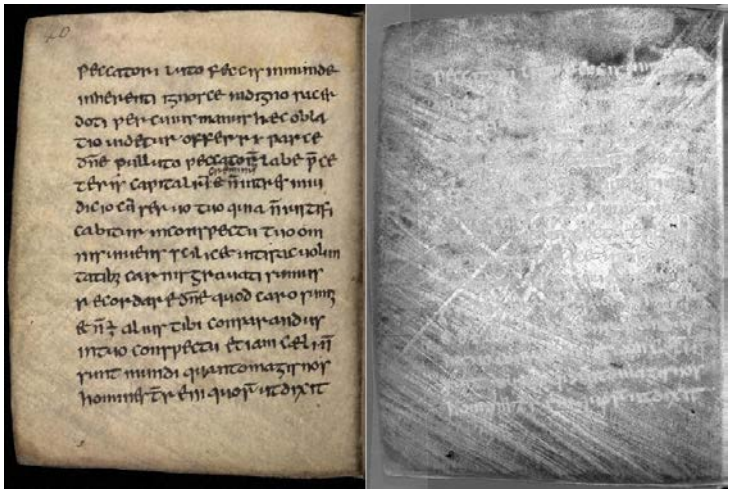

Figure 1 – RIA MS D ii 3 (The Stowe Missal,) f. 31v, visible image (ISOS) and MSI (Dr Fenella France)

3. The Book of Uí Mhaine: Seeing Behind the Stains

In the years 2001 to 2003 ISOS made available high-resolution digital facsimiles of a number of manuscripts rightly regarded as numbered among the Great Books of Ireland (Anon. 1967). The Stowe Missal and Leabhar na hUidhre have already been mentioned. Also worthy of mention are significant manuscripts from the fourteenth and fifteenth centuries, such as the Book of Ballymote[17], the Leabhar Breac[18] and the Book of Lecan[19]. These manuscripts shared the common feature of being *seanchas* manuscripts, that is manuscripts containing anthologies of texts, both prose and verse, that were regarded as constituting the matter of Ireland. These are texts such as origin legends, place-lore and etymology, pseudo-history, genealogies, hagiography and biblical and classical literature. The manuscripts also had in common that they had all been facsimilised previously, Ballymote (the first Irish manuscript to be photographically reproduced) and the Leabhar Breac in the nineteenth century, the Book of Lecan in the twentieth[20]. In contrast to the pocket-size of the Stowe Missal, these are large manuscripts that challenged the ability of ISOS to digitise them at 600dpi, with camera and cradle just managing to achieve the necessary depth of field, which would not be a challenge today with the inclusion of blending features in processing software and the development of alternative large-format digitising hardware.

These three fourteenth- and fifteenth-century books, therefore, were Great Books in extent, content and dimensions. A fourth manuscript, the Book of Uí Mhaine[21], dated to *c.* 1390, was also digitised by ISOS in 2002[22]. At 42 cm in height, this manuscript is one of the largest sur-

[17] RIA MS 23 P 12.
[18] RIA MS 23 P 16.
[19] RIA MS 23 P 2.
[20] *Leabhar Breac* (Dublin 1872-1876); *The Book of Ballymote* (Dublin 1887); *The Book of Lecan* (Dublin 1937).
[21] RIA MS D ii 1.
[22] <www.isos.dias.ie/libraries/RIA/RIA_MS_D_ii_1/english/catalogue.html> (05/2022).

viving Irish manuscripts, making its digital capture one of the highlights of the work of ISOS. It takes its current name from the fact that it was compiled towards the end of the fourteenth century in the interest of the Í Cheallaigh, lords of the territory of Í Mhaine in east Galway and south Roscommon. It shares many of the features of the contemporary books referred to already, including the fact that prior to digitisation it had already existed in printed facsimile[23]. It is, again, a *seanchas*-manuscript, but is distinguished from the other manuscripts by the fact that, although only half of the manuscript survives today, its 157 leaves are remarkable for the variety of texts that they contain, particularly in the area of traditional poetry (Ó Macháin forthcoming).

The manuscript presents an anthology of virtually all varieties of poetry that were held in regard by the learned classes in medieval Ireland: place-lore, genealogical and synchronistic verse, gnomic verse, narrative verse, religious verse. When more intact than it is today it also contained a copy of the great Fenian prosimetrum, Agallamh na Seanórach, but this text is now missing. The Book of Uí Mhaine also contains the earliest collection of bardic poetry to survive in a *seanchas*-manuscript, including poetry by Giolla Brighde Albanach and Muireadhach Albanach Ó Dálaigh, two thirteenth-century poets whose fame would endure.

Such comprehensive representation of poetry may be taken as reflecting the literary taste of the Ó Ceallaigh patrons, but they are also a function of the interests of the numerous scribes who worked on the Book (O'Sullivan 1989). Some of these were specialists in genealogy, others in the traditions of the lore of places, but over-riding them all was the main scribe, who signs himself Adam Cusin, whose penmanship is in evidence throughout the manuscript. He is one of two of the manuscript's scribes whose name is known to us. The other is Faelán Mac an Ghabhann na Scéal, who uniquely wrote a stand-alone gathering for Muircheartach Ó Cealllaigh, Bishop of Clonfert and later Archbishop of Tuam[24]. This gathering of four bifolia is the most ornate in the entire manuscript and speaks to the combination of scribe and artist in one person, for analysis suggests that Faelán combined these two talents that, in other manuscripts, were sometime allotted to separate individuals.

This analysis, primarily carried out using XRF technology, has enabled us not just to go beyond the visible images of Faelán's gathering, but also to create a library of ink and pigment signatures for the Book of Uí Mhaine as a whole. One might add that we are also enabled to improve on the readings presented by the visible images. The Book of Uí Mhaine, in common with so many manuscripts of the vellum era, has suffered badly in places from the effects of water-damage, with dampness reacting with the collagen in the animal skin to affect the legibility of the book in many places. Using a data-analysis technique known as Principal Component Analysis (PCA) (Jolliffe, Cadima 2016), however, it is possible in many cases to enhance the MSI images and restore the text beneath these stains. One small example will suffice to illustrate the results.

In a narrative poem on the multiple talents of the great Irish God, Lugh Lámhfhada, occurring towards the end of the Book of Uí Mhaine as it survives today, one part of the margin is obscured by a stain that extends into the text, encroaching on the text of lines 155 v.26-33, obscuring parts of verses 15-17 of the poem. A diplomatic transcript of the text at this point is as follows:

[23] *The Book of Uí Maine* (Dublin 1941).
[24] RIA MS D ii 1, ff. 48-55.

adbul // flaiteamnais mar thomles tlacht. ain**[..]**
Treidi flatha refreagra . gan omon gan imeagla
agus oinmideacht. // gan lea[t]hbreath gid lu**[.]**
Treidhi airdrig luaiter lind. geilli nageimlib go grin**[.]**
alith . tath tuath agus sit coigrich. // brig agus **[...]**
Coma 7 comdluth catha. treidhi gac urrig fl**[...]**
cudh is blad. iscosnam eirgach aenfear. // **[...]**
Treidi rondaire iarnuair. airem coitchend ar lin slu

The metrical characteristics of the poem allow an editor of this text to make a confident guess as to the obscured portions of many of the words. As Figure 2 shows, however. PCA allows us to go beneath the stain and to remove any doubt as to the restoration, and to supplement the transcription from the visible images as follows:

adbul // flaiteamnais marthomles tlacht. ain**es**
Treidi flatha refreagra. gan omon gan imeagla.
agus oinmideacht. // gan leathbreath gid lu**ach**
Treidhi airdrig luaiter lind. geilli nageimlib go grin**d**.
alíth. tath tuath agus sith coigrích. // brig agus **bros**
Coma agus comdluth catha. treidhi gac urríg fl**atha**.
cudh isblad. iscosnam eirgach aenfear. // **agh**.
Treidi rondaire iarnuair. airem coitchend ar lin slu

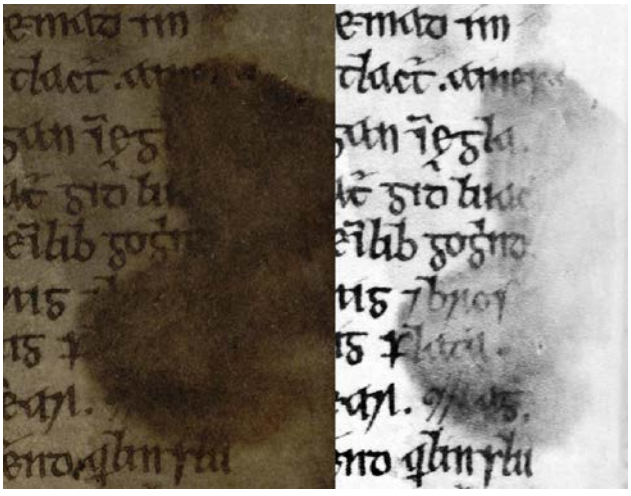

Figure 2 – RIA MS D ii 1(Book of Uí Mhaine,) f. 155v26-33, visible image (ISOS), PCA (Meghan Wilson)

4. The Book of Lismore: Fingerprinting Scripts

The last Gaelic manuscript to be facsimilised as part of the process pioneered by Seosamh Ó Longáin and John Gilbert in the nineteenth century was the Book of Lismore, which was

published in facsimile in 1950[25]. Together with the Book of the O'Conor Don mentioned earlier, at the time of its digitisation in 2010 this manuscript was one of a small number of very valuable manuscripts remaining in private possession, but in 2020 it was donated to University College Cork by its owners, the Chatsworth Settlement Trust, at the behest of the Duke of Devonshire.

The Book of Lismore is a vellum manuscript, written in the late fifteenth century in Co. Cork for the Lord of Carbery, Fínghean Mac Carthaigh Riabhach. If the Book of Uí Mhaine is distinguished by its eclectic anthology of poetry, the Book of Lismore is remarkable for its collection of tales, native and translated, religious and secular, many of which are linked by themes of kingship and by the element of the magical and the fantastic (Ó Macháin 2021). Among the codicological points of interest are the additions made to the manuscript by nineteenth-century scribes in Cork, following the discovery of the Book during the renovation of Lismore Castle, Co. Waterford, in 1814. The most prominent addition is the inclusion of a poem addressed to the Book by the Cork scribe Donnchadh Ó Floinn (*c.* 1760-1830), which he entered on a blank page at f. 157v (Ó Macháin, 2014, 236-237). Ó Floinn or his colleagues also coloured initial letters in parts of the manuscript and may have drawn some of them also. One of the central non-textual research questions pertaining to the Book, therefore, is to distinguish between initials that are original to the book and those that are nineteenth-century additions.

This analytical work has begun at University College Cork where we are using XRF to establish ink fingerprints for the nineteenth-century and fifteenth-century scripts using a triangulation process first developed by scientists in Berlin (Malzer, Hahn, Kanngiesser 2004). The initial results of this analysis are very promising. From just looking at the combined spectra for fifteenth- and nineteenth-century inks from two sampling areas, as shown in Figure 3, we can see a clear differentiation in terms of relative quantities of iron, and in the relative quantities of the trace elements copper and zinc. Spectra such as these should provide the basis for conclusive results as the research progresses. Again, without the preliminary, foundational digitisation provided by the ISOS project, this analysis would be much more difficult.

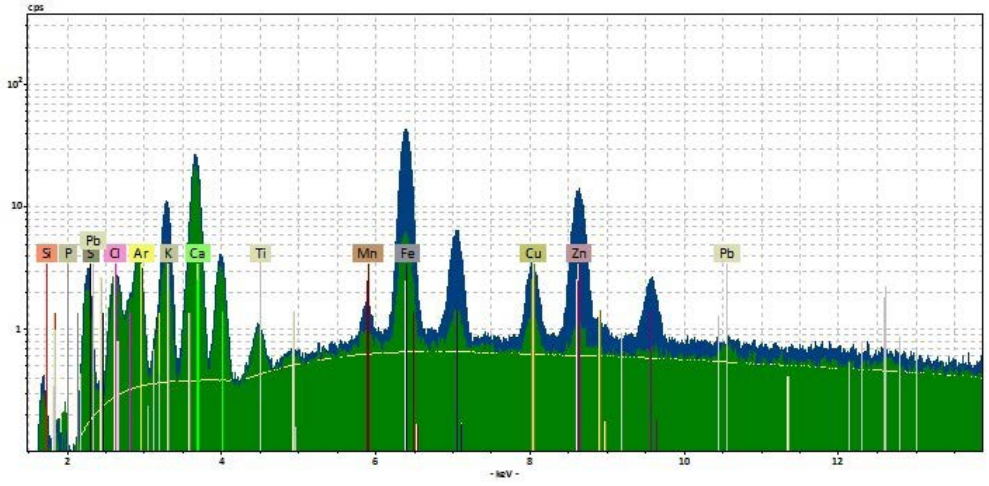

Figure 3 – Combined XRF spectra from the Book of Lismore: f. 132r (blue), f. 157v (green) (Veronica Biolcati and Anna Hoffmann)

[25] *The Book of Mac Carthaigh Riabhach, otherwise the Book of Lismore* (Dublin 1950).

5. Conclusion

Irish Script on Screen was Ireland's first manuscript digitisation project and is still thriving today. It was begun when digitisation was in its infancy and it remains the only continuous deep-digitisation project in Ireland. It was not designed to present highlights among library collections, nor to create surrogates for fragile artefacts, though both of these features are of course incidental and important outcomes of the project. It was created by scholars as a service for their peers, or for anyone with an interest in Irish script or the ability to read that script. The simplicity and clarity of its objectives, and the fact that it was scholar-driven, ensured that it overcame many challenges – not the least being the conversion of the unconvinced – to become an essential tool for a broad family of Irish-language and Celtic scholars and enthusiasts.

Within a period of just over twenty years, ISOS has gone from the periphery to the centre of Irish-language scholarship, while, somewhat paradoxically, achieving a status of acceptance that renders it today more a commonplace than a novelty. This is partly the result of the world-wide digital revolution, and partly because many other digital resources are now available in the area of Irish-language studies, which means that ISOS is now very much *primus inter pares* in a suite of resources.

Such has been the pace of progress that in some respects ISOS can be viewed as a relic of the time in which it was created: this is soon to be addressed by its conversion to the IIIF standard. More importantly, the consistent quality of the high-resolution images forms a basis for further exploration of Gaelic manuscripts using other analytic technologies, the practical uses of some of which have been outlined here. It is a testament to the quality of the work of ISOS, and to the durability of the digitisation principles established by the project in the late 1990s, that we are enabled now to advance beyond the visible and use other technologies to explore what lies beneath the written text. Rather than being viewed as a development disconnected from the generation and display of the visible image, the present-day use of other technologies to investigate Irish manuscripts should be seen as an extension of a remarkable evolution that began in the nineteenth century with Seosamh Ó Longáin and John Gilbert, and continued through the twentieth century, culminating in the establishment of ISOS over a hundred years later.

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