

Kodikologie und Paläographie im digitalen Zeitalter 3

Codicology and Palaeography in the Digital Age 3

Schriften des Instituts für Dokumentologie und Editorik

herausgegeben von:

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Band 10

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Oliver Duntze, Torsten Schaßan, Georg Vogeler

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2015

BoD, Norderstedt

Bibliografische Information der Deutschen Nationalbibliothek:

Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über <http://dnb.d-nb.de/> abrufbar.

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Herstellung und Verlag: Books on Demand GmbH, Norderstedt

ISBN: 978-3-7347-9899-3

Einbandgestaltung: Johanna Puhl, basierend auf dem Entwurf von Katharina Weber

Satz: L^AT_EX, Bernhard Assmann und Torsten Schaßan

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What lies beneath: The application of digital technology to uncover writing obscured by a chemical reagent

Christine Voth

Abstract

The Anglo-Saxon manuscript, London, British Library, Royal 12. D. XVII, is the oldest extant manuscript of Old English medical remedies (s. x^{med}). The manuscript ends incompletely on fol. 127v. On this same folio, a chemical reagent has been applied to several lines of writing along the long margin, obscuring the underlying text. This study adapts the digital technology established by Peter Stokes for uncovering palimpsests (2011) to uncover the writing hidden underneath the reagent. The methods are set out step by step in order that they may be repeated by others, or transferred for use on other damaged manuscripts. This study also reveals the underlying text as a possibly corrupted Hiberno-Latin charm, and provides an analysis and discussion of the text of the charm and its relation to the text of the manuscript. Overall, the results of this study further our understanding of the uses to which medical manuscripts were put during the Middle Ages, as well as providing a new means by which we can access text in damaged manuscripts.

Zusammenfassung

Die angelsächsische Handschrift, London, British Library, Royal 12. D. XVII, ist die älteste existierende Handschrift altenglischer medizinischer Heilmittel (Mitte 10. Jh.). Die Handschrift endet unvollständig auf fol. 127v. Auf derselben Seite wurde eine chemische Reagenz auf mehrere Zeilen Schrift am Rand entlang der langen Seite angewendet, welche die Schrift unlesbar gemacht hat. Diese Studie wendet die von Peter Stokes (2011) zum Sichtbarmachen von Palimpsesten etablierte digitale Technologie an, um die Schrift unter der Reagenz lesbar zu machen. Die Methoden sind Schritt für Schritt erklärt, damit sie von anderen wiederholt oder auf andere beschädigte Handschriften übertragen werden können. Darüber hinaus deckt diese Studie auf, dass es sich bei dem unterliegenden Text womöglich um einen fehlerhaften Hiberno-Lateinischen Zauber handelt und analysiert und diskutiert den Text des Zaubers und seine Beziehung zum Text der Handschrift. Insgesamt erweitern die Ergebnisse dieser Studie sowohl unser Verständnis von der Anwendung

medizinischer Handschriften im Mittelalter als auch von neuen Methoden den Text beschädigter Handschriften zugänglich zu machen.

1. Introduction

The application of chemical reagents came into vogue during the nineteenth century when scholars and antiquarians alike applied the liquid solutions to portions of medieval manuscripts where the writing had faded or had been erased (as well as some palimpsests) in order to make the faint writing more visible.¹ A number of Anglo-Saxon manuscripts were treated in this manner: the F-recension manuscript of the Anglo-Saxon Chronicle (London, British Library, Cotton Domitian A. VIII, fols. 30–70) shows evidence of reagent having been applied to the margins and text on fols. 58r, 60r, 61r and 67r (Baker 2000: XVI). Sometime after Grímur Jónsson Thorkelín made his transcription in 1787, a chemical reagent was applied to faded portions of the text of the Beowulf manuscript (London, British Library, Cotton Vitellius A. XV) on fols. 179r and 198v (Wrenn 1953: 12). When working on his edition of the Leofric Missal (Oxford, Bodleian Library, Bodley 579) in 1883, F. E. Warren received permission to apply a solution of hydrophosphate of ammonia to portions of the texts which were no longer readable.² The application of a reagent, typically similar in chemical makeup to the oak galls used in medieval ink, was intended to darken erased or faded scripts, and in many cases, the reagent temporarily darkened the text. But in all cases, irreparable damage from the chemicals occurred, changing the surface of the parchment in such a way as to make reading the underlying text nearly impossible for later use.

Until recently, scholars were restricted to the use of ultraviolet lamp, fortuitous natural light (Parkes 1991: 263), or a magnifying glass to aid in reading through the damage left by the reagent, often with limited results. However, the availability of high quality colour images of medieval manuscripts and the advent of digital technology provide new access to texts underlying a reagent. Adapting the image manipulation methods developed by Peter Stokes (2011) for use with palimpsests, I was able to digitally enhance a folio from the tenth-century Anglo-Saxon manuscript London, British Library, Royal 12. D. XVII that had been treated with a reagent. Although the procedures described below derive from Stokes's methods, their importance lies in making accessible the application of digital enhancement to texts that have been damaged by reagents or have darkened due to age or environment.

¹ In 1912, palaeographer E. M. Thompson recommended certain 'least harmful' reagents for use on palimpsests (p. 65).

² No scholarly work has been undertaken recording the number of Anglo-Saxon manuscripts having been treated with a reagent; these are just a few examples of the more well-known manuscripts.

Digitally uncovering palimpsests involves creating a colour difference between the parchment and the erased writing where little to none can be distinguished by the naked eye (Stokes 2011: 42). The same principles apply to working with a reagent because the ink and the reagent are often indistinguishable. This paper presents the digital manipulation in three sections: in the First, I will share the methodology of uncovering obscured writing; next, I will discuss what was discovered under the chemical reagent and my preliminary analysis; and finally, I will relate these results back to the manuscript itself, addressing the results of my findings in relation to both, the codicology of the manuscript and the content of the page upon which the text was written.

1.1. The Manuscript

Royal 12. D. XVII is an Old English manuscript of medical remedies, copied in a single hand of s. x^{med}. The manuscript is made up of three books, the first two of which are known collectively by the name ‘Bald’s Leechbook’ because of the colophon naming Bald as the owner of the book, copied at the end of book II. The third book, which is now referred to as ‘Leechbook III’, is not believed to have been part of the original ‘Bald’s Leechbook’ compilation, but copied into the current manuscript collection probably because of similar medical content. In its entirety, Royal 12. D. XVII comprises some of the earliest extant vernacular medical texts in Europe and is important to our understanding of early medieval medicine, as well as the production and use of medical texts in Anglo-Saxon England.

The manuscript ends incompletely on fol. 127v. Comparing the text of the final folio with the table of contents of book three (on fol. 111r, see Table 1), three remedies are apparently missing. The last few lines of chapter 71 (on the treatment of ulcers) are written at the top of fol. 127v, followed by the chapter on the treatment of ‘yellow disease’, which is numbered as chapter 72 in the text, but 73 in the table of contents. Chapter 73, providing remedies for when one’s bowels are on the outside, is actually listed as chapter 74 in the table of contents and ends incompletely after only five lines. To sum up, chapter 72 on venom is missing entirely as are chapters 75 on ‘inner sickness’ and 76 for the making of a holy salve. This would seem to indicate that there is a missing gathering of unknown size at the end of the manuscript.

A chemical reagent has been applied to several lines of text written along the long margin of 127v (see figure 1). Only a few letters of the text are visible to the naked eye as the reagent has caused significant damage to the parchment – beyond the nature of the dark brown after-effects of the reagent – as the organic material of the page is now very delicate with a glossy appearance. In addition, several scrape marks are visible across the top of the reagent, indicating some attempt had been made in the past to try to remove it. Because of the incomplete nature of the third book, it seemed

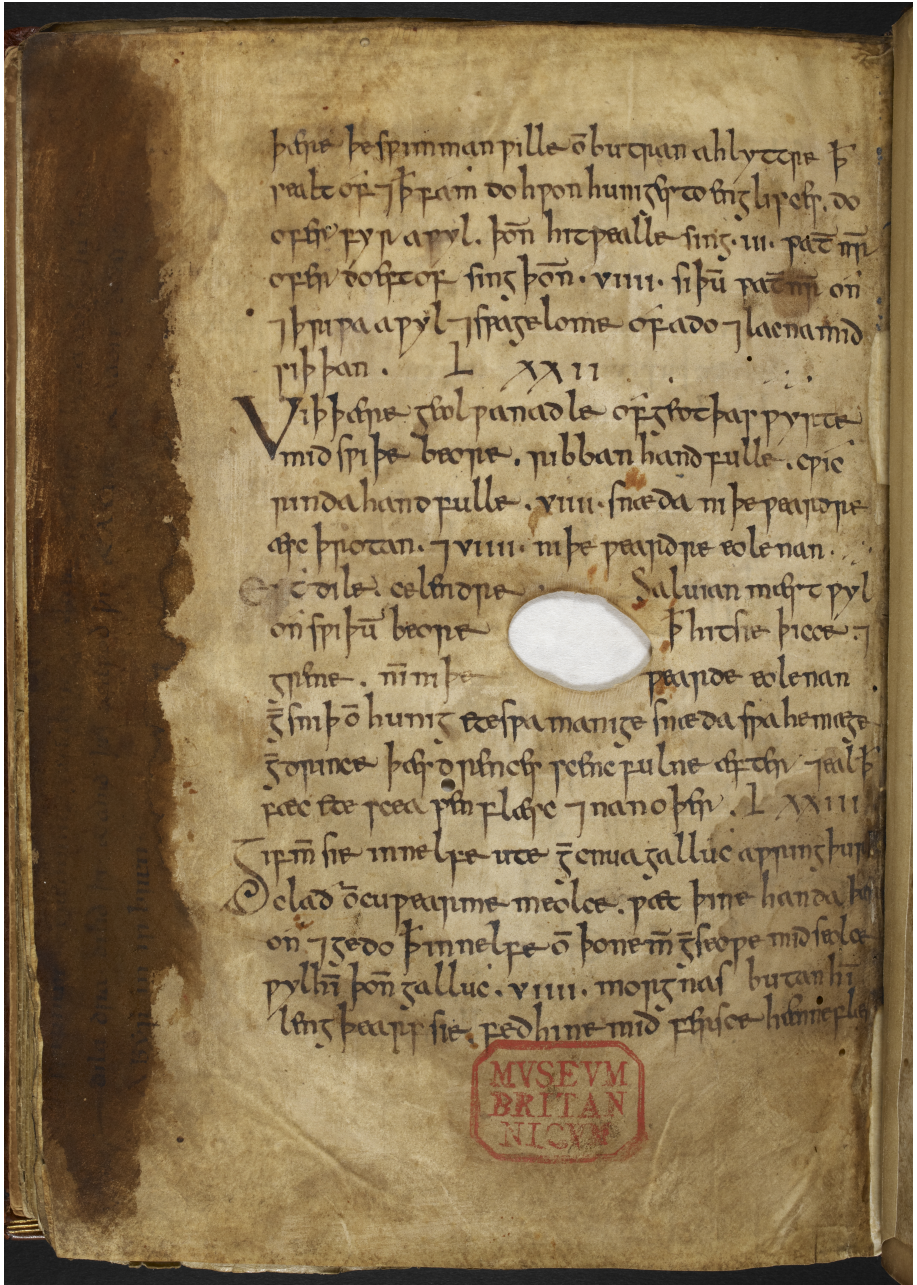


Figure 1. ©British Library Board: London, British Library, Royal 12. D. XVII, fol. 127v before any adjustment.

Chapter	Heading	
lxxi	<i>Wiþ springe smiring 7 sealf</i>	For ulcer, an ointment and a salve
lxxii	<i>Wiþ attr drenc 7 smiring</i>	For venom, a draught and a salve
lxxiii	<i>Wiþ þære geolwan adl</i>	Against the yellow disease
lxxiiii	<i>Wiþ þam gif innelfe si ute</i>	For when the bowels are on the outside
lxxv	<i>Wiþ ælcra innan untrymnesse 7 wiþ hefignesse 7 wiþ hleor blæce</i>	For all inner sickness, and for heaviness, and for a rash of the cheek
lxxvi	<i>Be þam hu man scyle halige sealf wyrcean</i>	How one can make a holy salve

Table 1. Book III, Table of Contents.

important to conduct a full codicological analysis of the manuscript to uncover the writing under the reagent and to see if what is written might include or shed any light on any of the missing remedies.

Like the rest of the manuscripts of the Royal library that survived the fire at Ashburnham House, Royal 12. D. XVII was given to the care of the British Museum in 1757. When Royal 12. D. XVII was edited in 1865 by Oswald Cockayne as part of the Roll Series, no mention was made of the use of a chemical reagent on the final folio. In regard to the text of the long margin, Cockayne transcribed the following (p. 360):

[line 1] (*completely obscured*)

[line 2] *dila dra bind þ.....wod þi..... A Byr in ir bren.*³

If the reagent was not applied by Cockayne in an attempt to clarify the text – and he makes no mention of taking that effort in his edition – it would appear the reagent was then applied at some point after 1865. No record exists from the British Museum of permission being given to anyone for the application of the reagent.

2. Methodology

Scholars have had some success in viewing faint writing or erasures by using ultraviolet light, particularly in the case of palimpsests, because the ‘organic material in the parchment fluoresces under such lighting’ (Easton 2004: 3) and the underlying ink is then more visible to the naked eye. But given the similar chemical nature of reagents

³ In Cockayne’s transcription he only notes two lines, including words from line 3 on line 2 (see transcription below). Leonhardi (1905) makes no mention of the reagent in his diplomatic edition of the manuscript.

and ink, UV light may be of limited help in viewing writing covered by a reagent. I had the occasion to view 127v under both ultraviolet and white light to see if either environment aided in making the obscured portions of the text more visible. However, due to damage to the parchment from the reagent, neither method was successful. By far the best means of uncovering obscured writing has been Multispectral Imaging, as demonstrated with great success in the Archimedes Palimpsest Project. However, while extremely effective, MSI is also incredibly expensive, and thus not a feasible option for projects of limited size.

The success in uncovering palimpsest text using digital manipulation provided a more economic option for uncovering the underwriting. Although most graphics editing programmes can be used for the purposes, I used a freeware programme known as GIMP: the GNU Image Manipulation Program (version 2.6),⁴ which offers the same tools for digital image manipulation as the commercial Adobe Photoshop. There is also a freeware programme developed for Macintosh by Peter Stokes called Image Viewer. Using GIMP, I adapted the methods established by Stokes for palimpsests and created a colour distribution histogram and then adjusted the colours of the image in an attempt to clarify the underlying text. To these I added a step of inverting the image so that all the text underlying would appear lighter than the reagent-covered parchment. This produced the best results.

2.1. Histogram⁵

A colour distribution histogram is a 'statistical summary of [...] the distribution of colour' in an image (Stokes 44), with the peaks of a histogram indicating the highest concentration of colour in the image. The arrows underneath the histogram are positioned to indicate the lightest colours of the image (to the left) and the darkest colours of the image (on the right). It is possible to take that concentration of colours and 'spread' it out to improve the readability of the obscured writing by narrowing the available colour range to either side of the peak of the histogram. This can be done on an entire folio or a very small portion of text. The best results will be to focus the histogram on the portion of the text covered by the reagent. As seen in figure 2, I selected a square of text to show the distribution, and adjusted the histogram to increase the differences between the lightest and the darkest colours. Moving the right-most arrow to the very edge of the peak lightens up the background, and moving the left-most arrow to the other edge of the peak, makes the darker portions (that is, the writing) appear darker. The levels that worked best were (47, 1.00, 112).

⁴ Different versions of software may have different menu options than those indicated here from v. 2.6.

⁵ In GIMP, this is found under Menu: colors > levels.

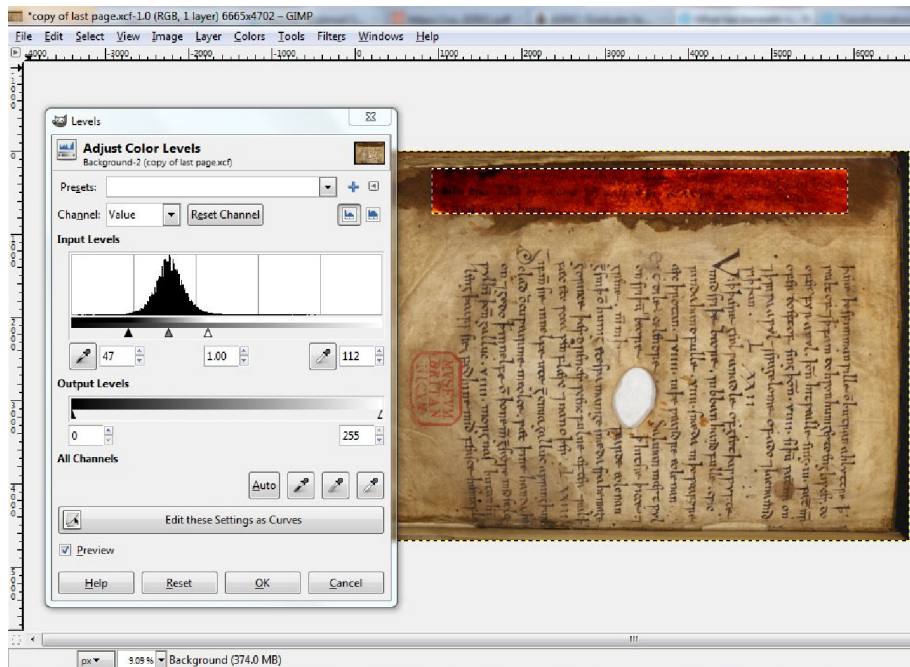


Figure 2. Histogram on 127v.

2.2. Colour Adjust⁶

The next step was to take the same portion of the image and make a further distinction between the background and the foreground. One of the easiest ways to do this is to use the 'monochrome' function. This will present the image in greyscale format, in which it is much easier to distinguish letter forms. However, in most cases, and particularly in the case of reagents and faded writing, an additional step is needed before changing the image to greyscale. This involves a process known as channel manipulation where essentially the colours of the image can be altered individually or in tandem in order to clarify the distinction between the parchment and the ink. Since computers represent colours through different intensities of red, green and blue, channel manipulation involves changing the intensities and allocation of one or more of these three colours. In the GIMP programme, this is done in 'channel mixer'. The primary background colour of the image after adjusting the histogram was red; this is

⁶ Menu: colors > component > channel mixer

indicated as percentages in the channel mixer function by settings of red channel 100, green channel 0, blue channel 0. Increasing the amount in the red channel column – that is, increasing the percentage of red colour in the image – eliminated much of the background noise and made the forms of the letters more apparent. After making these adjustments, I used the monochrome function to greyscale the image (this is also found within channel mixer) (see figure 3).



Figure 3. Colour adjustment (histogram) plus monochrome.

Because a high resolution photograph of a manuscript is quite large, there is often the problem of pixilation, ‘noise’ or artefacts which can distort the viewer’s perception. Blurring the image or using a despeckling filter often presents a clearer image.⁷ As this can be done at any time in the process, I was able to use this filter when it was most needed. For example, when the writing was very faint, I found it better to blur the image immediately after adjusting the histogram. But in the portions of the text where the writing or the reagent was particularly dark, it was better to use despeckle or blur after adjusting the colours, but before changing the image to greyscale.

⁷ Menu: filters > blur OR filters > enhance > despeckle.

These steps can be taken on large portions of text, as I've shown in the previous images, but it may be necessary to highlight and manipulate a single word or segment of the image, particularly if the reagent covers just a single word or small portion of the text. In the case of 127v, the greatest amount of damage to the parchment has occurred in the upper left corner (when the image is in landscape orientation) where the pigment has darkened significantly and the surface of the parchment is thin and reflective. As someone has tried to remove the reagent with a sharp instrument (thus removing some of the underlying text as well), the sections on the very right are lighter, and thus better results were achieved by performing different adjustments on different portions of the folio (see figures 4 and 5).

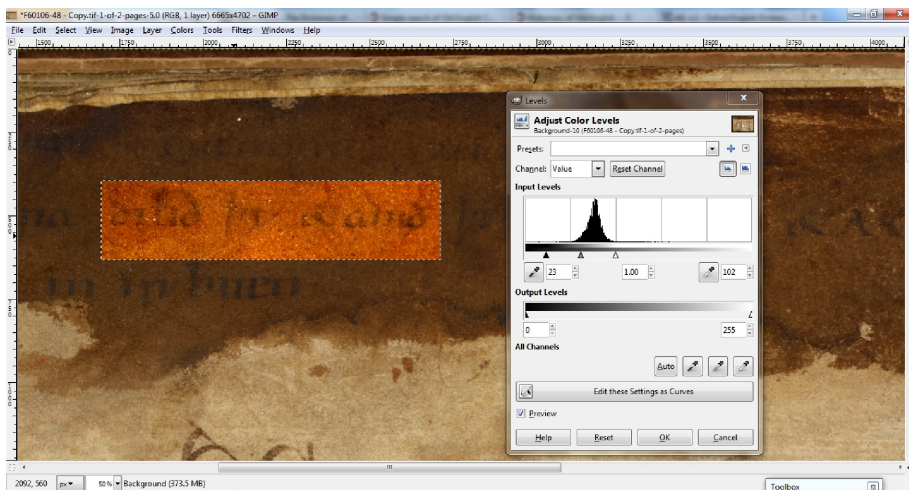


Figure 4. Using histogram to colour adjust individual words.

2.3. Inverting the Image

Experimenting with the different functions within GIMP, I came across a way to manipulate the colours of the entire folio by inverting the image so that the darkest portions of the page, the reagent and the ink of the main text, became the lightest colours. This presented a clearer picture of the underlying text as well as the damage the reagent had caused to the parchment. A histogram of the image showed two sub-peaks which represented the colours of the parchment and the main ink and a main peak, representing the darkest colour of the image, which would be the reagent. I narrowed the histogram (50, 1.00, 205) to either side of the two largest peaks, in an



Figure 5. Monochrome plus despeckle on small portions of text after histogram.

attempt to narrow the range between the darkest and lightest colours in the image. Then, using the channel mixer, I altered the colours of the parchment entirely so that all the areas not covered by the reagent were tinted green, the ink and the reagent appeared red (200 red channel, -200 green channel, -200 blue channel) (see figure 6). The final step was to change the image to monochrome as seen in figures 7 and 8, giving us a better idea of the distribution of the writing under the reagent.

3. The Readable Text

It is possible to make out several words with only one or two letter forms showing through with some clarity, which I've indicated in the transcription below in Table 2. The square brackets indicate where I had the impression of word divisions but the letter forms are too severely damaged to make that out for certain. I've also indicated possible word/letter alternatives in the footnotes.

In comparing the above results to what was visible to the naked eye in 1865, it is possible to see that most of the top line had faded entirely already by 1865, whether from damage, erasure or time. The application of the chemical reagent and the subsequent attempt at removal may also have caused further obscuring of the writing. The marks below the marginal commentary annotation which look like water damage when seen in the inverted image are where the chemical reagent bled through to the

recto. It would appear that at least two coats of reagent were applied, although it is uncertain whether they were applied in the same sitting or at different times.

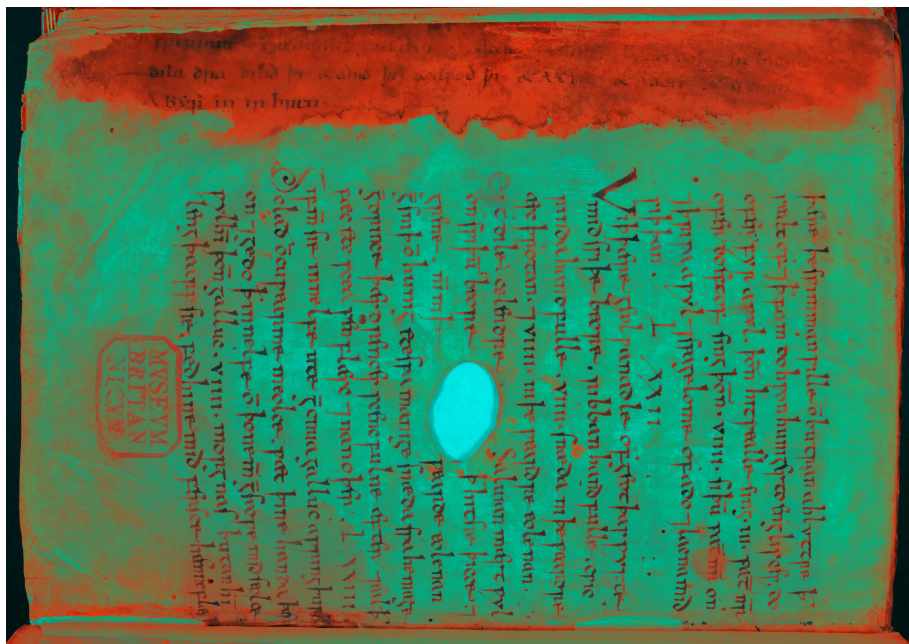


Figure 6. The first step in inverting an image.

[line 1]	† swernum ⁸ Tremme[.....] ⁹ lara [...] [...a] [d..] In ¹⁰ Iren
[line 2]	dila dra dilið þy & anið þri _eawod ¹¹ þy & A Cin & Adon ¹² [...æs] ¹³ [...]
[line 3]	A Byr in ir bren.

Table 2. Transcription of the underlying text.

The underlying text is in a hand of Vernacular Minuscule c. 1000, and does not appear elsewhere in the later annotations or additions to the manuscript. While at a glance the text does not represent recognisable Old English, the orthography, such as

⁸ or spernum
⁹ At least one, possibly two words between *Tremme* and *lara*
¹⁰ *t* is subscripted directly below the *n*, so it may be long to In/t/ or [...æs\t/]
¹¹ or *_eawod*; the formation of Insular *d* and *eth* are nearly indistinguishable in vernacular script.
¹² or *Adam*
¹³ This word begins with a majuscule letter, looks to be an *R*, *B* or a *K* with at least one, possibly two letters between it and *æ*



Figure 7. The inverted image of 127v.

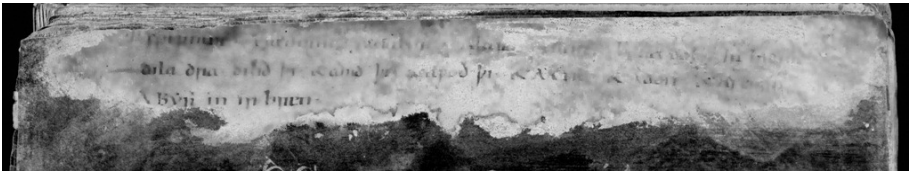


Figure 8. A closer view at the underlying text with the image inverted.

dotting the *y* of *Byr* (the second word on the third line of text), appears to be Late West Saxon.

Despite the loss of part of the text, the marginal annotation resembles an incantation, or charm. At first glance, it has only the vaguest resemblance to Old English in the first line, along with many unintelligible words, and some alliteration like *dila dra dilið* in the second and third lines. Felix Grendon classified this type of charm or incantation as ‘gibberish’ or nonsensical in 1904, yet the work of Heinrich Zimmer in 1895 and Howard Meroney in 1945 has shown that the original language of the

majority of extant incantations are a combination of Old Irish and Latin. Recent advances have also been made by Professor David Stifter in the study of the Old Irish origin of medical charms and incantations in the Stowe Missal.¹⁴ Additionally, Lea Olsan has shown that the forms of Anglo-Saxon vernacular and Latin charms were fluid, affected both by transmission and oral tradition (1999:407–8).

4. History of Incantations and their Medical Use

While most charms or incantations have come to the Anglo-Saxon medical corpus through the writings of Classical and Late Antique authors including Alexander of Tralles, Theodorus Priscian, Pliny the Elder, and Marcellus Empiricus transmitted through the medium of *florilegia* texts (Cameron 1982: 135–55; Wallis 1995: 101–26), Anglo-Saxon nonsensical charms most typically derive from a Hiberno-Latin tradition of prayers and incantations that were borrowed into the Anglo-Saxon medical practice. Many of the unfamiliar Old Irish words in these charms have been altered: truncated, divided or even combined with other Old Irish or Latin words, which does not make it easy to recover their original forms. The use of unintelligible language in charms, incantations or amuletic remedies is believed by some scholars to have strengthened the perceived efficacy of the remedy by ‘virtue of being unintelligible’ (Pollington 2000: 422). Corrupted Hiberno-Latin in Anglo-Saxon charms occurs with some frequency in the eleventh century medical manuscript known as the *Lacnunga* (London, British Library, Harley 585).¹⁵

These incantations are now considered gibberish because the language has been corrupted in transmission, possibly through a combination of phonetic and orthographic adaptation, resulting in a loss of the original word forms over time. This may have been, in part, due to Anglo-Saxon practitioners or scribes attempting to regulate unfamiliar words into something with a perceived familiarity, or possibly the corruption of the words may have occurred in the process of writing down phonetically the recitation of an unfamiliar language. Alternatively, the transmission of these incantations in this altered state may have been purposeful, so that the true meaning of the incantation would only be known to the practitioner, and the esoteric nature of the incantation preserved (Olsan 2003:357–60).

Within Royal 12. D. XVII there is further evidence for the transmission of a language corrupted over time in an amuletic charm in Book 1 (chapter 65, fol. 53r) that requires the medical practitioner to write down a series of names in Greek as part of a prayer.

¹⁴ Professor Stifter discussed the results of his continuing work with the Stowe Missal at his inaugural lecture on the study of Old Irish at the National University of Ireland, Maynooth (2 February 2012).

¹⁵ The most recent edition of the *Lacnunga* by E. Pettit (2001) includes commentary on these types of incantations.

What is written is HAMMANTEL. BPONIce. NOYεPTAYEPΓ.¹⁶ Somewhere in the written transmission of this remedy, some of the original Greek letter forms have been lost, some replaced with Latin letter forms and runes, and the meaning and form of the final word has been lost entirely.

Because an incantation, by its nature, is spoken aloud, the written form must be such that it can be read or performed as part of a healing ritual; many remedies prescribe that charms be carried or used in rituals as inscriptions. The original language may have been lost, but the written transmission has at least maintained clarity and preserved some rhythmic qualities, albeit at the expense of understanding the actual content. What appears in the incantations in the Anglo-Saxon medical corpus is an attempt to re-create word structure which would seem familiar to someone with knowledge of Latin and Old English. There are some Hiberno-Latin charms found in Anglo-Saxon manuscripts that have survived in forms which are more easily reconstructed to the original language,¹⁷ whereas other incantations provide much more of a challenge in recovery of the original language and sense of the charm.

I have laid out some possible interpretations of the recovered words in the text from 127v in Table 3.¹⁸

The first line has a sense of Old English, and perhaps comprised the Old English introduction to the incantation, though the inability to recover many words and letter forms at this time makes it difficult to judge this with any level of certainty. If this line is Old English, then the general impression is that the incantation is for the use of iron (*Iren*) in a ritual to strengthen or aid something (*getremme*); possibly alluding to a teaching tradition (*lara*). The emphasis should be placed on *if* in this situation, however, since there are other possible readings for Tremme.

The second and third lines provide more challenge, despite the fact that there are more words recovered here than in the first line. The first word on line two may be translated as dill (*dila*), which is a herb found in over 30 remedies in Royal 12. D. XVII. *Anið* may be a truncated or corrupted version of the Latin word for dill: *anethum*. In which case, there may be an importance being placed on this particular herb as a medical ingredient or cure-all. *Cin* and *Adon* may be Cain and Adam or Adonai as many of these incantations call upon a saint or have Biblical or Christian references.

¹⁶ The first word is most typically written in medieval Greek as EMMANOTHA (Emmanuel), the second BEPENIKHE (Veronica), so it is easy to see where the corruption has occurred in these words. Veronica is also called upon as protection against evil in chapter 64, 52v, written BEPPNNIKNE. For more on the transmission of Greek in Anglo-Saxon England, see Bierbaumer, Peter, "Small Latin and Less Greek? Zur Kenntnis der Klassischen Sprachen in altenglischer Zeit", in *The History and the Dialects of English. Festschrift for Eduard Kolb.* ed. Andreas Fischer, Heidelberg: Carle Winter, 1989. 79–90.

¹⁷ See Merony, 'Old English Charms' (1945) and Pettit, *Lacnunga* (2001).

¹⁸ Many thanks to Dr. Elizabeth Boyle, Prof. Paul Russell and Silva Nurmio for help with the philological reconstruction of the Irish portions of this text.

Tremme [Old English: <i>getremman/trymman</i> ‘to strengthen, confirm’]
lara [OE: lar ‘teaching, instruction’, genitive plural]
In Iren [OE: ‘with iron’]
dila [OE: <i>dile</i> ‘dill’; Old Irish: <i>do lega</i> ‘dissolve, digest’; Lat: <i>dilaudo</i> ‘distinguish with praise’]
dra [Latin: <i>tria</i> ‘three’]
dilið/dilid [Lat: <i>dilato</i> ‘to dilate, spread out’; OE: <i>dile</i>]
þy [OE: demonstr. pron. instr.]
anið (þri?) [Lat: <i>anethum</i> ‘dill, anise’]
Cin [OIr: <i>cenn</i> ‘head’ /proper name?/Cain?]
Adon [OE: <i>adon</i> ‘to take away, banish’/proper name?/Adam? Adonai?]
A [OIr vocative particle]
Byr [OIr <i>bir</i> ‘spear’/proper name??]
bren [OIr: <i>brén</i> ‘putrid, rotten’]

Table 3. Preliminary linguistic breakdown of the incantation on 127v.

The reference to Cain may be in relation to the slaying of his brother Abel, and a reference to a form of wound by iron. However, the reconstruction of this charm is still in the working stages.

The distribution of majuscule letters in the text should also be noted. *Tremme* is the second word in the first line, but begins with a majuscule **T**. *In Iren* at the end of line one both begin with a majuscule **I**. *Cin*, *Adon*, *Bren* also begin with majuscule letters, although they may also represent proper names. While attention to style and character formation is not always a priority in marginal commentaries, it is interesting to see this kind of specific detail used. This leads me to believe that these particular words, proper names or otherwise, are important to the perceived efficacy of the remedy and were copied from the original.

The hand dates to the end of the tenth/beginning of the eleventh century and the letters are more indicative of Vernacular Minuscule than Caroline Minuscule, thus the scribe’s use of the Caroline *et* (the ampersand) rather than the more common Tyronian *nota* is unusual. It is uncommon to see the use of an ampersand in a vernacular text, unless there is an interjection of Latin, and in which case the ampersand is only ever really used within the Latin portion of the text. The presence here may be an indicator of a remnant of the Latin origins of the incantation.

5. Discussion

The incantation begins with a *signe de renvoi*, which is intended as a cross-reference for the reader, directing him/her to a particular place in the manuscript where a notation or correction has been made. However, there is no corresponding *signe* on 127v. As the location of an incantation is rarely coincidental, it is important to establish to which remedies the incantation might correspond. The three remedies on 127v include the end of chapter 71 on ulcers, the entirety of chapter 73 (mis-numbered 72) on yellow disease, probably jaundice, and part of chapter 74 (mis-numbered 73) for when one's insides are on the outside. Ker (1957:332) suggested that the underlying text may provide information regarding the missing remedy, which was my initial impression as well. However, it appears that the chapter on venom was lost before the manuscript was copied, which makes it unlikely the incantation refers to that particular remedy. It is possible that the incantation relates either to the remedy for jaundice or for the inappropriately placed intestines. An examination of the uses of iron and dill in medical remedies in Royal 12. D. XVII shows that iron is most likely to be used in remedies for wounds and internal disorders such as 'broken intestines' (*tobrocenum innođum*) and 'swollen spleen' (*aswollenum milte*), whereas dill is found in over 30 remedies for various ailments and wounds of the stomach and intestines. Therefore, it seems likely that the incantation pertains to the remedy for internal disorders such as chapter 74.

However, going back to the word that follows the *signe* at the beginning of the first line: *swernum* [*spernum*], it should be noted that it begins with a minuscule long-s, and is followed by a word which begins with a majuscule letter, *Tremme*. This combination is troubling, but it could be explained if that first word is not part of the incantation itself, but is used together with the *signe* as a second point of reference. As there is neither a corresponding *signe* on 127v nor is there a word that resembles *swernum* in the text, this incantation may not refer to a passage on 127v at all, but to one on the facing page of the manuscript, the now missing folio 128r.

6. Conclusion

Uncovering the passage written on the long margin of 127v was attempted not only to identify the text itself, but also to see if that text might shed light on the missing remedies at the end of the manuscript. The marginal notation found was written almost fifty years after Royal 12. D. XVII was copied, and furthers our understanding of the use and readership of medical manuscripts. Medical texts would appear to be a logical vehicle for incantations, yet none were copied into the Royal manuscript before the eleventh century; the other medical compendia where incantations of

this type have been recorded date no earlier than the eleventh century.¹⁹ This alone may tell us something about the earliest transmission of Hiberno-Latin charms in Anglo-Saxon England and their incorporation into the vernacular medical tradition at a time when the production of medical codices was flourishing.

In regard to the codicology of the final quire of the manuscript, the presence of the incantation raises more questions than it answers. The darkened and worn parchment found in the first and final extant quires of Royal 12. D. XVII are consistent with what we know of medieval manuscripts that were kept in a soft binding, and do not suggest the presence of additional quires at the end of the manuscript. Yet the Royal scribe did not note an incomplete exemplar, which would suggest that perhaps single sheet(s) were added to the final quire to complete the text of book III. A missing leaf would supply sufficient parchment for the final remedies which may have included the corresponding *signe* and reference point for the incantation. Furthermore, a single leaf at the end of a quire could easily have come loose and been lost at any point before the manuscript was rebound in 1751.

The methods addressed in this paper provide a useful and economical technique for finding what lies beneath reagents. They could easily be adapted for examining other types of obscured portions of manuscripts. Certain environmental conditions or insufficient storage can result in permanent damage to a manuscript. Codices exposed to a lack of humidity or excessive heat have darkened and become brittle. The techniques discussed here could provide aid in seeing texts obscured by a change in the organic nature of the folio.

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¹⁹ See reference to the *Lacnunga* above.

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