The Nome of the Knyght Þat Causet it to be Made

The patron of John Clerk of Whalley, author of the *The Destruction of Troy*

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Abstract

The longest extant alliterative poem from the fourteenth century is *The Destruction of Troy*. In the preamble to the poem, the author promises to reveal his own name and that of his patron in the text. Thorlac Turville-Petre discovered the name of the poet in 1988, encoded in the text as John Clerk of Whalley, but the name of his patron is still unknown. In this paper we show how the name of the patron and his residence were encoded in the poem as a 35 letter anagram of *John Catterall Heton Lonsdale Lancaster*, and investigate the relation of the patron and his family to the Abbey at Whalley and to other established aspects of the alliterative poetry of the fourteenth and fifteenth centuries.

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1. Introduction

Remarkably little is known of the authorship of most of the surviving alliterative poetry of the fourteenth century. Poets of that period were generally reliant upon a patron for support and were often found in religious establishments or the household of a wealthy patron. Typical secular patrons might be of the nobility of the time or landed gentry of knightly status. Frequently we find a close relationship between such patrons and a nearby religious foundation. A typical example is the clerk "William" commissioned by Humphrey de Bohum to translate *William of Palerne* from French into English. Such clerks possessed at least the rudiments of education; a knowledge of Latin and French, and often some legal training. They might be minor clerics in an abbey or maintained in the household of a wealthy noble, but it was probably not economically feasible for the majority of knightly families in the north west to support a poet as such.[i] Given the dependent status of the alliterative poet, it is perhaps not surprising that only rarely did they openly claim authorship of their work, and the patron, who was probably sufficiently satisfied with ownership of another book (a precious commodity at that time,) would not insist on a record of his name in the work. The poet served his lord, and the lord held his possessions: no names were needed. Nevertheless, many authors of that period did work their names in some coded form into their text, and Turville-Petre [TURPET88] gives many examples.

The introduction to *The Destruction of Troy* promises to reveal the name of both the writer and his patron, but a gap in the manuscript suggested that these might have been lost, possibly during its transcription in the early sixteenth century by Thomas Chetham. It was not until 1988 that Turville-Petre demonstrated very convincingly the existence of one name, presumably that of the author, John Clerk of Whalley, which was encoded in the text of the poem. However, he concluded that the name of the patron was not present in the text as it now stands. It is the object of this work to show that the name of the patron and his residence were also encoded in the text and can be extracted by a relatively minor extension of the technique used to identify John Clerk.[ii]

Derek Pearsall (1981) has argued that religious houses were a very important factor in the literary life of the period: their libraries held copies of the past literary record, their inhabitants were amongst the more literate of the English community, they generally had strong links with the local nobility and knightly gentry (often housing younger sons), and they were generally sympathetic to literary activity despite the growing secularisation of literature. For further evidence for the role of Whalley abbey and the surrounding area in the literary scene of the fourteenth century we note that one of the two surviving copies of Higden's "Polychronicon" came from Whalley Abbey, that the Princeton copy of the *The Siege of Jeruselem* came from the Petre family of Dunkenhalgh near Whalley, and

[i]The poets of the south and east were apparently considerably more independent and supported themselves and their families by other work. Chaucer indeed was 'in service' as a squire of the lesser degree to Edward III in 1369, but he later held important posts in the City of London. Langland supported himself by lay preaching, and Gower apparently was possessed of independent means There was also a growing commercial market for books in the south among the rising population of merchants, and Chaucer in particular was concerned to establish his authorship.

[ii]It might be argued against the extension of the technique proposed in this paper that it has no precedent, but then, no-one has looked for it elsewhere in the body of Middle English alliterative poetry.

that the only surviving copy of *The Destruction of Troy* (transcribed at Nuthurst east of Manchester) was owned early in the sixteenth century by John Drurye, the master of the free school at Gisburn, a few miles east of Whalley. John Lyndelay, abbot of Whalley 1342-1377 was most noted for his scholarship and writing (*The Coucher Book of Whalley* and *De Statu Blagborneshire*.) [WHITAKER72] (p.96-7)

The king's wars provided ample opportunity for the knights of the north and west to travel, to acquire wealth and to aspire to the rising culture of the south and east. Returning home with wealth and opinions, they may well have appreciated the criticism of society and ecclesiastical establishments that occurs in much alliterative poetry from the north west. In contrast to the hard fighting northern knight, the ecclesiastical houses would have maintained a more conservative poet, one dedicated to the local work of the abbey and the enjoyment of the culture of the past. It was surely to this latter class that the author of *The Destruction of Troy* belonged; not for him the social criticism of *Wynnere and Wastoure*, although he himself may well have enjoyed a *Somer Soneday*. He would have felt perfectly at home with the *The Wars of Alexander* and the *The Siege of Jeruselem*, but rather out of sympathy with *Wynnere and Wastoure*.[iii]

Putting the name of *John Clerk* to the authorship of *The Destruction of Troy* does not, on its own, materially assist us in coming to an understanding of the poem, but the addition of “de Whalley” does provide a link to an ecclesiastical establishment, the Cistercian abbey at Whalley. With this connection in mind we can at least hypothesise that a copy of Guido delle Colonne's “Historia Destructionis Troiae” was held at the abbey, that John was a (possibly lay) clerk at the abbey, that he (probably) learnt Latin there, that through the abbey he had contact with local knightly families, and that he was (quite possibly) a younger son of one of those families. With these ecclesiastical and knightly connections we can begin to relate *The Destruction of Troy* to the life of its author. Knowing the name of the “knight who causet it to be made” would give us a lead into the literary aspirations of the local society, the literary activities of the local gentry, and into local culture.[iv]

It has often been said that there is little or no evidence of any cultural activity in the more northern and eastern regions of Lancashire and their borders with West Riding of Yorkshire, without any comment that the longest surviving alliterative work of this era was produced by a poet who was

[iii]It would be interesting to try divide the body of alliterative poetry of the fourteenth century into two groups, those poems attributable to clerks of an ecclesiastical establishment, and those made for patrons who were returned fighting knights with immediate political and social concerns.

[iv]For example, was this interest in literature on the part of a local knight an isolated event, or can we see a persistence of the tradition in the area. Is it significant that the only surviving copy of Beowulf holds the name of Lawrence Nowell of Read (two miles from Whalley), that Lawrence was a major founder of the birth or resurgence of interest in Old English, that Roger Nowell of Read paid for the education of Edmund Spenser at Merchant Taylor's school and Pembroke College, and that Spenser's brief period with relations in the north was probably at the Spenser household at Hurstwood, four miles from Whalley, that the Towneleys of Burnley (and Wakefield) preserved the medieval plays of that name, and that a later Towneley collected and preserved so much manuscript material. Or, retreating back into the period of Old English literature, that king Athelston purchased the whole region of Amounderness, barely five miles west of Whalley, giving most of it to St. Peter's in York save for a portion for “those to whom he was Bel-pere”. The alliterative poem *Brunanburgh* in the Anglo Saxon Chronicle which recounts the success of Athelstan and Edmund against combined Celts and Vikings has been located at Burnley on the river Brun [CHECKTHISREF] a few miles to the east of Whalley, although this has been disputed.

extremely competent in the alliterative metre and resided at Whalley. The home of alliterative poetry is invariably said to be the north west midlands and particularly the area around south east Cheshire and north west Staffordshire, and that the "alliterative revival" originated in the south west midlands [PEARSALL81] (p.17). If this is beyond dispute, we should look for close family ties between the patron of John Clerk and those areas, or, alternatively, we must extend the north west midlands to include the Whalley area.[v]

There are one or two speculations in the literature about the patron of John Clerk which deserve mention. Michael Bennett [BENNETT97] (p.78-9) says "The statement of the author of The Destruction of Troy that it was written at the request of a knight suggests a local manor house" and "the patron of The Destruction of Troy may well have been a prominent local captain". Turville-Petre notes that "The list of contents in the Hunterian MS. promises also to reveal the 'nome of the knight þat causet it to be made' - presumably one of the Lancashire gentry - but he suspects that the promise is not fulfilled in the text as it now stands".

Another important issue was raised by Bennett: *the historical identity* of John Clerk of Whalley needs to be established, the name alone tells us nothing about the man, his life or his poetry. To write as competently as he did he must have had considerable contact with (or at least with the works of) other poets in the alliterative tradition, it would be extremely unreasonable to regard *The Destruction of Troy* as a purely local phenomenon. In this work we also include some indications and discussion of the identity of John Clerk

It is with these thoughts in mind that we pursue the identity of the patron of John Clerk of Whalley and show that the name and manor of John Catterall, Heton in Lonsdale, Lancaster are encoded in the poem.

[v]The present inhabitants of the Whalley area would certainly regard it as a gross insult to be labelled as coming from the Midlands, even the north west midlands.

2. The Hunterian Manuscript 380

The only surviving copy of *The Destruction of Troy* is the Hunterian MS 380 (MS V.2.8) in the Library of Glasgow University. This manuscript copy was transcribed by Thomas Chetham about 1540 and passed to his son John "to be an heyrelome at Notehurst".[vi] For the purposes of this paper we have used the diplomatic and facsimile transcription prepared in electronic form by Hiroyuki Matsumoto and released by the Society for Early English and Norse Texts through the University of Michigan Press in 2002 ([MATSUMOTO02]).

We also know that this manuscript traveled north again and was for a time "towards the end the sixteenth century", that is after the dissolution of the monasteries, in the possession of John Drurye, the master of the free school at Gisburn in west Yorkshire, some 10 miles east of Whalley[vii] .

As Pearsall [PEARSALL81] has observed there is an importance difference between the provenance and the destination of manuscripts of the period. The introduction of the *The Destruction of Troy* explicitly identifies its destination as the home of the "knyght that causet it to be made", but the production of *The Destruction of Troy*, a poetic translation of Historia Destructionis Troiae by Guido de Columnis in 1287 ([PANTON69] and [GRIFFIN36]), clearly required the resources of a significant ecclestical institution, not only the possession of a manuscript of the earlier work, but also the use of the general facilities of the scriptorium of a major abbey. The translation of a major Latin work into the vernacular and its representation as over 14,000 lines of poetry must have been a work of at least a year's duration (and probably significantly longer) and a significant drain on the resources of even a major abbey. To divert the manpower (monk or clerk) and the facilities of an abbey (scriptorium) to the production of a work for the home of a lay knight requires that the knightly family must have had considerable influence at the abbey.

The early notes attached to the Hunterian MS 380 suggest that Nuthurst was in Warwickshire, near Henley in Arden, but more recently a Nuthurst in Lancashire has been favoured ([LUTTRELL58]). We find that Baines [BAINES36] records an incident in 1527 referring to a Thomas Chetham of Nuthurst living in the region to the east of Manchester, an area roughly coincident with the Moston of today.

> About eight o'clock in the morning, Thomas Radclyffe of Chaderton, gentleman, John, son of Edmund Tetlow, Ralph Cowper, of Chaderton, husbandman, John Smethhurst, of the same place, husbandman, with other wrongdoers to the number of 30, whose names were unknown, assembled on the waste of Nuthurst, in the hamlet of Moston and within

[vi] For a discussion of the role of the Chethams in the transcription of the *The Destruction of Troy* see [LUTTRELL58]. From a comparison of the hand-writing in the *The Destruction of Troy* manuscript and several other documents attributable to the Thomas Chetham who lived from about 1490 to 1546, Luttrell concluded that Thomas Chetham himself was the transcriber of the *The Destruction of Troy*. It is clear that the marginal comment on folio 189b was added by his son John. It is interesting that Chetham himself transcribed the poem; he did not employ a clerk.

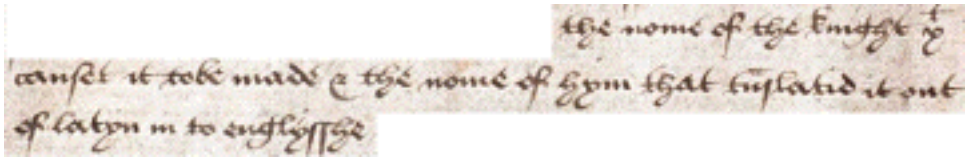
[vii] On folio 190, in a hand tentatively dated at around 1600 ([LUTTRELL58]), there appears the note "John drurye maister of the free Schole at Gisburne".

> the vill of Assheton, riotously, and drove off the animals of Thomas Chetham and Edmund Chaderton, gentleman, which were feeding there according to anticessorial custom.'
> (quoted from Vol XXV-52. ot the Lancashire and Cheshire Antiquarian Society]
>
> —Baines,*Hist. Lancs.*

Baines (v.II, p.395) also gives an account of the Chethams of Nuthurst with the comment that the descent is “extremely confused and contradictory”. He reconstructs the pedigree from Flower's Visitation of 1567, Familiae Lancastriensis MS and other sources. There is a Thomas Chetham of Nuthurst whose son John was living in 1567. John's son Henry married a daughter of Sherburne of Stonyhurst near Whalley, whose brother, Robert married Dorothy Catterall, daughter and heiress of Thomas Catterall of Little Mitton in 1561.[viii] It is probably just coincidence that the Chethams also adopted the Catterall family motto “quod tuum tene”.

The manuscript starts with a list of contents, and it is in these that there exists a promise to reveal in the text “the nome of the knight Þat causet it to be made and the nome of him that translatyd it out of latin into Englyshe”. This promise is somewhat obscurely wrapped up in the description of Book 36.

An extract from the bottom of the second page of the MS reads:



> The xxxiiij. boke of the lesyng that was made to kyng
> Nawle & of the dethe of his son palamydon the dethe of
> Agamynon & the exile of dyamede by Þere wifes
> The xxxv. boke how orest toke venionse for his fader dethe
> The xxxvj. boke & the last how hit happit vlixes aftur the

[viii] There is an unsolved historical problem here: it is extremely rare (unique?) for the descent of property to pass over a living eldest son. Thomas Catterall (who died 1579) settled the Little Mitton estate in 1561 on his 4th. daughter, Dorothy, on her marriage to Robert, 3rd. son of Thomas Sherburne in 1561, when his son James, noted by Whitaker [WHITAKER72] on the authority of Canon Raines, was aged 7. James was still alive and aged 35 in 1579 and, as far as we know, died without issue. Robert Sherburne died in 1570, leaving the Little Mitton estate to his son Thomas whilst James Catterall was still alive. The time of the transfer of the property occurred 16 years before the last record we have of Thomas, and it is very unlikely that son James at age 7 and father Thomas had become irrconcilably estranged. Following the dissolution of the abbeys, the Catteralls came under severe religious pressure, and perhaps transferring the property to the Sherburnes was the only means of avoiding forfeiture of the estate to the crown. It is perhaps significant that after about 1570 James is transformed into Jane in the records.

Baines ([BAINES36], notes a similar local and later instance among Catholic recusants, when John Southworth of Samlesbury in 15.. tried to disinherit his son, but in this case Sir Francis Walshingham heard of it and wrote to the bishop of Chester instructing him to prevent the action. Thomas Catterall and John Southworth, together with John Townley and Anne Catterall, his wife, were named among 12 prominent recusants who “…if they conform, all the others will” [WHITAKER72] (v.X,p.xx). This is well worth further investigation.

> sege whiche endis in the story with the nome of the knight Þat causet it to be made & the nome of hym that translatid it out of latyn in to englysshe And how long the sege last with the nowmbur of grekes & troiens that were slayn & what kynges Ector slogh whom paris slogh whom Achilles slogh whom Eneas slogh whom pirrus slogh And “Laudes deo”
>
> —John Clerk of Whalley*The Destruction of Troy*

Thorlac Turville-Petre in 1988 ([TURPET88]) discovered the name I(O)HANNES CLERK DE WHAL(A)LE encoded in the first character of the first line of the first twenty two books of the poem, with some hesitation over the two letters in parentheses, and conjectured that this was the name of the author. The chance that this name could have been accidentally encoded purely by chance is exceedingly remote (see Appendix A, *Probability of Authorship by John Clerk of Whalley*,) that it was a later addition by a scribe is almost equally unlikely, and we may take Turville-Petre's contention that the encoding of this name was a deliberate act on the part of the poet as being beyond any serious doubt. Turville-Petre also suggested that the first word of the introductory material, “Maister” might be taken as an indication of the rank or social status of John Clerk. The name Clerk, taken in conjunction with the town of Whalley suggests very strongly that Iohannes was a clerk in the abbey at Whalley, and the title of “Maister” would not have been inappropriate. Turville-Petre was unable to find the name of the “knight Þat causet it to be made” encoded in the manuscript, and concluded that “the promise is not fulfilled in the text as it now stands”: perhaps a deliberate excision on the part of the transcriber, Thomas Chetaham. Turville-Petre did note the historical existence of a “John Clerk” living about 1450 a few miles east of Whalley at Royle near Burnley, but was unable to trace any link between him and Whalley abbey.

Whitaker [WHITAKER72] records the names of the monks at Whalley Abbey in the period 1350-1400. Not surprisingly there are several with the name of “John”, but none easily identified with John Clerk.

It is important to note that any “discovery” of another name in the poem is not sufficient to identify this name with the patron of John Clerk. We need to look also for historical evidence that a family of that name existed in the locality of Whalley, that one of them had the name John, that there were relations between the family and Whalley abbey, and perhaps also that the family had connections with the area currently recognised as the “home” of many manuscripts of alliterative poetry, the area of south east Cheshire and north west Staffordshire, roughly within a few miles of Leek. We might also look for connections between the family and Royle or its surrounding area. If the knight was sufficiently wealthy to support what may well have been the activity of two or three years, then we might infer that he had been involved in the wars on the continent, and must have been in the service of someone like John of Gaunt, the Duke of Lancaster. As a local knight, he would probably also have held his property of the Duke of Lancaster. If we can find historical evidence linking a name found in the text of *The Destruction of Troy* to most, if not all, the above requirements, then we might be reasonably sure that we have identified the patron of John Clerk.

If, as seems possible, John Clerk was a younger son of another local family, then it might be preferable to take the name “Clerk” as an indication of profession rather than as a surname. If this were the case, then it would be important to identify the family name and look for links between the families of the patron and the poet. This we will also discuss although without much real historical evidence.

The content of the manuscript is a translation from the latin of Guido delle Colonne, of the “Historia Destructionis Troiae” of 1287. The translation is consistently close to the original and it is clear that the translator was very familiar with the latin language, arguing that he had a close connection with a religious establishment. It is just possible that John Clerk was a university graduate and ordained, but the extremely variable spelling and local dialect of *The Destruction of Troy* suggest a provincial education, presumably at the abbey. It is also, of course, just possible that the spelling and dialect were an artifact of the transcriber, Thomas Chetham.

3. Authorship

In the light of a well established tradition of recording an author's name in the first letters of some logical subdivisions of text (see Turville-Petre [TURPET88] for many examples) it seems unlikely that “John Clerk of Whalley” is the name of a patron, and it remains unclear whether “clerk” was a family name or an indication of profession or status. I have been unable to find any record of a Clerk family at Whalley towards the end of the fourteenth century,. The first historical evidence of a Clerk family at Royle is perhaps a generation later than the probable composition of the *The Destruction of Troy* and it is at least conceivable that the family name was taken from the John who was a clerk at Whalley Abbey. If the correct reading is “John, a clerk at Whalley” it becomes important to identify John with a local family and demonstrate his historical existence. It is very unlikely that an eldest son of a knightly family (such as the contemporary John Nowell of Read or John Towneley of Burnley) would ever describe himself as “a clerk” and younger sons of that period are rarely documented. There is a John Catterall, third son of Alan and Lora of Little Mitton, within sight of the abbey, who is recorded as assisting his mother in a dispute over tythes with the abbey in 132?. This is possibly the John Catterall who married Agnes Towneley of Burnley and an ancestor of the John Catterall who held land in Habergham Eaves (adjoining Royle) in the early 1500s. This John must have been born somewhere in the region of 1310-15, which would make him about 70 when the production of *The Destruction of Troy* was completed. The John Catterall, listed as John Cat, in the household of Edward III in 1369 held the manor of Heton in Lonsdale, but I return to this point later.

I take as indisputable the contention of Turville-Petre that John Clerk of Whalley was indeed the author of *The Destruction of Troy*. [TURPET88], but I do not feel we can as yet identify him with a historically substantiated person.

4. Knightly Families near Whalley Abbey

Turville-Petre's identification of the author of the *The Destruction of Troy* with a John Clerk of Whalley, taken together with the requirements of access to the facilities of a scriptorium and to a copy of the Historia Destructionis Troiae [PANTON69], suggests very strongly that the provenance of the *The Destruction of Troy* was the Cistercian abbey at Whalley. As we pointed out earlier (Section 2, " *The Hunterian Manuscript 380* ") the family of the knightly patron of John Clerk must have had considerable influence at the abbey. It would also be supportive to find some connection between the family of the patron and the Clerks.[ix]

In the search for the patron of John Clerk, we might first summarise the prominent knightly families in the Whalley area towards the end of the fourteenth century, together with any evidence for any involvement with the abbey at Whalley. Fortunately there are not too many families of sufficient status in this period and it would be reasonable to infer that the patron of John Clerk came from one of the following families (presented in alphabetical order).

Blackburn.

any interaction? Certainly present around Langho etc. Catterall manor of Mitton came via Beatrice of Blackburn's daughter, Lora who married Alan de Catterall around 1310. Generally the Blackburn presence was on the opposite side of the river Calder from the abbey, and dominant in the parish of Blackburn. We have not found any connection between the Blackburn family and Whalley Abbey.

Catterall.

The Catterall family originated before the Norman Conquest as lords of Goosnargh, a few miles west of Whalley on the northern banks of the river Ribble. In 1212 they received a grant of the manor of Halcath and Catterall, a few miles north of Preston, from William the second earl of Lancaster. Once established on the southern bank of the Wyre they took the name of Catterall. In 1310 they acquired the manor of Little Mitton, one mile from Whalley and adjacent to the site acquired for the abbey, when Alan de Catterall married Lora de Pontchardon, a daughter and heiress of the Blackburn family. By the end of the fourteenth century Adam de Catterall held Little Mitton of John of Gaunt, Duke of Lancaster. The present Little Mitton hall was built around 1497 about half a mile from the west gate of Whalley abbey, and it appears that some of the land attached to

[ix] It is of course possible that John Clerk of Whalley was a monk at some other religious institution and that identification of the provenance of the *The Destruction of Troy* with Whalley abbey is totally wrong. The phrase "iohannes clerk de whalale" is susceptible to different interpretations: Iohannes was a clerk at Whalley (abbey), Iohannes was a member of the Clerk family resident near Whalley and (just remotely possible) that the "clerk" was the one who formally transcribed the work of Iohannes into the original manuscript. In the first and third cases we need to identify the family name of Iohannes, in the second case we need to establish the existence of a family surnamed Clerk in the vicinity of Whalley. It is worthy of notice that if Iohannes had been a monk at some other abbey, he would more probably have been named Iohannes de Whalale, just as we have a Fr. Robertus de Selby listed as a monk at Whalley ca. 1350-1360. Turville-Petre favours the surname Clerk, and this does appear to be both the simplest and the most probable solution.

the manor was held from the abbey.[x] In the records of the sale of the abbey properties following the dissolution, there is included in the sale “Catterall wypes” There are records of younger sons of the Catteralls entered as monks in the abbey, and an item “pro mensa Ric. Catterall” in the abbeys accounts at the time of the dissolution suggests a close relationship between the family and the abbey. The Catterall brass, now in what used to be the Mitton chancel at Whalley parish church, was discovered about 1800 at Catterall Hall by Whitaker and possibly came from the abbey at the time of the dissolution. If this is so and Catteralls were buried in the abbey itself, “whyche bodies lyeth Before this Pellor”, the relationship was certainly a close one.[xi]

Thomas Chetham of Nuthurst transcribed the *The Destruction of Troy*. His son John preserved it and John's son Henry had married a daughter of Sherburne of Stonyhurst near Whalley, whose brother, Robert married Dorothy Catterall, daughter and heiress of Thomas Catterall in 1561.

Clerk.

There is a Clerk Hill just east of Wiswell, very close to Whalley, but the only record of a Clerk family is at Royle near Burnley.

de la Legh.

The de la Legh family of Hapton, south of the river Calder belonged to the manor of Blackburn, but although they had a considerable presence in Whalley, I find no trace of their interaction with the abbey. However, when Gilbert de la Legh married the Towneley co-heiress in ... he took the name de Tounlay and the Towneley family became the prominent, perhaps dominant, family attending Whalley parish church in the fifteenth and sixteenth centuries.[xii]

Mitton.

Across the river Ribble from Little Mitton was the manor of Mitton Magna, originally seised of the Mitton family. Although close to Whalley abbey, the Ribble must have presented a major obstacle to everyday interactions between the Mittons and the abbey. Avota, daughter of Jordon de Mitton married Richard de Catterall (died 1256). Her grandfather, Hugh de Mitton (fl. 1206) was married to a daughter of Robert Fitz Bernard de Catterall and Goosnargh. When the Mitton line failed in ???, the Mitton estates passed to the Sherburnes.

Nowell.

[x] Dispute over the payment of tythes to the abbey in 1320-ish?

[xi] History of the Catterall brass. See Whitaker, first recorded (by Raines?) in the parish church in .... then disappeared, then found again in Catterall Hall by Whitaker and restored to the parish church in ...

[xii] The seating in Whalley church was assigned by John Towneley, to Shuttleworth of Hacking, Catterall of Little Mitton and Nowell of Read

> What shoulf be in this blockquote???
>
> —[]

The Nowell family originated at Mearley on the north side of Pendle Hill some 6 miles east of Whalley but on the same side of the Ribble. They acquired the manor of Read, 2 miles east of Whalley but on the south side of Pendle in .... and John Nowell in 138??? settled at Read Hall. It was not until the sixteenth century that the Nowells became a major family in the area. Whitaker records the marriage of Grace Catterall to a Nowell around 15..

Sherburne.

The rise of the Sherburne family followed the acquisition of the manor of Mitton Magna from the Mittons in ??? They later (after the reformation) acquired the Little Mitton estate from the Catteralls.

Shuttleworth.

Shuttleworth of Hacking resided across the river Calder from the abbey. John Shuttleworth de Hacking was living 1n 1399, died in 1422 and started the family of Shuttleworth of Hacking. His father, Henry de Shotilesworth (living 1369 and 1372) married the heiress Agnes de Hackinge.

Talbot.

The Talbots of Bashall were the origin of the Talbot family of .... Although five or six miles from the abbey, and across the Ribble, they interacted strongly with the Catteralls in the fourteenth century (Halton aspect, near Gisburn). The Talbots held the manor of Bashall from John of Gaunt, and there is a record of Gaunt authorising his head forester to provide oaks for building to Thomas Talbot in 13.. this Thomas Talbot acquired the manor of Halton near Gisburn on his marriage to the heiress Isabella Catterall. Catteralls and Talbots appear to have had a close relationship in the fourteenth century, with Thomas referring to his “tres cher pere Alan de Catterall” of Halton (a younger son of Alan de Catterall of Little Mitton.)

Quallay (Whalley).

Jo de Quallay (Whalley) and Alan de Cathurton (Catterall) were co-witnesses -need a date here -. Jo could not be John Clerk de Whalley - too early. Alan must be the Alan de Catterall who had acquired the manor of Little Mitton in 1310.

Towneley.

A dominant family. The de la Legh connection and the marriage of the two Towneley sisters to a Catterall and a de la Legh

5. The Search for the Patron of John Clerk of Whalley

5.1. Canonical Text

Before we can search for the name of the patron of John Clerk we need to define clearly the text to be searched. We have taken the diplomatic text prepared by Matsumoto ([MATSUMOTO02]) and produced a canonical text as follows.

The alphabet of characters in the manuscript has 29 characters, A-Z, thorn, yogh and dflourish. Of these the last three are represented in the XML text by þ (lower case), Þ (upper case), ȝ (lower case), Ȝ (upper case), ɗ (lower case only). The additional character, —, only occurs in the excluded extraneous matter and is not included in the alphabet. dflourish, which occurs 3328 times, is NOT included with 'D' - the poet (or scribe) regarded dflourish as a different character.

The character '/', which often represents the caesura has been excluded completely and is not included in the alphabet. No digits are included as all numeration in the text of the poem is in Roman numerals.

The 'alphabet' used in this analysis also includes the characters '&', ' ' (space), and '.' (undecipherable) for a total of 32 characters from which to draw random characters. '&' is a frequently used contraction (2569 times) and is treated as a separate character

Thorn and 'th' are treated separately - as they are in the text; 'þ' occurs 8169 times (including Þ) whilst 'th' occurs 12007 times (e.g. in thurghe on line 300) thus 't', 'h', and 'thorn' are treated as separate characters, just as the poet did.

5.1.1. Contractions

The scribe and/or the poet used frequent “well-known” contractions in the text. Most often these consist of the omission of vowels, and are sometimes indicated by a mark above the preceding character. In the diplomatic transcription these have been expanded and are indicated by including the expansion in parentheses, and rather than any attempt to represent these contraction marks within the alphabet, the contractions have been silently expanded and the parentheses around the interpolated characters deleted - any other course would bias any distribution functions for characters as most of the contractions are implied vowels. We simply remove the parentheses. The contractions used in the diplomatic text are listed in Table 1, “Contractions”.

Table 1. Contractions

Contraction	Number of Times it Occurs
a	794

au	52
er	1742
es	1686
h	2822
i	2843
n	203
o	155
r	457
ra	124
re	306
ri	572
ro	76
ru	2
ur	995

5.2. Anagrams

The name of John Clerk is encoded in the manuscript of *The Destruction of Troy* as the first letter of the first line of each of the first 22 books of the poem. These letters taken in sequence spell out IOHANNESCLERKDEWHALALE. The same coding technique has been used by other alliterative poets of the fourteenth century [TURPET88]. Extending this technique to the remaining 14 books of *The Destruction of Troy* does not yield any recognisable name for the patron of John Clerk. There is also an older tradition of encoding names as anagrams (e.g. The Exeter Riddle book), and we have sought for anagrams in the text. There are many other possibilities than the first letter of the first line of each book, but they all reduce to finding a logically cohesive set of letters and checking for feasible names. For example, the first letter of each book is a cohesive set, and yielded the name of John Clerk. The second letter of each book, or the first letter of the second line, or the last letter of a book are all alternative cohesive sets. If John Clerk was a “top-down” code, there is also the possibility of a “bottom-up” approach. We have accepted the possibility of anagram coding, but restricted our search to names of knightly families and manors local to the Whalley area. Individually the first or second characters of each book yielded no accepable names (other than John Clerk of course). Again individually, the first and second letters of the second line of each book were unproductive. The last letters of each book were also unproductive. So also was the set comprised of the firt and last letters of the first line of each book (as in a double acrostic.)

Only when we extended the search to look for names in the first two characters of each of the first two lines of the books did we find acceptable anagrams. The search was subject a few simple con-

straints: one, and only one, letter was chosen from each group of four, starting with the first book, and the first occurrence of a group of four with no acceptable letter terminated the sequence of the anagram. Following this procedure we were able to eliminate most of the local knightly families of the area, but we did find six suggestive anagrams. The selection of a letter from a group of four in each book adds considerable flexibility to the search, and incidently made the work of the poet in constructing anagrams much easier. It might be argued that with the increased flexibility of this scheme, we are bound to produce at least some acceptable anagrams, but the surprising elimination of so many (most in fact) of the names of local knightly families and manors is certainly encouraging. In the following table (Table 2, “Family Anagrams”) we list both failures and successes.

Table 2. Family Anagrams

Failures	Successes
ALANCATTERALL-HALTON	ALANDECATTERALL
ALANCATTERALLMITTON	IOH(A)NCATTERALLHETONLONSDALELAN-CASTER[a]
BALDERSTON(E)	IOHNNOWELLREAD
BASHALL	IOHNSHUTTLEWORTHDEHACKIN[b]
BAYLEY	IOHNTOWNELEY
BLACKBURN	RICHARDCATTERALL
BOWLAND	
BROCKHOLES	
BURNLEY	
CATTERALL	
CATTERALLMITTON	
CLERK	
CLERKWISWELL	
CLITHEROE	
DELALEGH	
DINCKLEY	
DUNKENHALGH	
EDISFORD	
GARSTANG	
GIGGLESWICK	
GILBERT	

GISBURN	
HABERGHAMEAVES	
HACKING	
HOGHTON	
(I)CLERKWISWELL	
(I)NOWEL(L)MEARLEY	
(I)NOWEL(L)READ	
JAMES	
LANGHO	
MEARLEY	
MITTON	
OSBALDESTON(E)	
PETRE	
QUALLAY	
READ	
ROYLE	
SALMLESBURY	
SHERBURNE	
SHUTTLEWORTH	
SOUTHWORTH	
TALBOT	
TALBOTBASHALL	
THOMAS	
THOMASTALBOT	
TOWNELEY	
WHALALE	
WHALLEY	
WISWELL	
WYNCKLEY	

The requirement for a success is that the anagram is formed by taking exactly one character from each succeeding group of four starting at Book 1. Where a letter appears in parentheses, this indicates that the anagram fails/succeeds with or without the letter.

[a]Iohan is a reasonable abbreviation for Iohannes, especially as there are only 36 books in the *The Destruction of Troy*, but the patron of John Clerk would have used the English form, John, (as in the John Cat of Edward III's household in 1369) - particularly as he had required the translation of Latin to English.

[b]The final 'G' of Hacking is missing, but we include this “near miss” as Hacking is just across the river Calder from Whalley Abbey. The usual spelling of Hacking at that time was Hackinge.

The selection of name and manors to test cannot be claimed to be exhaustive, but it does cover all the major families in the area in various combinations. The only successful anagrams we found are for the Towneleys, Nowels, Catteralls and possibly the Shuttleworths. Perhaps the most surprising observation is that so many of the local families and manors fail to appear as anagrams: clearly random anagrams according to this rule are not favoured.[xiii] Of the Nowels, Towneleys and Catteralls, the Nowels were only just beginning to emerge as a major family, the Towneleys were an old family but were going through a series of crises, with no male heir in 1320 and an alienation of property in 1386. In contrast, the Catteralls had been firmly established of knightly status for almost 200 years. The Catterall manor of Little Mitton, adjoined the abbey at Whalley, and was the residence of the main line of the family, although Catterall Hall at Catterall south of Garstang was still retained and occupied. The manor of Heton was some 25 miles away, but there were clear family ties to Mitton. Connections with the abbey are established for the Catteralls but not for the Nowels. It is certain that the Nowels were a rising family who by the sixteenth century were exhibiting strong literary tastes and patronage. Of the six successful anagrams found [xiv] the length of the anagram for John (or Johan) Catterall of Heton in Lonsdale, Lancaster (35 or 36 letters) stands out as the most obvious candidate. We list only those anagrams which can be readily identified with historical persons.

This survey (Table B.1, “Anagrams in *The Destruction of Troy*”) of the local knightly families in the Whalley area in the last quarter of the fourteenth century produced six suggestive anagrams:

- ALANDECATTERALL (15 letters)
- IOH(A)NCATTERALLHETONLONSDALELANCASTER (35 or 36 letters)
- IOHNNOWELLREAD (14 letters)
- IOHNSHUTTLEWORTHDEHACKIN (24 letters)
- IOHNTOWNELEY (12 letters)

[xiii]“CLERKWISWELL” is included because Clerk Hill is just behind Wiswell. “HABERGHAMEAVES” is included because there is a John Catterall recorded there around 1450 “ROYLE” is included because Turville-Petre found a John Clerk living there, and also because Royle is very close to Habergham Eaves (both on the north side of Burnley).

[xiv]We ignore short anagrams like “NOWEL” and restrict our attention to anagrams of 6 letters or more. Whilst this is difficult to justify, it does seem intuitively reasonable. Similarly, to avoid an combinatorial explosion of possibilities, we do not explore the many alternate spellings of place and family names, but stick to the dominant ones.

- RICHARDCATTERALL (16 letters)

5.3. Probabilities

The likelihood of producing anagrams in this way totally by chance is not intuitively obvious (at least to me) and requires some investigation. We have calculated the likelihood of producing the anagram for JOHNCATTERALLHETONLONSDALELANCASTER by chance. The investigation involved considerable technical detail and is presented in Appendix B, *Anagrams* and Appendix G, *Fit of Growth Functions to Success Rate Data*. Here we simply quote the result that the odds are about 10 to 1 against this being a fortuitous chance occurrence. 10 to 1 are certainly not overwhelming odds, but are at least very suggestive. We follow up this suggestion in the next section (Section 6, " *Historical Evidence* ") by looking for historical evidence for an individual John Catterall, living in the last decades of the fourteenth century, associated with a manor of Heton Lonsdale, and associated in some way with the city or family of Lancaster.

6. Historical Evidence

The discovery of an anagram in the text is an indication but no more. In this case it creates the conjecture that, for example, a John Catterall of Heton Lonsdale who was connected in some way with Lancaster was the patron of the John Clerk who produced the *The Destruction of Troy*. If we were able to find clear evidence that the place Heton Lonsdale never existed, then the hypothesis would be disproved and the anagram would have to be relegated to a meaningless chance.[xv] However, if we find the people and places mentioned in the anagram did have a real historical existence at the time we believe the *The Destruction of Troy* was written, then the conjecture has passed its first test. We have not "proved" the conjecture, but we have strengthened our confidence in it. We next apply further tests to the conjecture, for example, can we find a demonstrable historical link between Heton Lonsdale and Whalley. If it passes this test, we can then test further by looking for links between the family of this John Catterall with Whalley Abbey, with the Clerk family, with Royle, or the literary world of fourteenth century alliterative poetry. And so on: note that we are never able to "prove" the conjecture, we only fail to disprove it, but the more we fail to disprove it, the higher we raise our confidence in it.

We can posit three levels of investigation. Firstly then, we must look for historical evidence that the people and places mentioned in the anagram did in fact exist at the time we suspect *The Destruction of Troy* was produced, the last two or three decades of the fourteenth century and just conceivably the first few years of the fifteenth. The names in question are Lancaster, Heton Lonsdale and John Catterall. We may regard these first historical evidences as "required". If we find these people and places have a real historical existence, this would add very considerably to our confidence in the anagram. If we do not find such evidences, our statistical confidence level remains at the random choice level, but our intuitive confidence would be somewhat shaken. Secondly, given that these historical evidences are found, we should look somewhat wider for other historical evidence that the patron, or at least his family, had some close connection with the Whalley area and preferably with the abbey, and also any links between the patron or his family with "John Clerk of Whalley" or the Clerke family: we might also regard these as required, although absence of evidence would not be quite as damaging to our confidence. Thirdly, we should be encouraged to look for any historical evidence for wider connections between the patron's family and the general area of, and family connections with, the sources of alliterative poetry in the second half of the fourteenth century, the family's contacts with noble families, with London, the family's interests in learning, and its religious affiliations. We might hope to find evidence of both earlier and later interest of the family in these matters, e.g. evidence of an on-going family connection with literature, the family's contacts with other families known to be associated with alliterative poetry, etc. The alliterative form of the

[xv] The description that follows is couched in Popperian terms. Karl Popper [POPPER59] proposed a logic of discovery [Karl R. Popper, *The Logic of Scientific Discovery*, Routledge, New York, 2002] in which conjectures can never be proved, but can only be disproved, and the investigator must always strive to disprove his conjectures (theories). This is not generally the way researchers see progress, and Popper's theory of investigation has been strongly criticised. Nonetheless, Popper's point about the logical status of proof and disproof cannot be denied: one observation can disprove an hypothesis, but no amount of circumstantial evidence will constitute proof, it can only raise our confidence level.

The Destruction of Troy, is derivative in some way from the old Saxon or Scandinavian forms, and clearly not Norman in form or feeling: we should look for evidence of Saxon or Scandinavian blood in the family of the patron. Clearly this third group of evidences is not required, but any of them would strengthen our confidence in the anagram. We now explore these issues. First we consider all the candidates suggested by the anagrams.

Alan de Catterall (died 1380).

Richard de Catterall (b.1308) dying in 1381 passed the manor of Little Mitton (and others) to his second son Adam de Catterall who held it until his death in 1397 when the manor passed to his son, another Richard. Adam's older brother Alan had married the heiress Isabella de Halton and acquired the manor of Halton West near Gisburn. This Alan died in 1380, a year before his father Richard, and the manor of Halton passed on the marriage of his daughter Isabella to Thomas Talbot of Bashall (died 1414) living just across the river Ribble from the main Catterall family residence at Little Mitton. If we accept Turville-Petre's dating of the *The Destruction of Troy* then this Alan died too early (1380) to be the patron of John Clerk. He also died a year before his father died (1381) and the estate passed to his younger brother Adam, so he was probably never in a sufficiently wealthy state to contemplate patronage. It seems we can exclude Alan de Catterall from further consideration. We found no anagram for Adam.

Iohn or Iohan Catterall.

Richard Catterall (d. 1381) had a younger brother, John, who married Agnes Towneley around 1320, rather too early to be the patron of John Clerk, Iohn and Iohan Catterall are obviously the same person. A John Catterall held the Manor of Heton Lonsdale, just across the river Lune from Lancaster castle until 1441 when he passed it to the Brockholes. A John Cat, possibly his father, is recorded as a squire in the service of Edward III in 1368, the year before Geofrrey Chaucer was listed as a squire of the lesser degree in the same household. The manor of Heton was held of John of Gaunt, and the lord of the manor made a substantial contribution to the wedding of Gaunt's eldest daughter, Philippa.[xvi] The Catteralls acquired the manor of Heton around 1377, the year of the death of Edward III, and we might suppose that John Cat retired to that manor at an age of about 30-40 with an eldest son, also John, perhaps 10 years old, which would make him about 20 when *The Destruction of Troy* was written. This would suggest that the John Catterall of Heton Lonsdale in the anagram was the father, John Cat who had several years experience at royal court, where he would have been exposed to literature.

John Nowell of Read (living in 1394).

[xvi] I have proposed that another member of the Heton family, James, accompanied Philippa to Portugal on her marriage to João I in 1386-7, after serving with Edmund and Gaunt on the previous expedition to Castile in 1381. James, who we have proposed as the Gawain-Poet, never returned to England, serving first as Philippa's majordomo and head of the royal household and tutor to her sons, until Philippa's death in 1415 when he become head forester and hunter to her fourth son Enrique (Henry the Navigator). James's son Lopo became secretary to Philippa's first son, Duarte, when he succeeded his father, João, as king of Portugal in .....

Little is known of John, son of Lawrence whose wife Katherine died 1369. His great grandson, Roger (died 1486), held the manor of Arkesay in the parish of Wakefield. The Nowells in succeeding generations 150 years later were to exhibit considerable contact with, and influence in with the literary world (Lawrence Nowell was Dean of Lichfield, the preserver of the Beowulf manuscript, and the origin of the Nowell Codex; Alexander was Dean of St.Pauls, the author of the creed and led the nation in prayers of thankfulness following the defaeat of the Armada, Roger Nowell was the sponsor of Edmund Spenser. John's mother, Katherine, was living and married to Lawrence Nowell in 1369, so we might put John's age at around 18-25 in 1386, perhaps a little young to be sponsoring poetical work, but still a feasible patron of John Clerk.

John Shuttleworth of Hacking.

His father, Henry de Shotilesworth (living 1369 and 1372) acquired the manor of Hacking by his marriage to the heiress Agnes de Hackinge. We find no records associating the Shuttleworths with the abbey. It is only several generations later that we find the Shuttleworths interacting on an equal social basis with the Towneleys, Nowells, Sherburnes and Catteralls.[xvii]

John Towneley (1350-1399).

The Towneleys arose from the old Deans of Whalley who were displaced by the translation of Stanlaw abbey to Whalley at the beginning of the fourteenth century. Roger Towneley was the last Dean of Whalley, and his brother Richard inherited land in Towneley near Burnley from his father Geoffrey, the previous dean.[xviii] The male Towneley line failed in the next generation, but was restored when John de la Legh married Cecilia (died 1323) the Towneley heiress, and took the name of Towneley. Richard, son of Cecilia, was Sheriff of Lancashire from 1375 until his death in 1379. His son and heir, John, married Isabella the heiress of Rishton (who died before 1397). John's second marriage was to Elizabeth who died 1401. A later branch of the Towneley family settled in Wakefield and preserved the Towneley plays. Much later Christopher Towneley of Carr Hall copied and preserved many old manuscripts. Cecilia's sister Agnes married John Catterall, younger brother of Richard Catterall of Mitton (b.1308, d.1381). John Towneley's dates look about right, but we also know that John was ordered abroad on the king's business in 1386, but he stayed in Kent, resulting in a forfeit of his manors which were only restored in 1397. During the period of his forfeiture he would have been unlikely to sponsor John Clerk. Turville-Petre [TURPET89] (p.170) has argued that the date of *The Destruction of Troy* is after 1385 on the basis of possible

[xvii] Following a dispute over the seating in Whalley Parish church somewhat earlier than 1534, John Towneley proclaimed "My man Shuttleworth, of Hacking, made this form, and here I will sit when I come, and my cousin Nowell may make one behind me if he please and my son Sherburne shall make one on the other side, and Mr Catterall another behind him; and for the residue the use shall be, first come first speed, and that will make the proud wives of Whalley rise betimes to come to church." These four families were closely related by marriage: three daughters of Ralph Catterall (of the Catterall brass in Whalley church) tie these names together: Anne married Sir John Towneley himself, Katherine married Henry Shuttleworth of Hacking and Grace married a Nowell of Read.[WHITAKER72] Johanna, daughter of John Towneley married first Thomas Sherburne of Stonyhurst, and secondly Ralph Shuttleworth of Hacking.

[xviii] The Deanship was hereditary

influence from Chaucer's Troilus and Criseyde. If we can accept this date then it is very unlikely that John Towneley was the patron of John Clerk.

Richard Catterall (1308-1381) and Richard Catterall (1382-1404).

We have two possible candidates here, grandfather and grandson (with an Adam in between). On the whole the grandfather looks rather too early and the grandson rather too late. If we put the *The Destruction of Troy* in the last quarter of the fourteenth century, then the first Richard would have been at least 67 (rather too old) and the later Richard at most 18 (rather too young) when John Clerk was sponsored. If we accept Turville-Petre's dating then the first Richard is definitely excluded.

Of the six anagrams found in the *The Destruction of Troy* all are at least minimally feasible candidates for the role of the patron of John Clerk. The dating evidences are somewhat against John Nowell, John Towneley, Alan and Richard Catterall, but acceptable for John (Johan) Catterall of Heton and John Shuttleworth (although his anagram is incomplete.) The length of the anagram for John Catterall of Heton is certainly impressive, but the only way to proceed is to probe the historical records. We have found no significant records of John Nowell of Read, and it was 150 years (4 or 5 generations) later before the Nowell family shone in the literary world. The only literary links of the family of John Towneley lies in the future acquisition of an estate in the parish of Wakefield alongside that of John Nowell's great grandson. The Towneleys of Wakefield preserved the Wakefield or Towneley series of mediaeval plays. John Shuttleworth had no obvious links with literature or the abbey, and was of a very recently established family. John Catterall of Heton (possibly alias John Cat of Edward III's court) seems eminently feasible, even though Heton is some 25 miles north west of Whalley. Accordingly we restrict our attention to John Catterall of Heton and explore the extensive links of the Catterall family with Whalley, the abbey, the Clerk family, the world of alliterative poetry of the late fourteenth century and subsequent literary developments in the north west.

Lancaster - a trivial point - it did exist in the fourteenth century - Henry of Lancaster played a major role in Edward III's wars in France. The Lancaster dynasty, long established, was greatly enhanced by the marriage of Henry of Lancaster's daughter and heiress, Blanche, to John of Gaunt, the third son of Edward III of England. The Catterall family had held various manors of the House of Lancaster for 200 years. Does the existence of Lancaster in the anagram imply “geographically close to Lancaster”, or does it imply held of the House of Lancaster (or both, which are demonstrably true)?

The manor of Heton in Lonsdale did exist at that time, just across the river Lune from Lancaster Castle ([BAINES36]). The modern name is Heaton. It is, however, some distance from Whalley and to support the relevance of the anagram we will have to demonstrate some close connection with Whalley. Originally Heton was part of Earl Tosti's manor of Haltune, but it passed quickly to the earldom of Lancaster and was feed in consideration of supplying carpenter services to Lancaster castle. In 1267 Roger de Lancaster had a grant of free warren in Ulverston and Heton. ([BAINES36] iv p.530) records that the lord of Heton in 47 Edward III (1374) paid 10 shillings aid towards the marriage of the eldest daughter of John of Gaunt. John of Gaunt's eldest daughter was Philippa of

Lancaster, born 31 March 1360, and her marriage to King João I of Portugal (João of Avis) did not take place until early in 1387. Froissart does record that there were two previous marriages attempted for Philippa, to King Charles VI of France and Albert, Duke of Bavaria, but both failed. Philippa would have been 14 in 1374, so it is possible that the Lord of Heton made a payment in anticipation of a projected marriage for Philippa, but it is also possible that Baines simply got the date wrong. Either way it is clear that Heton in Lonsdale was held of John of GauntDuke of Lancaster. The Catterall family succeeded to the manor of Heton about 1377 following the death of Edweard III, and held it until 1441 ([BAINES36]).

Henry de Grosmont (ca. 1300-1361) succeeded to the earldoms of Lancaster and Leicester in 1345 on the death of his father. In March 1351 he was created the first Duke of Lancaster and became one of the original Knights of the Order of the Garter. By deed dated 2 January 1360, he founded the Hermitage at Whalley Abbey to support a recluse, together with instructions for prayers for his soul after his death. The recluse and her successors were to be nominated by the Duke and his heirs. Isold de Heton (possibly the widow of John Cat?) under a Privy Seal of Henry V was appointed recluse in 1437, strengthening the link between Heton in Lonsdale, John Catterall and Whalley abbey.

In 1440-3 the Abbot of Whalley presented a petition to the king to dissolve the hermitage at Whalley quoting Isold breaking her vows 'two yeres or more' ago. This must have occurred around 1440.[xix]

There is a further link between the Catteralls and Heton when Richard de Catterall and Isabella de Eton are listed as paying a fine for a writ to the Duke of Lancaster in 1486.[xx]

[xix] **To the Kyng owre Sovereign Lord, &c.**

Be hit remembryd that the plase and habitacion of the seid recluse is within place halowed, and nere to the gate of the seyd monastre, an that the weemen that have been attendyng and acquayntyd to the seyd recluse have recorse dailly into the seyd monastre, for the livere of brede, ale, kychin, and other thyngs for the sustentacyon of the seyd recluse accordyng to the composityon endentyd above rehersyd: the whyche is not accordyng to be had withyn such religyous plascs. And how that dyvers that been anchores and recluses in the seyd plase aforetyme, contrary to theyre own oth and professyon, have brokyn owte of the seyd plase, wherin they were reclusyd, and departyd therfrom wythout eny reconsilyatyon. And in especyal how that now Isold de Heton that was last reclusyd in the seyd plase, at denomynatyon and preferment of owre Sovereign Lord and Kyng that nowe is, is broken owte of the seyd plase, and hath departyd thyerfrom contrary to her own oth and professyon, not willyng nor entendyng to be restoryd agayn, and so livyng at her own liberte by this two yere and more, like as she never bin professyd. And that divers of the wymen that have been servants ther and attendyng to the recluses afortym have byn misgovernyd, and gotten with chyld withyn the seyd plase halowyd, to the grete displeasaunce of hurt and disclanedr of the abbeye aforeseyd, &c.

[xix] Please hyt your Highness of out espesyal grase to grant to your orators the abbat, &c.

Whitaker also records a rather different Whalley legend about Isold; that she broke a leg on Whalley Nab trying to escape the attentions of monks from the abbey. Whatever the truth of the matter the financial support dedicated to the Hermitage by the House of Lancaster was transferred to the benefit of the abbey. The position of recluse was well worth having, she had home, food (including 24 loaves of bread and eight gallons of beer a week), a weekly cash allowance, and two servants.

Isold reappears in literature when Harrison Ainsworth in *The Lancashire Witches* uses her as a recurring malevolent ghost resolved to corrupt the innocent Alizon Device.

[xx] A writ was the official document, issued in the king's name, confirming the transfer of property. The fine for the writ is the fee paid for the writ.

In 1366 a John, son of John de Catterall made a feoffment of his lands [VCH] v.11, 192]. Richard, son of William Gest in 1367 claimed three messuages, 40 acres of land etc. in Goosnargh against John, son of John de Catterall, alleging a grant from Ralph de Catterall in the time of Edward II to Paulin de Catterall and Alice his wife. Their daughter Margaret was the mother of Richard Gest. A John Cat was in the service of Edward III in 1368/9 at the same time as Geoffrey Chaucer was listed as “a squire of the lesser degree”.. Another John Catterall held land at Habergham Eaves near Burnley before 1455. This is very close to Royle where a John Clerk existed at that time. John appears to have been a favourite Catterall name in upper Ribblesdale in the fifteenth/sisteenth century (Rathmell and Giggleswick), there are two testamentary burials of John Catteralls (died 1539 and 1623) in Giggleswick church, and Stephen Hamerton of Hellifield Peel appointed John Catterall his executor in 1630.

The Catterall family descended from the line of the lords of Goosnargh, pre-conquest residents of the area. The were also closely associated with the Athelston family, and a grant of land in Catterall from the second William of Lancaster in 1212 was to Michael Athelston, Beatrice de Goosnargh and Richard de Catterall. The three daughters of Bernard, Lord of Goosnargh, were Avice who married Michael de Athelston, Beatrice married to Hugh de Mitton and Iseult married to Richard de Catterall, son of Swain de Catterall.

Baines ([BAINES36] IV 464) notes that a bridge over the Wyre connecting Catterall Hall with the church of St. Helen is recorded in the charter of Robert Fitz Bernard, of Catterall, in the reign of King John [1199-1216]. In the same charter Robert Fitz Bernard gave a chapel of St. John the Baptist to the Knights Hospitaler. On p.472 he adds: 'Robert Fitz Bernard in the reign of King John grants to the Hospital of St. John of Jeruselem the manse of St. John the Baptist super Howarth with the chapel of St. John the Baptist with the desmesnes.apos; The remains of the chapel are near Pilling.

The main Catterall residence was at Little Mitton from about 1310. The present manor house was built around 1495 about half a mile from the west gate of Whalley abbey. From 1310 the Catterall family held the manor of Little Mitton of the House of Lancaster. Richard and Adam de Catterall held the manor of John of Gaunt.

Of the Catteralls at Whalley abbey, we find a Catterall monk together with a Savil at end of fourteenth century, and later “de mensa Ric. Catterall” in 1478 accounts [Whitaker I, 120] A Fr. Rad. Catterall in 1530 accompanied Abbott Paslew on a visit to Furness.

At the dissolution, the land “Catterall Wypes” was included in the sale of abbey properties to the Ashtons[xxi]

[xxi][Letters patent of King Edward VI by which the manor of Whalley with its apputenances was sold by the crown to Richard Assheton and John Bradyll, both of Whalley]

> … Catterall wypes, Wheatley, Newfelde ... le Kytchyn Garthes, le Prior's Orchard ...le Proctors stable de Blakborne …

The OED which does not include “wype” as a piece of land - only the bird.

There were early disputes between the abbey and the Catteralls. I quote (loosely) from [WHITAKER72] (vol. 2, pp.22-23) 1338-9 Lora de Catterale and her sons Ralph and John drove away the Abbott of Whalley and his servants when they came to collect and carry the "garbas decimalesde quodam campo vocato Kirkefurlong," in Little Mitton, and that the said Lora refused to pay the tythes of hay from certain meadows called "Kolmes et oxenlache infra fines et limites de Whalley per non modicum tempus." Several writs and a pleading belonging to this case are preserved in the Add. MS 10374, f.90 b and ff. 104b to 106b. Lora's husband, Alan, had died in 1322, so we must conclude that Lora in her dower state was acting on behalf of her eldest son Richard with the help of his younger brothers, Ralph and John. Possibly Richard was then living at the earlier family residence at Catterall Hall. At this time work had barely commenced on the construction of the abbey,[xxii] and the community was still housed in the property of the old Deans of Whalley. Catteralls arrived in Little Mitton in 1310, when Alan de Catterall acquired the manor on his marriage to Lora de Pontchardon. Perhaps, not surprisingly, there were on-going boundary disputes 20 years later.

Jo de Quallay (John of Whalley) and Alan de Cathurton (Alan de Catterall) were co-witnesses to a deed in 9 Edward II, (1315-6) [see Whitaker p.353] - this is certainly too early to be John Clerk, even if we were to read Turville-Petre's John Clerk as John of Whalley, clerk. A clerk is reasonably one witness, together with one of the local gentry as a second witness. The Whalley family did not achieve knightly status until the early seventeenth century.

Nicholas Towneley, third son of John Towneley of Townley married Elizabeth Catterall of Mitton (sister of the Ralph of the Catterall brass in Whalley parish church,[xxiii] and widow of William Tempest of Broughton, between Gisburn and Skipton). Of their two sons, the eldest, Richard, living 30 Henry VIII, married Margaret, daughter and heiress of John Clerke of Royle, so that Royle became the seat of the Towneleys of Royle.[xxiv] We may conclude from this that the John Clerk of Royle mentioned by Turville-Petre must have been of mature age about 1450, and that he could not have been the author of the *The Destruction of Troy*. It is of course possible that his father was also a John and the author of the *The Destruction of Troy*, but I have been unable to trace the Clerkes back any further. It is possible that the Clerk family name at Royle had been derived from the John who was a clerk at Whalley Abbey. We do, however, have a close relationship established between the Catteralls and the Clerke family one or possibly two generations after the *The Destruction of Troy*.

Jennet Parker, widow of William Habergham of Habergham Eaves, adjoining Royle, who was living in 1509-10, married a James Catterall. A John Catterall sold his land in Habergham Eaves to Hugh and William Halstead somewhere around 1555.[xxv] It would appear reasonable that John was the

[xxii] The foundation stone of the conventual church was laid on June 12, 1308.

[xxiii] There is brass plaque on the wall of the old Mitton chantry at the head of the north aisle (the chantry at the head of the south aisle was appropriated to the abbey) portraying Sir Ralph Catterall, his wife Elizabeth and their nine sons and eleven daughters. The plaque was recorded at Little Mitton hall in 1659, but then disappeared until it was found by Whitaker at Catterall hall near Garstang early in the nineteenth century and replaced by him in the church.

[xxiv] The younger son, Nicholas, was chaplain to Henry VIII and clerk of works to the building of Cardinal (now Christ Church) College at Oxford.

[xxv] [Bennett, Hisory of Burnley, Vol II, Appendix IV] quotes (Aug. Misc. Bks CLXXX m2)

son of James and Jennet. However, this cannot be the James, son of Thomas Catterall of Little Mitton, who was passed over in the succession, as he would only have been of age 1 year in 1555.

John Catterall of Giggleswick died 1539, and John Catterall of New Hall Rathmell, who died 1623 do not appear to fit the Burnley role. William Catterall of New Hall, Rathmell who died 1591 is closer to the dates, and may possibly have had a brother John, but I have found no record of one.

The grandfather of the passed-over James, John (b.1478, d.1517 aged 39) had a brother, also James of whom nothing is known, who might be a reasonable candidate for the second husband of Jennet Parker sometime around 1510, which would make his son John a first cousin of Thomas Catterall. This is probably the best candidate for the Burnley line. I have found no evidence for a continuation of the line in Burnley, and the sale of the property in Habergham Eaves is consistent with John producing no heir.

The Princeton copy of the "The Siege of Jeruselem" came from the Petre family of Dunkenhalgh near Clayton-le-Moors, not far from Whalley. The main Petre family appeared too late upon the scene[xxvi] to have been directly connected with this fourteenth century work, but see the next point.

Another branch of the Petre family does exhibit several connections with both the Catteralls and with Heton in Lonsdale. John Catterall of Heton in Lonsdale passed the manor of Heton to Roger Brockholes (son of John de Brockholes, living 1403) in 1441. The primary residences of the Brockholes were then the manors of Higher and Lower Brockholes.

Brockholes, on the northern bank of the Ribble, a few miles west of Whalley (not to be confused with Brockhall just across the river from Whalley) was held of the Diocese of Manchester by the Lathom family. It was held of the Lathoms by Award de Brockholes whose son, Roger, was living in 1246. The manor descended in the Brockholes family until early in the fifteenth century when it was divided between two sisters. Margaret, married to Roger Elston receiving Old or Higher Brockholes. This Roger was probably the Roger de Brockholes who received the manor of Heton in Lonsdale from John Catterall. It then descended in the Elston family until Robert died in 1662.

The Elston name was a shortening of Ethelston or Athelston.[xxvii] and the original grant by William Second Earl of Lancaster (1200) of land in Catterall & Halcath to the Catterall family was to Michael

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> Item. These are parcels of land lying in our park/parish (check!) - 1 tenement in Burnley Wood or Habergham Eaves of the tenure copyhold late in the tenure of John Catterall of the annual value of 20s. Sold to Hugh Halstead and William Halstead.

Another item in the same document is dated 25 March, 7 Edw. VI (1553-4.)

[xxvi]Dunkenhalgh descended in the Walmesley family until Francis, son of Bartholomew died in 1701 without issue, when the estate went to his sister Catherine who had married Robert seventh Lord Petre, from whom it passed to George William Petre born 1766.

[xxvii]The grant of the land in Ethelston appears to date back to Saxon times. William Elston at the beginning of the seventeenth century writes ["Mundana Mutabilia", Harl Ms 1727, fol. 336]

> It was told me by Mr Alexander Elston, who was uncle to my father, and son to Ralph Elston my great grand-father, that the said Ralph Elston had a deede or copie of a deede in the Saxon tongue, wherein it did appear

Athelston and his wife Beatrice Catterall, together with Richard de Catterall. In 1694 Brockholes was held by Thomas Winckley and passed eventually to his daughter and heiress, Frances, who became Lady Shelley on her marriage to ir John Shelley in 1807, and who died in 1873. At that time the Winckleys also held Catterall, and it was from Lady Shelley, then living at Catterall Hall and claiming descent from the Catteralls, that Whitaker recovered the Catterall brass now in Whalley parish church. After the death of Lady Shelley, the Brockholes estate was sold to Edward Petre who passed it to his son Oswald Henry Philip Turville-Petre of Husbands Bosworth in Leicestershire.

The Catterall estate was originally from William II of Lancaster, and was still within Gaunt's estate sat the end of the fourteenth century. Richard, (b. 1308, d.1381) was the father of Alan (the eldest son, but he died one year before his father in 1380) who married Isabella de Halton (Whitaker Craven] and thus acquired the manor of Halton, and Adam (the second brother, d. 1397) who married Katherine, widow of William Marton and held Little Mitton until his death in 1397, when it passed to his son, another Richard (b. 1382, d. 1404). It seems reasonable that the John Catterall who was the father of the John Catterall who held lands in Wrightington in 1367 (see below) was a younger brother of the first Richard.

The Catterall estates at Wrighington were close to the Lathom stronghold of the Stanleys and there were both disputes and joint lordship between the Lathom and Catterall families. IN 13.. the Lathom estates at Wrightington passed to the Stanley by the marriage of the Lathom heiress to ... Stanley.

[VCH vi p.170, notes 2 and 3] In 1334 Richard de Catterall claimed a mesuage in Wrightington against Sir Thomas de Lathom and Eleanor his wife. In 1356 William de Kirkby, Thomas de Lathom the elder, Nicholas de Boteler, Richard de Catterall and Edmund de Greystock were named as lords of Wrightington. The lordship was held in common.

Chauntrell was sergeant-at-law to Stanley.

Talbots. (Q.need something here.)

John Cat was in the service of Edward III at the same time as Chaucer in London. A James Cottrell was in the service of Gaunt in 1381-7 and accompanied him abroad on at least two occasions, 1381 and 1386 - probably via London.

Chethams of Nuthurst - Thomas Chetham caused the manuscript of *The Destruction of Troy* to be copied (by his son John?). Thomas was in the service of Stanley. The Chetham reference in Whitaker. The marriage links between Catterall and Chetham via Sherburne.

Stanley - Chauntrell and Chetham connections - service of Richard II

The manor of Dunham-Massey was originally held by Hamon Massy, first baron of Dunham, under Hugh Lupus, earl of Chester in the reign of William I. The manor then passed successively through

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that King Ethelston, lyinge in camp in this county upon occa¸on of warrs, gave the land of Ethelston unto one to whom himselfe was Belsyre.

a total of five Hamon Massy descendants (all named Hamon Massy) until the last, dying without male heir, the manor was divided among many co-heirs. Henry de Grosmont, first Duke of Lancaster bought out all the co-heirs, re-united the estate and assigned Dunham to Roger le Strange of Knocking. From here the manor became divided again between Fittons, Duttons, Venables and Masseys, until Robert Booth, a younger son of John Booth of Barton acquired several properties from Sir William Venables (died 1421) by marriage to his daughter and co-heir, Dowse Venables. This Robert Booth then laid claim to the Dunham estate, and the matter was finally settled when Sir Thomas Stanley and William Chantrell, his sergeant-at-law, acquired half of Dunham for themselves in 1433, Robert Booth gaining the other half. William's younger brother John married Lucy, sister of Robert Booth and (somehow) the remainder of the Dunham estate passed to the Booths. The descendants of William Chantrell descended from the line of Catheralls of Horton, when John Catherall acquired the manor of Bache, just south of Chester, and started the line of Chantrells of Bache. John's great grandson continued the alliance with he Booths when he married Elizabeth Booth (whose name appears in the manuscript of *St. Erkenwald*), great great great granddaughter of Sir Robert Booth of Dunham Massey [the Booths had a run of very short-lived descendants, William, William and George who held the manor for only 7, 12 and 12 years respectively]. Catheralls also held land at Neston, very close to Dunham Massey.

Booths - Elizabeth Booth is named in the manuscript of St. Erkenwald. She married a Chauntrell. What about Bowker?

Elizabeth Booth, daughter of George Booth of Dunham) married William Chantrell de Bache [see Visit. Chesh. 1580, p.61 and Harl. MSS, 1585, fo. 76b], a descendant house of the Catheralls of Horton near Leek in Cheshire, who were descended from a younger son of the Catteralls of Catterall and Little Mitton in Lancashire, and a (distant) relative of the I. Catterall of Heton in Lonsdale, LC for whom *The Destruction of Troy* was made.

Putter, Intro, p.34 - 'The unique MS of *St. Erkenwald* was owned in the sixteenth century by Thomas Bowker, a priest in Eccles, Lancashire. A note in the margin [of the MS] also contains the name of Elizabeth Boothe of Dunham-Massey [Luttrell, 1958, 39]. The neighbours of the Booths ... were the Newtons and Humphrey Newton (died 1536) produced some poems in the alliterative style and diction of *Sir Gawain and the Green Knight* [R H Robbins, 'The poems of Humphrey Newton Esq.apos;, Publications of the Modern Language Association of America, 65, 249-81 (1950); 'A Gawain Epigone', Modern Language Notes, 58, 351-6 (1943); E Salter, p.62]'.

Leek area - this is the SE Cheshire / NW Staffordshire area of the Nero A.x manuscript according to Mc???*****. Catteralls were established at Horton, 2 miles form Leek in the fourteenth century, claiming descent from the Catteralls of Catterall and Little Mitton. Catteralls also held lands in Neston near Dunham Massey.

Gisburn - links to the Catteralls of Halton, Rathmell (2 - New Hall and Hollin Hall), Giggleswick, and Cal Newton. John Drurye, schoolmaster at Gisburn, owned *The Destruction of Troy*, a Nowel founded Giggleswick Grammar with a Catterall on the first Board of Directors. Interest in education and learning. In conjunction with Mitton and Burnley, Gisburn is surrounded.

Interest in education and learning. Catteralls later took part in encouragement of education and learning in the Whalley area. John Drurye, schoolmaster at Gisburn, owned *The Destruction of Troy*, and the Drury family were living in Elston and Brockholes in thirteenth century, a Nowel founded Giggleswick Grammar School with ..... Catterall on the first Board of Directors. Catteralls inter-married with Nowells who funded Edmund Spenser at Merchant Taylors and Pembroke College. The "famous" Nowells, Alexander, Dean of St. Pauls and close friend of Isaac Walton, (first catechism,) and Lawrence, Dean of Lichfield, and preserver of the only copy of Beowulf and himself the author of an Old English dictionary and author (with Jocelyn?) of the revival of Old English studies. Lettice Nowell married Laurence Spenser, dean Nowell left money to Edmund Spenser, "a poor scholar at merchant Taylor's school"[McKay pp.307-7], Edmund Spenser occurs in the account book of Robert Nowell in 1568-9 as receiving money at merchant Taylors and also at Pembroke hall, Cambridge. Grace Catterall married Roger Nowell in 15... [Whitaker, Catterall pedigree]. All suggestive of an on-going interest and involvement in learning by the Catteralls.

At the time of the Dissolution the Catteralls were staunch Catholics - the note that Thomas Catterall, John Towneley and his wife (Anne Catterall) and Thomas Southworth of Salmesbury were the prominent adherents of the old religion,[xxviii] others would all convert if they did. Catterall died 1579, just before Towneley and Southworth were imprisoned for recusancy - and eventually aided and extricated by influence of their neighbour Alexander Nowell, Dean of St. Pauls. Move to avoid wealth going to the king as fines and confiscations for recusancy - Thomas Catterall's son, James suddenly became a daughter, Jane, and at an early time (1570-ish?) the Catterall estates passed to a daughter on marriage to a Sherburne. Southworth later (date?) tried to do the same and disinherit his son, …, but Sir Francis Walshingham wrote to the Bishop of Chester warning him and instructing him to prevent it.[xxix] The Catterall brass in Whalley church, discovered by Whitaker around 1824 at Catterall Hall in Wyresdale - possaibly came from the abbey at Whalley after the dissolution and was preserved by the Catteralls. All suggestive that the Catteralls were closely involved in religious matters. The brass is now in Whalley parish church.

De la Legh - links to Cheshire - and Hapton or thereabouts - took over the Towneley estates by marriage to a daughter (with change of name to Towneley at the same time as another Towneley daughter married a Catterall from Catterall or Mitton. A Chauntrell was bound over to keep the peace towards a son of a De la Legh - security was provided by two Masseys. Masci possibly associated with the Gawain-poet.

Other religious establishments. A James Cottrell was abbot in Dublin about end of fifteenth century. No trace at Sawley. What about Barnoldswick? Catteralls donated a chapel in twelfth century to the hospital of St. John of Jeruselem[xxx] Churchtown across the Wyre from Catterall Hall - the Catterall

[xxviii]**********

[xxix]Sir Francis Walsingham to the Bishop of Chester, March 2, 1384: " ... inquire into the reason why Sir John Southeworth is minded to disinherit his son ... and take care to prevent his doing so" - [Baines I, 540.

[xxx][Baines IV, 472] in a deed without date," Robert, son of Bernard in the reign of King John, grants to the hospital of St. John of Jeruselem the manse of St. John the Baptist super Howarth with the chapel of St. John the Baptist with the desmesnes, viz from the bridge of Haweyd ... And one bovate of land in Hoton upon Ribel". Is this a mistake for Heton upon Lune.

pew. Seating in Whalley church ordered by John Towneley - Towneley, Shuttleworth of Hacking, Nowell of Read, and Catterall - Catterall wives throughout.

All these points together strengthen the belief that John Catterall of Heton in Lonsdale near Lancaster could have been the patron of John Clerk of Whalley, and that the Catterall family was associated over a wider area than that of Whalley area with patronage of learning and the church.

7. Conclusion

We have identified the patron of John Clerk of Whalley.

8. Acknowledgements

Thanks etc.

This document was prepared in Extensible Markup Language (XML) using the Oxygen XML Editor 13.2, and conforms to the Docbook 5.0 specification. Conversion to formatting objects (FO) was achieved using SAXON 6.5.5 with the Docbook XSL stylesheet 1.78.1 (with appropriate customisation,) and transformation to Portable Document Format (PDF) was achieved using XEP 4.10 or Apache ???.

A. Probability of Authorship by John Clerk of Whalley

The probabilities of the letters in the sequence IOHANNESCLERKDEWHALALE occurring as the first letter of a line are calculated from Table C.1, "Character Frequencies in the Text of *The Destruction of Troy*". The character "A" occurs 3043 times at the start of a line, and there are 14,052 lines in *The Destruction of Troy*, so the probability of finding a line starting with "A" is 3043/14,052 or 0.2166552804. The probability of finding three lines starting with "A" is therefore 0.010155269. Since this sequence is not an anagram, and the order in which the letters in the sequence occur is fixed, the probability of the sequence occurring by chance is simply the product of the net individual probabilities recorded in Table A.1, "Probability of finding the ordered sequence IOHANNESCLERK-DEWHALALE".

Table A.1. Probability of finding the ordered sequence IOHANNESCLERKDEWHALALE

Letter	Frequency of occurrence at start of a line	Number of occurrences in sequence	Probability per occurrence	Net Probability
A	3043	3	0.216552804	0.010155269
C	132	1	0.009393681	0.009393681
D	157	1	0.011172787	0.011172787
E	208	4	0.014802163	0.000000048
H	983	2	0.069954455	0.004893626
I	403	1	0.028679192	0.028679192
K	70	1	0.004981497	0.004981497
L	169	3	0.012026758	0.000001740
N	366	2	0.026046114	0.000678400
O	567	1	0.040350128	0.040350128
R	73	1	0.005194990	0.005194990
S	580	1	0.041275263	0.041275263
W	1343	1	0.095573584	0.095573584

Product of Net probabilities = $3.491242354 \times 10^{-35}$. Reciprocal = $2.864309889 \times 10^{34}$

The product of the 22 probabilities (allowing for four occurrences of the letter “E” etc.) is about 3.5×10^{-35}, or 2.9×10^{34} to one against the sequence being encoded purely by chance. These odds are so great that the identification of the name John Clerk of Whalley is beyond any question, even allowing for the possible worries recognised by Turville-Petre.

B. Anagrams

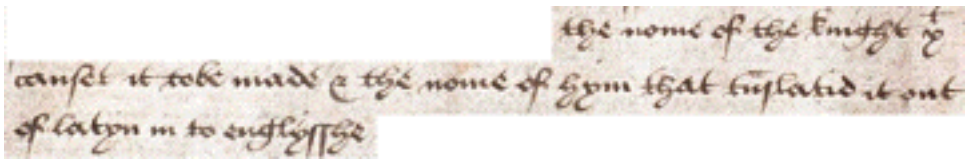
Although first published in 1921, Kenneth Sisam as late as 1970 ['Fourteenth century Verse and Prose', Oxford Unversity Press, repr. 1978, p.xli] was able to write

> Whether Sir Gawayne and *The Destruction of Troy* are from the same hand is still seriously debated. Both are alliterative poems; but it is impossible to read ten lines from each aloud without realizing the wide gap that separates their rhythms. The facility of the author of the Destruction is attained at the cost of surrender to the metre. Given pens, ink, vellum, and a good original, he could go on turning out respectable verses while human strength endured. And his meaning is all on the surface, the work does not improve on better acquaintance.[i] The author of Sir Gawayne is an artist who never ceases to struggle with a harsh medium. He has the rare gift of visualizing every scene in his story: image succeeds image, each so sharply drawn as to suggest that he had his training in one of the schools of miniature-painting for which early England was famous. It is this gift of the painter that, more than likeness of dialect or juxtaposition in the manuscript, links Sir Gawayne with The *Pearl*.

Physical Description.

Bound volume. Paper, 11 3/4 x 8, ff. 214, originally ff. 216, written by one scribe in two styles of handwriting, (1) a set and formal book hand (in the Prologue and occasionally through the work); (2) a quick current hand; (1) is ruled with bodkin; (2) is not ruled, margins in all cases are marked by fold-creases, in single cols. of 32-39 lines, each about 9¼ x 4½, signatures (B-Y), catchwords (from 2, 3 verso) every page, foliation by (?) Rev. Jos. Stevenson, S.J., 1-150 in ink, thereafter in pencil, 151-215 (f. 181 omitted), marginalia, much cropped, mutilated and repaired carefully at the beginning (margins only), 11, 2. [fol. 90] (text involved), and at the end (margins only) soiled from much handling, otherwise well preserved, fol. sec. Maistur. Early Cent. XVI. Binding: Millboards, covered spattered calf, red spattered edges, recently re-backed. Cent. XVII. [For detailed collation see: John Young and P. Henderson Aitken, A Catalogue of the Manuscripts in the Library of The Hunterian Museum in The University of Glasgow. (Glasgow, 1908), p. 309.]

Figure B.1.



[i]This somewhat disparaging view by Sisam (first published in 1921) of the merits of the author of *The Destruction of Troy* should perhaps be offset by that of Oakden (published 1935) that a “careful study of the poem certainly repays the amount of effort needed, for it is a work full of energy and poetic power”. Nevertheless, I think we must agree with Sisam that the two works (*Sir Gawain and the Green Knight* and *The Destruction of Troy*) are so different in feeling and technique that they must be by different authors.

An extract from the bottom of the second page of the MS Hunter 388 (V.2.8) in the Unversity library at Glasgow. The extract reads:

The xxxiiij. boke of the lesyng that was made to kyng
Nawle & of the dethe of his son palamydon the dethe of
Agamynon & the exile of dyamede by Þere wifes
The xxxv. boke how orest toke venionse for his fader dethe
The xxxvj. boke & the last how hit happit vlixes aftur the
sege whiche endis in the story with the nome of the knight Þat
causet it to be made & the nome of hym that translatid it out
of latyn in to englysshe And how long the sege last with the
nowmbur of grekes & troiens that were slayn & what kynges
Ector slogh whom paris slogh whom Achilles slogh whom
Eneas slogh whom pirrus slogh And “Laudes deo”

Thurville-Petre has shown convincingly that *The Destruction of Troy* was written by John Clerk of Whalley. It has been generally assumed that the name of the author was John Clerk (of Whalley), rather than John, (clerk of Whalley). Indeed there was was often little or no difference between the two descriptions, depending upon the social status of the individual: in the lower strata of society an occupation was generally sufficient to identify a particular 'John'. However, the occupation of 'clerk' demanded some education, and John 'clerk' certainly demonstrated a confident knowledge of Latin, classical history and the north western tradition of alliterative poetry in his very competent translation of the “Gvidonis de Colvmna, Historia Destrvctionis Troiae”. The position of 'clerk' in an ecclesiastical or noble house was often adopted by the younger sons of the minor gentry: the 'knights' of the English countryside. Whist there were several knightly families in the Whalley area (the Nowells of Mearley and Read, the Catteralls of Catterall and Little Mitton, the Towneleys of Burnley etc.) there was also the Cistercian abbey at Whalley, thriving at the end of the fourteenth century in the shadow of a very literate prior, John Lyndley, and it would appear very likely that 'John' was clerk at the abbey. However, in the introduction to the manuscript (Hunter 388 (V.2.8)at Glasgow University Library) there is the promise that the manuscript contains “the nome of the knight Þat causet it to be made & the nome of hym that translatid it out of latyn in to englysshe”.

It appears probable therefore that 'John' was a younger son of a local family of some consequence, who gained sufficient education to become clerk at Whalley abbey. It is perhaps supportive of this that although a copy of “Gvidonis de Colvmna, Historia Destrvctionis Troiae” might very well be found in the library of a major abbey, it would be much less likely in the household of a north western knight. Furthermore, we might now expect to find some strong connection between the family of the “knight Þat causet it to be made” and the abbey.

Thurville-Petre discovered the name 'iohannes clerk de whalele' in the first letters of the first twenty two books of the poem, but so far the “nome of the knight Þat causet it to be made” has eluded detection. Another extant problem is the family name of the clerk, John. In this Appendix it is demonstrated that there is indeed the name of a knight of Lancashire hidden in the text in the same

place, and as a simple extension of the way “iohannes clerk de whalale” is hidden, that the knight's family had their headquarters within sight of Whalley abbey, that a member of this family was a monk at the abbey at the end of the fourteenth century, and that there is also a possible indication in the text (repeated in that of *Sir Gawain and the Green Knight*) of the family name of 'John'.

Table B.1. Anagrams in *The Destruction of Troy*

Anagrams - see below for key				**[1]**		**[2]**		**[3]**		**[4]**		**[5]**		**[6]**		**[7]**	
Book 1	In Tessaill	I	N	I		I		I				I		I		I	
line 100	A prouynce	A	P							A							
Book 2	Of nygrama	O	F	O		O						O				O	
line 402	And all	A	N					A			N				N		
Book 3	Here tellus	H	E	H			E	H			E	H		H		H	
line 664	How the	H	O														
Book 4	All charge	A	L	A			L			A			L				L
line 1008	Ercules	E	R						R					E			
Book 5	Now as	N	O	N		N						N		N			
line 1508	W(i)t(h) his	W	T						T		T						T
Book 6	Now Priam	N	O	N								N					
line 2046	The greme	T	H			T		T		T				T		T	
Book 7	Envy Þ(a)t	E	N	E								E					N
line 2724	Ryxles full	R	Y			R		R		R					Y		
Book 8	Sone after	S	O	S									O		O		O
line 3531	Þat the	Þ	A				A		A		A						
Book 9	Comyn was	C	O	C		C		C		C						C	
line 4029	Was wastid	W	A									W		W			

Book 10	Lenge We	L	E	L		L		L		L		L									
line 4140	How thies	H	O												O	H					
Book 11	Every wegh	E	V	E										E		E					
line 4547	Listen a	L	I			L		L		L											I
Book 12	Robbet was	R	O	R		R		R				R				R					
line 4783	All the	A	L								L				L						
Book 13	Kyngys and	K	Y	K												K					
line 5152	All the	A	L				L	A		A		A									
Book 14	Dresse will	D	R	D		D		D		D		D				D					
line 5559	How thai	H	O																		
Book 15	Ector the	E	C	E			C		C	E											
line 6065	When the	W	H																		H
Book 16	Wen fortun	W	E	W			E		E							W					
line 7125	fful tid	F	F																		
Book 17	Herknys	H	E	H																	
line 7346	And I	A	N				N														N
Book 18	Aas hit	A	A	A												A					
line 7553	When the	W	H				H														
Book 19	Lystenes a	L	Y	L																	
line 7811	How hit	H	O				O									H					
Book 20	After the	A	F	A		A															
line 8182	Þen waknet	Þ	E																		E

Book 21	Lengys here	L	E	L															
line 8421	I shall	I	S				S												S
Book 22	Euery Weg	E	V	E															
line 8971	Lengis	L	E			L													E
Book 23	The tyme	T	H																
line 9401	Vnto batell	V	N				N											V	
Book 24	The Secund	T	H															T	
line 9629	Þe Troiens	Þ	E				E												
Book 25	When the	W	H																
line 9865	The Grek	T	H			T													
Book 26	When paste	W	H				H												
line 10134	ffro the	F	F																
Book 27	Paris Priam	P	A				A												
line 10789	Hade no	H	A																
Book 28	Now Þe	N	O				N												
line 11152	Keppit full	K	E																
Book 29	Than carpis	T	H			T													
11718	All the	A	L																
Book 30	All this	A	L																
line 12166	Þe	Þ	E				E												
Book 31	Hyt fell	H	Y																
line 12464	Was past	W	A				A												

Book 32	Now of	N	O				O														
line 13389	When he	W	H																		
Book 33	As Vlixes	A	S				S														
line 13803	W(i)t(h)	W	T																		
Book 34	Thys ylke	T	H			T															
line 12553	There wont	T	H																		
Book 35	Agamynons	A	G			A															
line 12938	Þat ydumi	Þ	A																		
Book 36	Vlyxes the	V	L																		
line 13107	ffro the	F	F																		

Note. Books 34, 35 and 36 are bound out of sequence in the manuscript and come between Books 31 and 32. The line numbering in the manuscript is preserved in this table, but the books are ordered correctly.

[1] - IOHANNESCLERKDEWHALALE

[2] - IOHNCATTERALLHETONLONSDALELANCASTER

[3] - RICHARDCATTERALL

[4] - ALANDECATTERALL

[5] - JOHNNOWELLREAD

[6] - JOHNTOWNELEY

[7] - IOHNSHUTTLEWORTHDEHACKIN (the final 'G' is missing)

In any analysis of the probability of the occurrence of anagrams, the size of the alphabet is a minor but significant factor. This analysis has ben carried out using the diplomatic transcription made by Hiroyuki Matsumoto in 2002 (University of Michigan press, ISBN 0-472-00276-7). In this copy, the character ȝ has been replaced (almost) systematically by 'gh' or 'z' as appropriate, (yogh remains on lines 1274 and 13957), but the character 'Þ' has been retained throughout, although 'th' occurs frequently (e.g. lines 1274 and 13957. Abbreviations have been expanded, with the expansions placed in parentheses, and on one or two occasions there is some doubt as to the second character on a line - should it be the one in the manuscript or the one in the expanded version. We have chosen to use the expanded version, but the problem arises so infrequently that it has negligible effect on

the analysis. The character 'dflourish' frequently replaces 'd' in the text, but no distinction has been made here.

The equivalence of 'i' and 'j', and of 'u' and 'v' requires a little prior investigation.

Use of 'i' and 'j'.

The character 'j' only occurs in two very specific situations: very frequently in roman numerals (e.g 'iij.d' on line 208), and on only four occasions when the sequence 'ij' replaces the double 'ii' ('seijt' on line 2511, 'ewsebij' on line 2622, 'ingijd on line 4690, and 'dromoudarijs' on line 6207) accordingly the character 'j" has been eliminated from the alphabet we use in this analysis.

Use of 'u' and 'v'.

It appears that 'u' and 'v' are used interchangeably throughout the text, both as a vowel and a consonant. The character 'v' is used either as a vowel (replacing 'u' in modern English), e.g vppon on line 6, and 'vntrew on line 47, or as a consonant, e.g line 304 “And thurgh voidyng of venym w(i)t(h)vomett(es) grete”. the character 'u', however, is used in (at least) six different ways, and these are listed below with one or two examples of each from the first few lines of the poem.

1. in place of the consonant 'v', .g. line 2, euer, line 31, haue

2. as a 'u', .g. line 18, sum, line 33, full

3. as an 'au' diphthong, .g. line 3, graunt, line 16, chaunce

4. as an 'oy' diphthong, .g. line 11, out, line 16, throughe

5. in place of the consonant 'v', .g. line 2, euer, line 31, haue

6. as a double 'uu' to represnt two contiguous sounds, .g. line 49, v(er)tuus

In this analysis we treat 'u' and 'v' very simply as two distinct characters

Use of 'q' and 'w'.

The character 'w' appears as in its own right as in line 4, “And wysshe me with wyt Þis werke for to ende”, or in combination with 'q' where it appears to replace the letter 'u' in the northern version, 'qu' of 'wh' - as in 'qwiles' on line 39, 'qwhom' on line 1685, 'qwat' on line 1793. The character 'q' can also appear in is own right as in 'beqwethe' on line 633, 'qwarters' on line 1970, and also together with 'u' as in 'quycke' on line 617 and 'conquest' on line 1877.

Again, we treat 'q' and 'w' as simple characters, with no distinction between the uses. a common spelling of 'Whalley' was 'Quallay' at the end of the fourteenth century.

Use of 'g'.

The letter 'g' occurs in two ways, as 'gh' replacing 'ȝ' and in its own right as in 'mageste on line 1 and line 40, “Þat w(i)t(h) the Grekys was gret of grice comyn”. We gloss over the difference and treat the letter 'g' as one character.

Use of 'x' ad 'z'.

The characters 'x' and 'z' occur frequently in proper names, e.g Zeferus on line 1057, Duke Melioz on line 4095, Alexaunder on line 314, Pollox on line 1014, but also as 'exulent' (line 2432), 'next' (line 13), 'citizens' (line 3262) and 'wallez' (line 4694). 'qw' or 'qu' is also replaced by 'wh' on occasions, e..g 'when' on line 28 and 'while' on line 56. The characters 'x' and 'z' are treated here as simple characters.

“IOHAN CATTERALL HETON LONSDALE LANCASTER”

In the selection above, the distribution of letters is

Table B.2. Occurrences - first 2 characters of first 2 lines of the first 25 Book

Character Occurrences		
Frequency of Occurrence	Letter(s)	No. of letters occurring with this frequency
0	B,G,M,Q,X,Z	6
1	D,K,P,U	4
2	C,S,V	3
3	I,Y,Þ	3
4	R,F	2
5	T	1
6	W	1
7	N	1
8	L	1
9	---	0
10	O	1
11	A	1
12	---	0
13	E,H	2

Table B.3. Occurrences - first characters of first 2 lines of the first 25 Books

Character Occurrences		
Frequency of Occurrence	Letter(s)	No. of letters occurring with this frequency
0	B,G,M,P,Q,U,X,Y,Z	9
1	D,F,K,O,S,V	6
2	C,I,N,R	4
3	Þ	1
4	T	1
5	E,H,L	3
6	W	1
7	---	0
8	A	1

Table B.4. Occurrences - of second 2 character of first 2 lines of the first 25 Book

Character Occurrences		
Frequency of Occurrence	Letter(s)	No. of letters occurring with this frequency
0	D,B,G,K,M,Q,W,X,Z,Þ	10
1	C,I,P,S,T,U,V	7
2	R	1
3	A,F,L,Y	4
4	---	0
5	N	1
6	---	0
7	H	1
8	E	1
9	O	1

Table B.5. Occurrences - first 2 characters of first 50 lines of Book 17

Character Occurrences		
Frequency of Occurrence	Letter(s)	No. of letters occurring with this frequency
0	G,M,Q,V,X,Z	6
1	B,K,Y,R,Þ	5
2	C,D,P,S	4
3	O	1
4	I,L	2
5	U	1
6	E	1
7	W	1
8	---	0
9	N	1
10	T	1
11	F	
12	---	0
13	H	1
14	---	0
15	A	1

Non-occurrence of Characters.

It is obvious from the above tables that the most frequent feature of the occurrence of characters is the NON-occurrence of about 6 characters in the first two positions on a line (the characters B, G, M, Q, X, Z), and it is interesting to look at the probability of not finding any of these letters in the text under examination. All six characters are to be found in character positions one and two elsewhere in the poem, but 'z' and 'x' only rarely, and in proper names.('xz' and 'x') or roman numerals ('x'). Both appear more frequently and more generally in other positions in the lines.

There are only two possibilities, either a character is found, or it is not, and the probability of finding exactly r occurrences of the character selected from a population of 1/p, with n trials is derived from the binomial case as:

P(r) = (n!/(r!(n-r)!))p(r)((1-p)^(n-r))

For large n and small p, when np is not negligible, this reduces to the Poisson distribution function:

P(r) = ((np)^r)exp(-np)/r!

For an alphabet of 24 characters, p=0.01467, and the probablity of finding exactly r occurrences of any particular character is given in the table below in both the exact (binomial) case and the Poisson approximation.

Table B.6. Occurrences - first 2 characters of first 50 lines of Book 17

Character Occurrences		
Number of Occurrences (r)	Binomial P(r)	Poisson P(r)
0	0.0142	0.0155
1	0.0616	0.0646
2	0.1327	0.1346
3	0.1884	0.1869
4	0.1987	0.1947
5	0.1659	0.1623
6	0.1142	0.1126
7	0.0667	0.0671
8	0.0337	0.0349
9	0.0150	0.0162
10	0.0059	0.0067
11	0.0021	0.0026
12	0.0007	0.0009
13	0.0002	0.0003

In summary then, we might expect that we are most likely to get about 4 occurrences of every character in the alphabet in the the first two characters of the first two lines of the first 25 books of *The Destruction of Troy*. In fact we see very marked bias in the distribution, with some characters highly favoured (the vowels), and some highly dis-favoured (B, G, M, Q, X, Z) although they all appear in these character positions somewhere in the text. That the vowels are highly favoured and that 'x' and 'z' are highly dis-favoured is no surprise, but the dis-favouring of B, G, M and Q shows that has been bias in the selection of the characters. We can see this clearly in the table below where the expected cumulative probabilities for the lower, middle and higher ranges of character occurrences are compared with those found for the first fifty lines of Book 17.

Table B.7. Character Occurrences

Character Occurrence Frequencies expected and found for the first two characters of the first fifty lines of Book 17.		
Range of Character Occurrences	Binomial Expectation of P(r)	Observed P(r)
0	0.0142	0.2500
0-1	0.0758	0.4583
0-2	0.2085	0.6250
1-7	0.9282	0.6250
2-6	0.7999	0.3750
3-5	0.5530	0.1667
4	0.1987	0.0833
8-13	0.0573	0.2083

NOTE: the expected frequencies are for an alphabet of 24 characters, the 'found' are for an alphabet of 26 characters. Ths needs correcting, but the changes will be negligible.

1. Consider a bag containg one each of 24 counters, each labeled with a different letter from the list: A,C,D,E,H,[I=J],L,N,O,R,S,T,B,F,G,K,M,P,Q,[U=V],W,X,[Y=ȝ],Þ

2. Withdraw one counter at random from the bag. Note the letter, and replace the counter in the bag and shake to randomise again.

3. The probability that the letter noted was (say) 'x' is 1/24 or 0.042, and the probability that the letter was not 'x' is 23/24 or 0.958.

4. For each Book of the poem we have four attempts - we withdraw four characters, and the probability of getting an 'x' is now 4*1/24 or 0.168, and so the probability of not getting an 'x' is 0.833.

5. If we repeat the withdrawal for each Book, a total of 25 times, the probability of not getting an 'x' is 0.833 raised to the power 25, or 0.0104.

6. We have 12 letters that never occur in the anagram, so the probability of not getting any of these is 0.0104 raised to the power 12, or 1.56x10^-24.

7. In other words, the the first two characters on the first two lines of each book were not chosen randomly, they were biased to exclusively favour half the alphabet.

8. Now consider the chance of withdrawing 5 counters with the letter 'L' on them for five of the 25 Books. For each Book the probability of getting an 'L' in any of the four positions is 0.168, and to get an 'L' in five Books is 0.168^5 or 0.000129

9. Similarly the chances of withdrawing three 'A's is 0.00463, and the same for 3 'E's and 3 'T's

10. The chance of withdrawing two 'C's, 'N's or 'O's is only .0278 each

11. The chance of witdrawing a single copy of any of the letters D,H,I,R,S is 0.168 each.

12. So the overall chance of withdrawing the correct combination of letters to make up the anagram is the sum of the above chances, or the likelihood of the combination of letters seen in the first two letters of the first two lines of the first 25 sections of *The Destruction of Troy* occurring fortuitously (by chance is 67490984, or rather less than 1 in six and a half million. Not quite as unlikely as a major win on the football pools, but not far off.

13. Note that the chance of withdrawing the necessary five 'L's is by far the dominant contribution, with the failure to find twelve letters anywhere making up most of the balance.

This calculation is of course subject to the same criticism that applied to the consideration of the (ordered) name IOHANNES CLERK DE WHALELE in the first letter of the first 22 sections: why choose this selection crierion. In the present case, the selection is clearly more arbitrary if considered on its own, but as a minor extension of the selection scheme 'approved' for John Clerk of Whalley, it has at least some authenticity.

The other test we can apply is to change the selection criterion and try again. In this case instead of using the first 25 sections (1-25) of the poem, let us try the last 25 sections (12-36). Since we have an overlap of fourteen characters, we must expect some success, but changing eleven characters must be significant. When we carry out this experiment, we find, rather surprisingly, that we get another good fit, the only discrepancy being the failure to repeat the sequence 'LC' standing for Lancaster. See the table below.

Table B.8. title

thead content			
Line	Letter	(letter,row)	Anagram
12	R	(1,1)	I
13	L	(2,2)	C
14	D	(1,1)	A
15	C	(2,1)	T
16	E	(2,1)	T
17	A	(1,2)	E
18	A	(1,1)	R
19	O	(2,2)	A
20	E	(2,2)	L
21	I	(1,2)	L
22	L	(1,2)	H
23	N	(2,2)	E
24	T	(1,1)	T
25	T	(1,2)	O
26	-	(-, -)	-
27	-	(-, -)	-
28	N	(1,1)	N
29	L	(2,2)	L
30	E	(2,2)	O
31	H	(1,1)	N
32	O	(2,1)	S
33	S	(2,1)	D
34	T	(1,1)	A
35	A	(1,1)	L
36	L	(2.1)	E

I CATTERALL HETON LONSDALE - -

Catteralls of Catterall, Heton and Whalley

Heton in Lonsdale (now Heaton) lies within sight of Lancaster castle, just across the river Lune.

Henry de Grosmont (ca. 1300-1361) suceeded to the earldoms of Lancaster and Leicester in 1345 on the death of his father. In March 1351 he was created the first Duke of Lancaster and became one of the original Knights of the Order of the Garter. By deed dated 2 January 1360, he founded the Hermitage at Whalley Abbey with instructions for prayers for his soul after his death.

'John Cat' was named as an esquire of Edward III in 1369. One year before, Geoffrey Chaucer had been named as an 'esquire of lesser degreee' in the same household, but John Cat was not mentioned in the household list for 1368, and presumably had just joined the household in 1368-9. This would probably make him a young man in his twenties in 1370.

William de Heton granted land in Heton to Ra. de Ipre and Peter de Bohrun in 1378. Baines then says 'the lordship passed at a subsequent period to the Catterells' That is, some time after 1378.

1381, James Catterall 'as a general' accompanied Edmund of Langley on an expedition to the south west of France and Spain.

1386-7, James Catterall, under John of Gaunt,accompanied Phlippa of Lancaster to Portugal and remained as head (Monteiro-Mór) of the royal household of Portugal after her marriage to João I.

1388, Birth of Philippa of Lancaster (Queen Félipa of Portugal)'s first child, a daughter, Branca (Blanca, after Blanch, Philippa of Lancaster (Queen Félipa of Portugal)'s mother?)

1389, Death of Branca.

1415, James Catterall (now Jaime Cotrim) became Monteiro-Mór to Henry the Navigator and lived 'under the sign of the pentangle' at the castle at Tomar which was the headquarters of the knightly Order of Christ, descended from the Templars.

In 1437-8, under a Privy Seal Hen VI appointed Isold de Heton to be the recluse at Whalley Abbey.

It is recorded in Baines, IV 473 that John de Catterall, who was living, and probably died, in 19 Henry VI, 1441, gave the manor of Heton in Landisdale (Lonsdale) to Roger de Brockholes, whose father John de Brockholes was living in Heton in 1402.

1440-3 the Abbot of Whalley presented a petition to dissolve the hermitage at Whalley quoting Isold breaking her vows 'two yeres or more' ago. This must have occurred around 1440.

At some date after 1440 and before 1443, occurred the death of abbot Eccles who presented the petition.

1441, Final transfer of the manor of Heton from John de Catterall to Roger de Brockholes.

1443-4, Death of abbot John Eccles.

It looks as though we should be able to identify '"IOHAN CATTERALL HETON LONSDALE LANCASTER"' as a Catterall of Heton, and probably also as the James Catterall who accompanied Philippa to Portugal. Possibly he was the 'John Cat' who served as esquire to Edward III from 1369, later transferring to the service of Edmund of Langley and finally of John of Gaunt, before accompanying Philippa to Portugal. He could also have been a younger brother, or the son of John Cat.

Note 1/19: *St. Erkenwald* (draft of Appendix) .

Putter, Intro, p.34 - 'The unique MS of *St. Erkenwald* was owned in the sixteenth century by Thomas Bowker, a priest in Eccles, Lancashire. A note in the margin [of the MS] also contains the name of Elizabeth Boothe of Dunham-Massey [Luttrell, 1958, 39]. The neighbours of the Booths ... were the Newtons and Humphrey Newton (died 1536) produced some poems in the alliterative style and diction of *Sir Gawain and the Green Knight* [R H Robbins, 'The poems of Humphrey Newton Esq.', Publications of the Modern Language Association of America, 65, 249-81 (1950); 'A Gawain Epigone', Modern Language Notes, 58, 351-6 (1943); E Salter, p.62]'.

Vantuono, [xxi -] 'about the middle of the fourteenth century the line of the barons of Dunham Massey came to an end and Henry de Grosmont, first Duke of Lancaster took possession. Dunham Massey became a centre of cultural excellence in the fourteenth century under Henry, and in the fifteenth century under the Booths'. See also p. xvii. For the descent of Dunham Massey, see Ormerod Vol 1, pp. 526-30.

There are some interesting and relevant questions here. How did the manuscript of "*St. Erkenwald*" get to Dunham Massey and into the possession of Elizabeth Booth? Does this relate in any way to the copy of *The Destruction of Troy* (Hunterian MS 388, Glasgow) produced by Thomas Chetham of Nuthurst (under present day Moston, east of Manchester) who was a bailiff to the Stanley family, who also had an interest in the estate of Dunham Massey. Humphrey Newton whose poetry was influenced by the poems of the Gawain-Poet [ ] lived very close to Dunham Massey. The area appears to be very rich in alliterative poetry, and it is possible to tie all three manuscripts in to these closely related families, and the link is the family of our proposed identity of the Gawain-Poet.

Elizabeth Booth, daughter of George Booth of Dunham) married William Chantrell de Bache [see Visit. Chesh. 1580, p.61 and Harl. MSS, 1585, fo. 76b], a descendent house of the Catheralls of Horton near Leek in Cheshire, who were descended from a younger son of the Catteralls of Catterall and Little Mitton in Lancashire, and a (distant) relative of the I. Catterall of Heton in Lonsdale, LC for whom *The Destruction of Troy* was made.

The family connections here become a little complicated. The following is the best description I can reconstruct.

The manor of Dunham-Massey was originally held by Hamon Massy, first baron of Dunham, under Hugh Lupus, earl of Chester in the reign of William I. The manor then passed successively through a total of five Hamon Massy descendants (all named Hamon Massy) until the last, dying without male heir, the manor was divided among many co-heirs. Henry de Grosmont, first Duke of Lancaster bought out all the co-heirs, re-united the estate and assigned Dunham to Roger le Strange of

Knocking. From here the manor somehow became divided again between Fittons, Duttons, Venables and Masseys, unil Robert Booth, a younger son of John Booth of Barton acquired several properties from Sir William Venables (died 1421) by marriage to his daughter and co-heir, Dowse Venables. This Robert Booth then laid claim to the Dunham estate, and the matter was finally settled when Sir Thomas Stanley and William Chantrell, his sergeant-at-law acquired half of Dunham for themselves in 1433, Robert Booth gaining the other half. William's younger brother John married Lucy, sister of Robert Booth and (somehow) the remainder of the Dunham estate passed to the Booths. The descendants of William Chantrell continued the line of Catheralls of Horton, whilst John acquired the manor of Bache, just south of Chester, and started the line of Chauntrells of Bache. John's great grandson continued the alliance with he Booths when he married Elizabeth Booth (whose name appears in the manuscript of *St. Erkenwald*), great great great granddaughter of Sir Robert Booth of Dunham Massey [the Booths had a run of very short-lived descendants, William, William and George who held the manor for only 7, 12 and 12 years respctively].

Ormerod seems to confuse this Elizabeth with a later Elizabeth (possibly a daughter or granddaughter) who married Randle Holme [see Randle Holmes MSS in the Harl. Coll.], and who was mayor of Chester in 1633. This Randle Holme was descended from the Norleys of Norley, east of Delamere Forest, and Alice Sparke of Bickerton, who claimed descent from the Catteralls of Horton, who also held land in Norley. Ormerod says Alice Sparke was the husband of Ralph Catheral, a younger brother of the ancient house of Horton. Ormerod's pedigree of Catherall of Horton shows Ralph marrying Margaret Sparke, not Alice. Alice Sparke's father, Roger, was living 7 Henry VIII (1516).

The Newtons of Newton and Pownall near Wilmslow were near neighbours of the Booths, and connected with them via marriages with the Mainwarings. Humphrey Newton (1446-1537) was a minor poet who, it is claimed [ ], was strongly influenced by the Gawain-Poet.

We also know that the only surviving copy of *The Destruction of Troy* was made by John (or his father Thomas ???) Chetham of Nuthurst about 1540. His father, Thomas Chetham was a landowner in south Lancashire, and a bailiff in the service of the Stanley family (both Thomas and Edward, compare William Chantrell who was sergeant-at-law to the Stanleys in 1434), and at his death in 1546 the maunuscript was bequeathed to his son “to be an heyrlome at Notehurst”, before it finally found a home in the library of the University of Glasgow as Hunterian MS 388. Nuthurst no longer exists, but used to lie in Moston in Greater Manchester, and there is a record of this Thomas Chetham at that place on April 4, 1527:

> 'About eight o'clock in the morning, Thomas Radclyffe of Chaderton, gentleman, John, son of Edmund Tetlow, Ralph Cowper, of Chaderton, husbandman, John Smethhurst, of the same place, husbandman, with other wrongdoers to the … number of 30, whose names were unknown, assembled on the waste of Nuthurst, in the hamlet of Moston and within the vill of Assheton, riotously, and drove off the animals of Thomas Chetham and Edmund Chaderton, gentleman, which were feeding there according to anticessorial custom.' (Vol XXV-52. Lancashire and Cheshire Antiquarian Society)
>
> —Baines, *Hist. Lancs.*

Baines [ii 395] gives an account of the Chethams of Nuthurst with the comment that the descent is "extremely confused and contradictory". He reconstructs the pedigree from Flower's Visitation of 1567, Familiae Lancastriensis MS and other sources. There is a Thomas Chetham of Nuthurst whose son John was living in 1567. John's son Henry married a daughter of Sherburne of Stonyhurst, whose brother, Robert(?) married Dorothy Catterall, daughter and heiress of Thomas Catterall in 1570-ish (?)

The point of all this close detail is that it establishes prolonged and close relationships between these families and between them and the manuscripts of *St. Erkenwald, The Destruction of Troy* and (probably) *Sir Gawain and the Green Knight*. In any case Elizabeth Booth, whose name is in the *St. Erkenwald* MS married into the family of the patron of John Clerk of Whalley, the author of *The Destruction of Troy*. That she also possessed a copy of *St. Erkenwald* is not too surprising, and might strengthen the possibility that the Gawain-Poet (James Catterall) might also be the author of *St. Erkenwald*.

It seems clear that the manuscripts of *The Destruction of Troy*, (Hunterian MS 388) and "*St. Erkenwald*", (Harley MS ....), the former from Whalley in Lancashire, and the latter probably originating in London, but written in a dialect very similar to *The Destruction of Troy* are both tied very closely to a few families, all related by marriage: the Booths, married to the Catteralls, who owned "*St. Erkenwald*", the Chethams, who owned and copied *The Destruction of Troy*, later married with the Sheburnes who inherited the Catterall estates, the Newtons, of whom Humphrey was influenced by the work of the Gawain-Poet, and the Catteralls, for whom *The Destruction of Troy* was produced, and one of whom we propose to be the origanal Gawain-Poet.

At various times members of the Newton, Mascy and Stanley families have been proposed for the identity of the Gawain-Poet or his patron, and it is interesting to see how closely these families, together with the Catteralls and the Booths were associated throughout the fifteenth and sixteenth centuries: certainly the manor of Dunham Massey was recognised as an important cultural centre in the fifteenth century.

I am still rather reluctant to attribute *St. Erkenwald* to the Gawain-Poet on stylistic grounds, but just possibly it might have been some of his early work.

C. Character Frequencies in the Text of *The Destruction of Troy*

Table C.1. Character Frequencies in the Text of *The Destruction of Troy*

	entire text	start of words	start of lines	text/word	text/line	word/line
thorn	8169	6720	1374	1.216	5.945	4.891
yogh	109	92	14	1.184	7.786	6.571
dflourish	3328	0	0	-	-	-
ampersand	2569	2567	2	1.001	1284.500	1283.500
undecipherable	97	26	1	3.730	97.000	26.000
A+a	29362	7148	3043	4.108	96.904	2.349
B+b	6180	4287	641	1.442	9.641	6.688
C+c	5724	3242	132	1.766	43.364	24.561
D+d	14132	3430	157	4.120	90.013	21.847
E+e	62948	1356	208	46.525	302.63	6.519
F+f	15481	7207	667	2.148	23.210	10.805
G+g	10143	2933	152	3.458	66.730	19.296
H+h	30552	10191	983	2.998	31.080	10.367
I+i	25800	3660	403	7.049	64.020	9.082
J+j	33	0	0	-	-	-
K+k	4996	1835	70	2.723	71.371	26.214
L+l	24539	3474	169	7.064	145.201	20.556
M+m	10659	3993	403	2.669	26.449	9.908
N+n	28513	2137	366	13.343	77.904	5.839
O+o	36000	6433	567	5.596	63.492	11.346
P+p	7821	3587	334	2.180	23.416	10.740
Q+q	177	153	11	1.157	16.091	13.909
R+r	28527	1084	73	26.316	390.781	14.849
S+s	28714	7377	580	3.892	49.507	12.719
T+t	42759	12157	2153	3.517	19.680	5.647
U+u	14791	1	1	14791.000	14791.000	1.000

V+v	1712	1470	108	1.165	15.852	13.611
W+w	12358	8534	1343	14.488	9.202	6.354
X+x	350	28	15	12.500	23.333	1.867
Y+y	17015	1006	80	16.914	212.688	12.575
Z+z	15	3	2	5.000	7.500	1.500

D. Second Character Frequencies at Start of Lines

Table D.1. Second Character Frequencies at Start of Lines

	Þ	3	d	&	.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	space	total
Þ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
&	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5138	5138
.	0	0	0	0	0	2	0	8	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	2	0	4	0	0	0	44
Aa	0	0	0	0	0	3	298	160	4	0	234	264	0	75	0	0	1322	100	3190	0	73	0	372	1101	521	206	12	58	1	100	0	2097	10191
Bb	0	0	0	0	0	625	0	0	0	1276	0	0	0	170	0	0	135	0	0	662	0	0	766	0	0	730	0	0	0	564	0	0	4928
Cc	0	0	0	0	1	683	0	1	0	29	0	0	596	180	0	1	387	0	0	1233	0	0	113	0	0	149	0	0	0	1	0	0	3374
Dd	0	0	0	0	0	299	0	0	0	1588	0	0	0	225	0	0	0	0	0	541	0	0	298	0	0	324	0	21	0	290	0	0	3586
Ee	0	0	0	0	0	10	2	166	5	0	31	86	0	0	0	2	91	27	430	0	5	0	258	39	21	321	21	2	39	2	0	1	1559
Ff	0	0	0	0	0	891	0	0	0	1030	663	0	0	407	0	0	161	0	2	2026	0	0	826	0	0	1475	0	0	0	239	0	5	7725
Gg	0	0	0	0	0	160	0	0	0	290	0	0	0	178	0	0	78	0	0	594	0	0	1726	0	0	2	0	0	0	57	0	0	3085
Hh	0	0	0	0	0	1714	0	0	0	2400	0	0	0	3214	0	0	0	0	0	2337	0	0	0	0	0	176	0	0	0	1331	0	2	11174
Ii	0	0	0	0	0	46	0	14	5	7	100	0	1	0	1	0	10	2	2643	99	0	0	4	343	194	53	0	17	1	0	0	519	4059
Jj	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kk	0	0	0	0	0	67	0	0	0	272	0	0	0	58	0	0	2	0	455	19	0	0	0	0	0	1	1	0	0	1080	0	0	1905

Explanation: the number 1588 appears in the table above at the intersection of column E and row Dd. This should be interpreted as *There are 1588 lines in* The Destruction of Troy *in which the character "E" or "e" occurs in the second character position immediately following the character "D" or "d".*

E. This is Table D.1, “Second Character Frequencies at Start of Lines” continued

Table E.1. This is Table D.1, “Second Character Frequencies at Start of Lines” continued

	Þ	ȝ	ƌ	&	.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	space	total
Ll	0	0	0	0	0	591	0	0	0	1107	0	0	0	381	0	0	0	0	0	995	0	0	0	0	0	131	0	0	0	438	0	0	3643
Mm	0	0	0	0	8	876	0	0	0	1395	0	0	0	357	0	0	0	0	0	861	0	0	0	0	0	35	3	0	0	861	0	0	4396
Nn	0	0	0	0	0	165	0	0	0	695	0	0	0	68	0	0	0	0	0	1553	0	0	0	0	0	5	0	0	0	17	0	0	2503
Oo	41	0	6	0	0	0	17	4	37	4	4243	5	0	2	0	0	52	1	1040	0	57	0	281	45	240	784	2	48	3	3	0	83	6998
Pp	0	0	0	0	0	684	0	0	0	573	0	0	49	153	0	0	245	0	0	211	0	0	1298	0	0	619	0	0	0	88	0	0	3920
Qq	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	157	0	0	0	0	164
Rr	0	0	0	0	0	163	0	0	0	434	1	0	0	235	0	0	0	0	1	221	0	0	0	0	0	46	0	0	0	56	0	0	1157
Ss	0	0	0	0	0	880	0	54	0	1297	0	0	948	217	0	92	245	27	2	1903	395	2	0	0	949	399	0	255	0	287	0	5	7957
Tt	0	0	0	0	0	350	0	0	0	630	0	0	6462	214	0	0	0	0	0	4973	0	0	926	0	0	237	0	99	0	419	0	0	14310
Uu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
Vv	0	0	0	0	0	12	0	0	0	99	0	2	0	59	1	0	64	38	599	40	386	0	19	241	15	3	0	0	0	0	0	0	1578
Ww	0	0	0	0	0	2007	0	0	0	1782	0	0	580	3961	0	0	0	0	0	1122	0	0	226	0	1	9	0	0	0	187	0	2	9877
Xx	0	0	0	0	1	9	0	0	0	0	0	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	5	0	7	0	0	1	30
Yy	0	0	0	0	0	33	0	53	2	269	36	0	0	0	0	0	40	20	66	440	0	0	66	29	27	3	0	2	0	0	0	0	1086
Zz	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	5
space	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Explanation: the number 1297 appears in the table above at the intersection of column E and row Ss. This should be interpreted as *There are 1588 lines in* The Destruction of Troy *in which the character “E” or “e” occurs in the second character position immediately following the character “E” or “e”.* The *total,* 7857, in the last column for row Ss is the total number of times the character “S” or “s” occurs in the first position on a line.

F. New attempt at the algorithm

It is not intuitively obvious whether the existence of the anagram JOHNCATTERALLHETON-LONSDALELANCASTER is a likely or unlikely event: the choice of selecting one of four characters at the start of each book introduces considerable flexibility. The elimination of so many combinations of local families and manors that we recorded in Table B.1, "Anagrams in *The Destruction of Troy*" suggests that the anagram is an unlikely event to occur by chance, but the discovery of seven different anagrams also suggests that the selection process is capable of generating anagrams by chance.

An analytical solution of the statistical problem of selecting one character out of a set of four for each of the first 35 books of the poem would be very complex. We do not attempt a exhaustive analysis. Instead we take an empirical approach and choose 35 random groups of four characters and see if they generate the anagram. In order to do this we need to define the alphabet and we need to build distribution functions for the use of each letter of the alphabet in each position in the text. The frequencies of occurrence of each letter of the alphabet at the start of each line, given in Table C.1, "Character Frequencies in the Text of *The Destruction of Troy*" for all lines in the text, were used to generate a distribution function for the first letter of lines one and two of each book. The distribution functions for the second character of each line were calculated for each possible first letter from every line in the text, (the frequencies are given in Table D.1, "Second Character Frequencies at Start of Lines" and Table E.1, "This is Table D.1, "Second Character Frequencies at Start of Lines" continued".) Applying these functions we calculate 35 sets of four randomly chosen characters, and attempt to decide whether the anagram of JOHNCATTERALLHETON-LONSDALELANCASTER can be constructed from a choice of one character from each group of four. An exhaustive test of all possible combinations is out of the question, there are 1.18×10^{21} ways of selecting 35 characters, and even at a thousand seconds per combination this would require about 384 centuries of computational time. To arrive at a reliable estimate of the likelihood of achieving the anagram by chance we adopted the following procedure.

```
1. Look for successful anagrams in random sets of characters:
Loop over sample size = 1,2,5,10,15 … 300,000
  initialise Total_Successes to zero
  initialise Count_of_Successes to zero
  loop over tries from 1 to 100
    select at random a set of 35 groups of 4 characters
    if this set is an obvious failure
     (if one required character is missing,)
      drop out and try again
    reduce the number of effective groups of 4
      (truncate at first group of 4 which does not contain
      any of the wanted characters,)
    if any wanted character is missing drop out and try again
```

```
    loop from 1 to sample size
      select at random a combination of 1 character from each
      of the remaining groups of 4.
      If this combination is a success
        increment Count_of_Successes
    end of loop over sample size
    increment Total_Success by Count_of_Success
  end loop over tries
  calculate Mean_Success_at Sample_Size = Total_Success / 100
end of loop over sample size

2. Select a growth function:
We now have a table of Mean_Success versus Sample_Size
see Table_5l3)
Loop over possible growth functions to describe the table
  Use Minuit to find the best set of parameters to fit a
    growth function to this table,
    calculate chi-squared for the fit
    Appendix G,  Fit of Growth Functions to Success Rate Data
  Use GNUplot to compare real counts found against the values
    calculated from the best fit parameters for the growth
    function

  Calculate residuals
  (see Table C.1, “Character Frequencies in the Text of The Destruction of Troy
end of loop over growth functions
Select the best growth function by inspection of chi-square
and patterns of residuals


3. Calculate the odds against generating the anagram
   by a random process:
The parameter of the best growth function that represents
the limiting success rate for an infinite sample size i
the best estimate of the number of success per 100 tries.
The ratio 100 / parameter is the odds against producing
the anagram by random process, and is a measure of our
confidence that the anagram was an intentional construct
by the poet.
```

G. Fit of Growth Functions to Success Rate Data

Mathematical simulation of growth has a long history. Fibonacci's [FIBONACCI] study of the growth of rabbit populations predicted unrestricted growth (1 1 2 3 5 8 13 21 34 55 89 …,) and in 1798 Thomas Robert Malthus [MALTHUS98]introduced the need for limits to growth.

Gompertz Growth Function .

In 1825 Gompertz [GOMPERTZ25] followed by Winsor [WINSOR32] introduced a three parameter function which modelled sigmoidal growth with a limiting population.

$$y(x) = Y_{\max} \exp(-\exp(-k(x - x_{\max})))$$

Where the function value *y* at *x* is expressed in terms of y_{max}, the limiting maximum value attained by the function, *k* is an empirical constant related to the rate of growth and x_{max} is the ordinate value at which the rate of growth is a maximum.

Logistic Growth Function (Verhulst) .

Verhulst in 1838 [VERHULST38] introduced an alternative three parameter model, commonly known as the logistic function, which also modelled the sigmoidal form of growth.

$$y(x) = \frac{y_{\max}}{1 + \exp(-k(x - x_{\max}))}$$

Where the function value *y* at *x* is expressed in terms of y_{max}, *k* and x_{max} are as above.

Michaelis-Menten Growth Function .

Michaelis and Menten in 1913 [MICHAELIS13] proposed a rectangular hyperbola as a very simple three parameter growth function.

$$y(x) = \frac{y_0 K + y_{\max} x}{K + x}$$

Where the function value *y* at *x* is expressed in terms of y_{max}, y_0 is the initial value of *y* at $x = 0$ and *K* is an empirical constants with no physical meaning.

Weibull Growth Function .

The Weibull function [WEIBULL51] (simplified in this form) is another three parameter flexible form of growth which can include a significant initial induction period if *b* is much greater than *a*

$$y(x) = y_{\max}(1 - \exp(-ax^b))$$

Where the function value *y* at *x* is expressed in terms of y_{max}, and *a* and *b* are empirical constants with no physical meaning.

Richards Growth Function .

Richards in 1959 [RICHARDS59] introduced a 4-parameter function which included both the logistic and the Gompertz functions as special cases. This consolidation was achieved by the addition of a fourth adjustable parameter, *c*. In the special case where *c*=1, the Richards function reduces to the logistic function of Verhulst. Similarly as *c* tends to zero, the Richards function reduces to the Gompertz function.

$$y(x) = \frac{y_0 y_{\max}}{(y_0^c + (y_{\max}^c - y_0^c)\exp(-kx))^{1/c}}$$

Where the function value *y* at *x* is expressed in terms of y_{max}, y_0 is the initial value of *y* at *x*=0, and *k* and *c* are empirical constants.

Michaelis-Menten Growth Function (re-expressed) .

The Michaelis-Menten function was re-expressed in an easier format by France and Thornley [THORNLEY84]

$$y(x) = y_{\max} - (y_{\max} - y_0)\exp(-ax)$$

Where the function value *y* at *x* is expressed in terms of y_0, and *k* and *a* are empirical constants with no physical meaning.

Generalised 4-parameter Michaelis-Menten Growth Function .

The Michaelis-Menten function was generalised by Lopez *et. al.* in 2000 [LOPEZ00] by the addition of a fourth parameter, n, where the sigmoidal form is only developed for c>1.

$$y(x) = \frac{y_0 K^c + y_{\max} x^c}{K^c + x^c}$$

Where the function value *y* at *x* is expressed in terms of y_{max}, y_0, *y* at *x*=0, *K*, the value of *x* for which *y*=y_{max}/2, and *c* is an empirical constant with no physical meaning.

Generalised 3-parameter Michaelis-Menten Growth Function .

A special case of the 4-parameter generalised Michaelis-Menten function which forces passage through the origin (x=0,y=0) and reduces the number of adjustable parameters to three, is obtained by putting y_0=0

$$y(x) = \frac{y_{\max} x^c}{K^c + x^c}$$

where the parameters have the same meaning.

Gompertz Growth Function .

This has been re-expressed as

$$y(x) = y_0 \exp\left\{\frac{(k(1 - \exp(-ax))}{a}\right\}$$

Where the function value *y* at *x* is expressed in terms of y_0, and *k* and *a* are empirical constants with no physical meaning.

Yin Growth Function .

A somewhat different function was proposed by Yin *et. al.* in 2003 [YIN03]. This three parameter model differs in predicting a negative growth rate after the maximum has been achieved, and Yin *et. al.* arbitrarily truncated the function at its maximum value.

$$y(x) = y_{\max}\left\{1 + \frac{x_e - x}{x_e - x_m}\right\}\left\{\frac{x}{x_c}\right\}^{\frac{x_e}{x_e - x_m}}$$

Where the function value *y* at *x* is expressed in terms of y_{max}, x_e, the value of *x* at which the maximum value of *y* is attained, and x_m is the value of *x* at which the rate of growth is a maximum. The function range is restricted to $0 \le x_m < x_e$

First Order Growth Function .

The selection of a growth function is necessarily an empirical decision: which function fits the data best, the functions generally have no theoretical basis. The biggest problem in defining a growth function is that of modelling an initial low-rate induction period which appears to be inherent in all natural growth processes, and it is this induction period which rules out the simplest growth functions such as the 2-parameter first order kinetic growth in chemical reactions.[SIENKO74]

$$y(x) = y_{\max}\left\{1 - \frac{1}{b^x}\right\}$$

Where *a* and *b* are empirical constants.

Whilst the selection of a growth function is empirical, it is obviously useful if at least some of the adjustable parameters bear some clear relationship to a meaningful physical quantity, for example a parameter, y_{max}, representing the maximum value of the function also represents the ultimate limit of growth.

When there is no sound theoretical background for a particular function (which is generally the case), the empirical choice of a growth function depends upon the “goodness of fit” of the function to the observed data. How closely the calculated function matches the observed values is normally expressed in terms of the sum of squared differences (residuals) between calculated and observed values, appropriately weighted to account for the relative accuracy of the observed values. The process of obtaining the “best fit” then consists of adjusting the parameters in the function so as to minimise this sum. This sum can then be converted to a standard “reduced chi-square” statistic by dividing by the number of observed data points minus the number of adjustable parameters. The process of obtaining the best fit is generally known as the method of least squares. If the observed data also have known associated errors, then the minimisation process is generally known as a weighted least squares minimisation and reliable errors can be estimated for the parameters.

The problem of finding the best set of parameters to minimise the sum is relatively simple for a linear function (one in which the parameters are completely independent of each other - orthogonal), but unfortunately all the growth equations described above are non-linear, that is, a change in the value of any one the parameters may be compensated to some degree by variations in the other parameters. The degree to which this replacement is effective is described by a correlation coefficient which can vary between zero (no correlation, the parameters are orthogonal) and one (the parameters are completely correlated and changes in any one parameter can be completely compensated for by changes in the others). Pairwise correlation coefficients measure the correlation between any pair of parameters (to what extent a change in can be compensated for by a change in the other,) whilst global correlation coefficients measure the extent to which changes in any given parameter can be compensated for by a combination of changes of all other parameters. When the correlation coefficient is exactly one, there is no change in the goodness of fit, but in the general case when 0<correlation coefficient<1 a change in one parameter will not be fully compensated for by changes in the others, and the fit will be less good.

A general description of the problem, which is common to much of scientific activity, is as follows. One sets (chooses) a set of values of an independent parameter, x, and measures a dependent parameter, y^{obs}. The next step is then either model dependent (do the measured data fit a theoretical model?) or, as in this case, can we find an empirical function, f(x) which approximates the data for any value of x? In both cases the problem is to find the best fit of the observed data, y^{obs} to a

function of the independent variable, x. The function generally includes a vector of parameters, *A*, which describe the form of the dependence of y upon x.[i]

Finding the best fit of a non-linear function to a set of data is far from trivial. There is no analytical solution, and the minimisation must proceed by a progressive refinement of initial estimates of the values of the parameters in the function. Although there is generally only one global (true or physical) minimum, there will often be multiple local minima, and the solution found by a minimisation process will depend on starting estimates of the best parameters. The statistical problems and procedures are described by Eadie *et. al.* [EADIE71], and an implementation of Fletcher's minimisation algorithm [FLETCHER70] is included in the CERN library program "Minuit" by Fred James [JAMES04]. Another minimisation approach based on the Marquardt-Levenberg algorithm [MARQUARDT63] is included within the Gnuplot package [GNUPLOT], which was used to obtain reasonable starting estimates for parameters, generally following a quick visual estimation using Graphing Calculator [GRAPHCALC].

In order to obtain realistic estimates of the probable errors on best-fit parameters obtained from a minimization process, the chi-square function to be minimised must be correctly normalised. The most general form of the chi-square expression is given by Eadie, [p.163]

$$X^2 = \sum_{i,j} (y_i^{obs} - y_i^{calc}(x_i A)) V_{ij} (y_j^{obs} - y_j^{calc}(x_j A))$$

where the y_i are the observations, and the $y_i(a)$ are the calculated values using the set of parameters in the vector, A. The matrix *V* is the inverse of the error matrix of the observations, y_i. If the observations, y_i, are statistically independent, then *V*, is diagonal and the expression for chi-square reduces to

$$X^2 = \sum_i \frac{(y_i^{obs} - y_i^{calc}(x_i A))^2}{e_i^2}$$

Where the e_i are the one standard deviation errors of the observations y_i. The chi-square statistic is often presented as a "reduced chi-square".

$$X^2_{red} = \frac{X^2}{n - n_a}$$

[i] As a simple example, a third order polynomial fit to a set of data points would be

$$y(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3$$

where n is the number of observations, y^{obs}, and n_A is the number of adjustable parameters needed to achieve the fit, and $(n - n_A)$ is the number of degrees of freedom in the system.

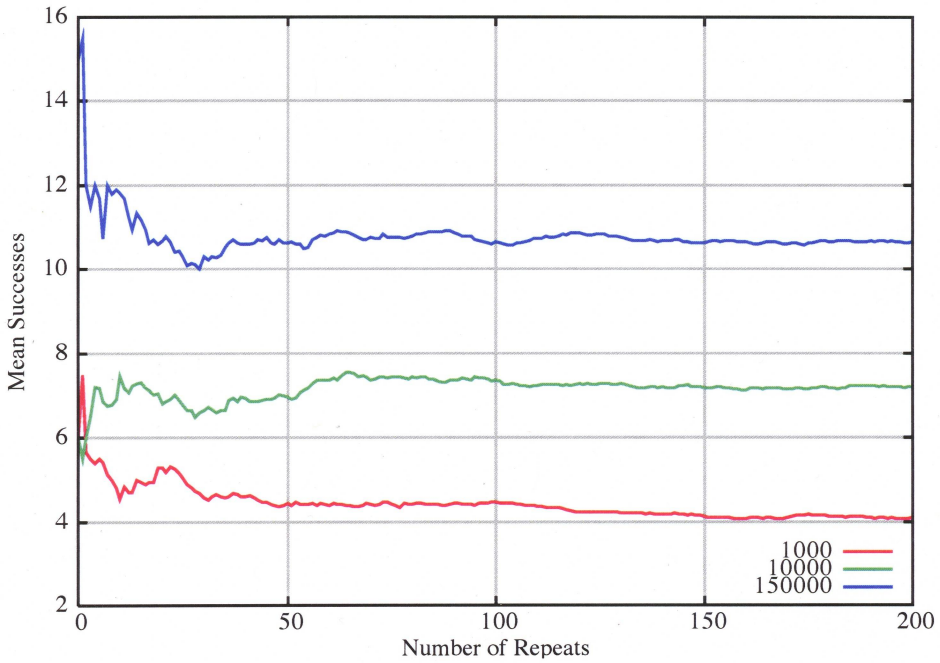
The fit tends to perfection as X^2_{red} tends to zero, and generally speaking the lower X^2_{red} the better the fit. However, a low value of X^2_{red} does not guarantee a good model or good parameter values for limits to growth. Catterall and Duddell [CATTERALL83] have demonstrated the importance of the pattern of residuals, which should look random for a good model, and have suggested other tests for model validity, although a visual inspection of the randomness of residuals combined with a low X^2_{red} is usually sufficient to determine validity of a model. As a (very) rough guide, a $X^2_{red}<1$ inspires some confidence in the model although this is by no means definitive. If the distribution of the residuals looks random, we probably have a good model. Another point to consider is the behaviour of the model outside the range of the data: for example, a growth followed by a physically implausible decay outside the data range, or a model which predicts an impossibly high growth limit would lead to very low confidence in the maximum growth predicted by the model. With $X^2_{red}<1$ and random residuals we can place reasonable confidence in the values of the final adjustable parameter estimates.

With a non-linear growth function we necessarily expect to find considerable correlation between the parameters of the model. The correlation coefficients are in fact a measure of the non-linearity of the model. If correlation coefficients are too high we must infer that the model is not well formulated. Again as a (very) rough guide, correlation coefficients greater than 0.98 or 0.99 suggest the model might be better formulated with fewer adjustable parameters.

Results.

Before a growth function can be fit to the growth of success figures for random anagram generation it is important to ensure that the success figures are meaningful. The procedure adopted is to repeat the estimation of success until the mean success is sufficiently constant. The variation of the mean success with the number of repeats for sample sizes of 1,000, 10,000 and 150,000 is shown in Figure G.1, “ Mean Success rate as a function of the Number of Repeats ”

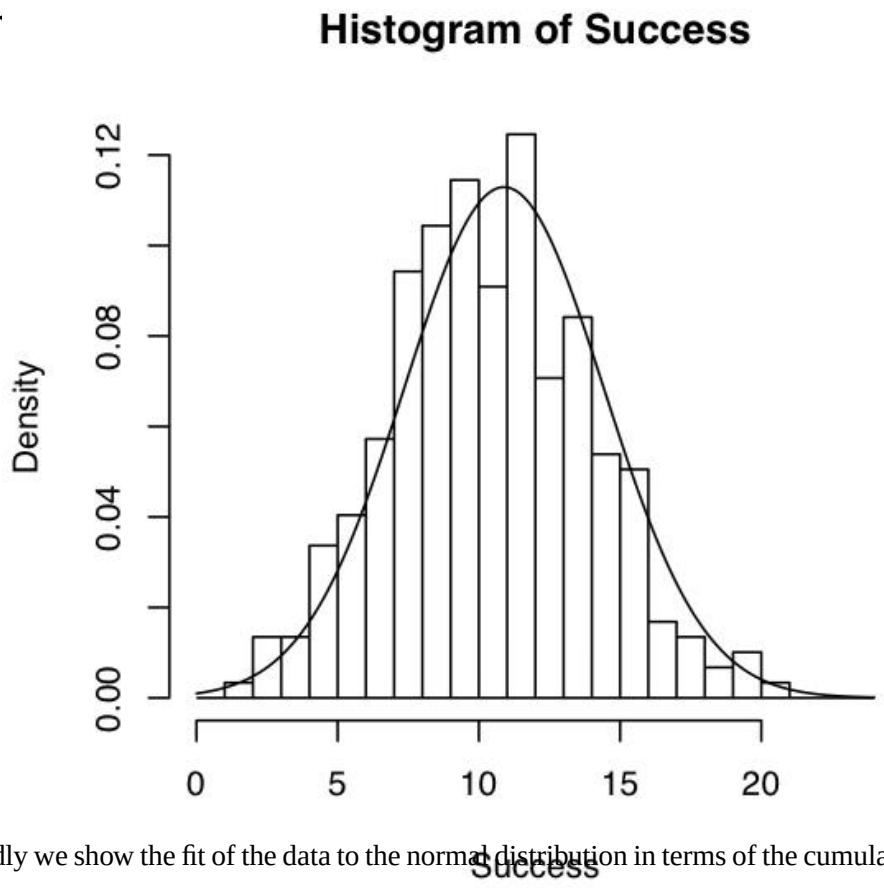
Figure G.1. Mean Success rate as a function of the Number of Repeats



From ??? we see that at least 150 repeats are required to achieve a success count good to within 0.1, and it is clear that a balance is required between the constancy of the mean success count and the computation time required to achieve it. To be confident that our mean success rates are meaningful we have always exceeded 200 tries. In the very low sample size determinations, where computer time is not a significant problem, and the success rate is changing rapidly, we have recorded significantly more data to get mean success rates to better than ±0.1.

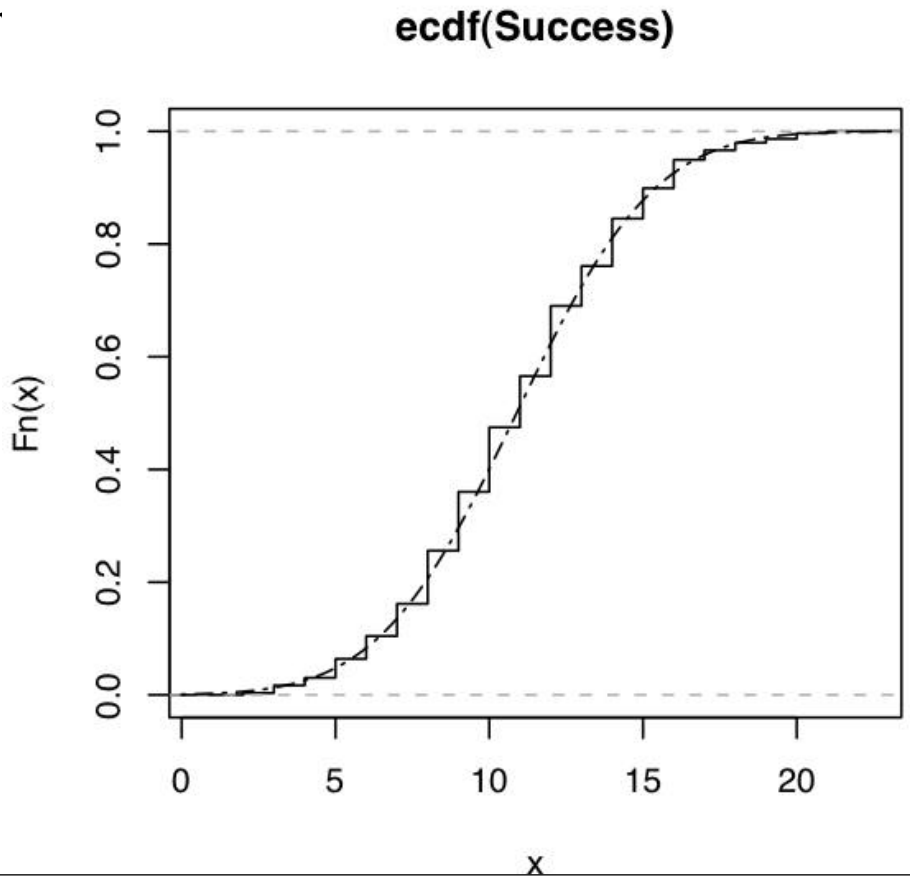
It is also necessary to show that the success counts are distributed normally if the statistics of the fit are to be meaningful. This is demonstrated visually for the case of 600 trials of 200,000 repeats, first with a fit of a normal Gaussian function to the histogram of the observations in the following figure. We can see that to a good approximation the successes we record in the 600 trials do indeed approximate well to a Gaussian distribution. If anything the successes appear to be tailing off at the high success end rather more rapidly than expected, but the effect is relatively trivial.

Figur



Secondly we show the fit of the data to the normal distribution in terms of the cumulative distribution functio

Figur



We have tried fitting each of the above growth functions to the success rate data in an attempt to obtain a reliable upper limit to the success rate, and thus arrive at a realistic estimate of the chance that the anagram is an accident of chance. Of the growth functions listed, only the Weibull and the generalised Michaelis-Menten functions give acceptable fits, and the parameters for the best fits are given in Table G.1, " Fit of Growth Functions to Mean Success Data ". We present fits separately for sample sizes varying from 2 to 300,000, and from 100 to 300,000. Acceptable fits are obtained in each case and for both functions, but we believe the former range perhaps emphasises the low sample size results too strongly, and underestimates the limiting success rates. Accordingly we later present results in more detail for the higher range of sample sizes.

Table G.1. Fit of Growth Functions to Mean Success Data

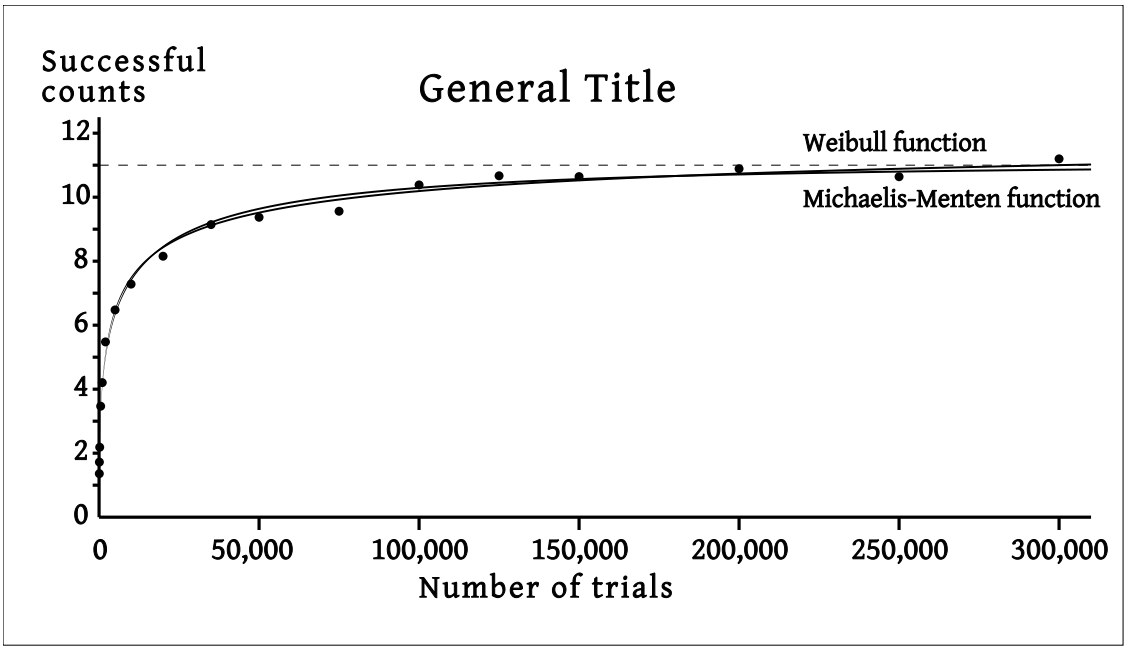
Model Name	Model Function	Sample Size range	Parameters	X^2_{red}	Success Limit
Weibull	$y = y_{max}(1-\exp(-ax^b))$	2-300,000	y_{max}=10.1932±1.326 a=0.0320453±0.03288 b=0.384972±0.1602	0.05179	10.2
		100-300,000	y_{max}=11.0374±2.461 a=0.0320453±0.03288 b=0.384972±0.1602	0.01045	11.0
Michaelis-Menten	$y = y_{max}x^c/(K^c+x^c)$	2-300,000	y_{max}=10.9982±1.871 K=2127.24±2254 c=0.632157±0.1412	0.02699	11.0
		100-300,000	y_{max}=12.4305±4.479 K=4215.21±9046 c=0.478539±0.2699	0.00615	12.4
Performing a 4-parameter fit for the generalised Michaelis-Menten function with sample size space 100-300,000 yielded y_0 = -0.0000026, very close to zero as expected, so we always use the 3-parameter model for the fit.					

The fit of these two growth functions to the growth data is shown in the next three figures. the fit is shown in the initial region of rapid growth (any induction period of low growth rate is too restricted to very low repeat counts to be of interest). The 3-parameter generalised Michaelis_Menten and Weibull functions both show an excellent fit to the data below 500 repeats.

In ??? the fit is shown over successively greater ranges up to a maximum sample size of 300,000. The fit is consistently good and there is little to choose between the two functions, although the

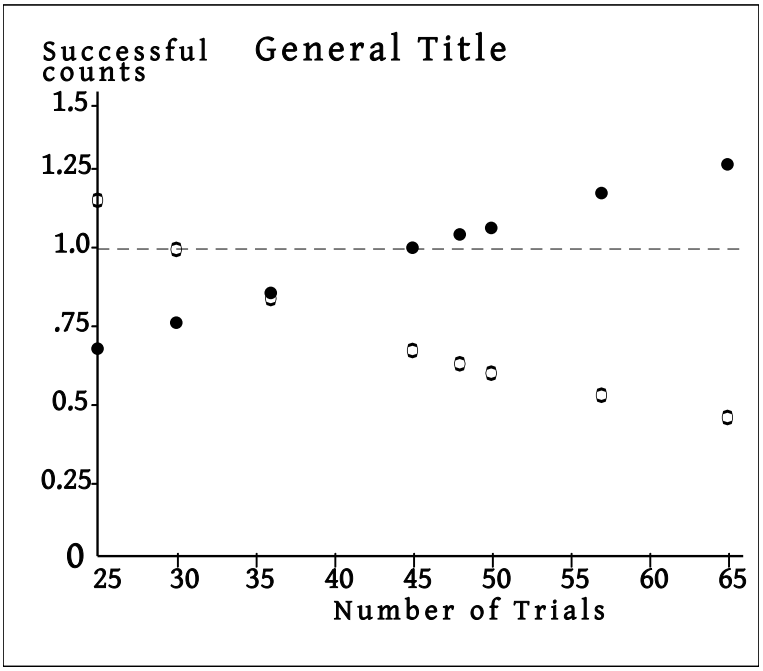
Michaelis-Menten function favours a slightly higher limiting success rate. We discuss this later, below.

Figure G.4. new counts



We explore alternative ways of estimating the likelihood of getting the anagram by chance alone. If we conduct a large series of tests at a particular number of trials, we expect to find varying numbers of success counts, and can compute the mean success rate at that number of trials. When we find the number of trials which yields a mean of unity, we might accept this as the odds against finding the anagram by chance alone. Alternatively we might look for the lowest number of trials which equal numbers of zero successes and successes greater than or equal to 1. These estimates are presented in ???. In the first case we estimate odds of about 50 to 1 against finding the anagram by chance. In the second case we estimate about 30 to 1 against chance.

Figure G.5. one count



In both cases the residuals appear random indicating both a good fit and a good growth model. The calculated values of the success rate from the two models are in good agreement with the observed values, and the residuals are small and randomly distributed as shown in (Table C.1, “Character Frequencies in the Text of *The Destruction of Troy*”).

Table G.2. Comparison of observed and calculated values

Tries	Success	Weibull	Wresid	Michaelis	Mresid
0	0	0	0	0	0
100	1.7217	1.89779543	-0.1760954	1.7779313	-0.0562313
200	2.18552	2.41024656	-0.2247265	2.3453058	-0.1597858
500	3.46789	3.26401747	0.20387252	3.2940072	0.17388270
1000	4.20417	4.05435752	0.14981247	4.1564195	0.04775046
2000	5.47711	4.96671025	0.51039974	5.1181374	0.35897254
5000	6.47674	6.32303880	0.15370119	6.4690174	0.00772256
10000	7.2827	7.40298785	-0.1202878	7.4819623	-0.1992623
20000	8.17747	8.44984453	-0.2723745	8.4292498	-0.2517798
35000	9.14354	9.21165039	-0.0681103	9.1188543	0.02468566
50000	9.37238	9.63643200	-0.2640520	9.5166815	-0.1443015
75000	9.56039	10.0488725	-0.4884825	9.9270881	-0.3666981
100000	10.38389	10.2922110	0.09167897	10.191050	0.19283968
125000	10.66827	10.4522576	0.21601236	10.380454	0.28781554
150000	10.64356	10.5647805	0.07877940	10.525486	0.11807330
200000	10.88889	10.7106192	0.17827078	10.737116	0.15177387
250000	10.63934	10.7990926	-0.1597526	10.887329	-0.2479894
300000	11.19835	10.8570893	0.34126065	11.001439	0.19691089
Sum of weighted squared residuals			0.11645883		0.03877389

f
r e

The important information that we obtain from this fitting process is the limiting value of the success count: From Table C.1, “Character Frequencies in the Text of *The Destruction of Troy*” we see that the most likely values for the limiting success rate lie between 10 and 12 successes per 100 trials. We conclude that the likelihood of generating the anagram for *John Catterall Heton Lonsdale Lancaster* is about 11 in a hundred, or about nine to one against the anagram occurring in the poem by chance.

The likelihood statistics quoted above in Table G.1, “ Fit of Growth Functions to Mean Success Data ” are for the usual error limits of one standard deviation (a confidence of about 70% that the true value lies within the limits of plus or minus one standard deviation). The standard deviations for the Michaelis-Menten function are particularly wide and are reflected in the high pairwise cor-

relation coefficients (Table G.3, “Pairwise Correlation Coefficients for the Michaelis-Menten Model”) found for this model and we are inclined to reject the Michaelis-Menten function.

Table G.3. Pairwise Correlation Coefficients for the Michaelis-Menten Model

	K	***c***	y_{max}
K	1	-0.8798	0.9624
c	-0.8798	1	-0.8921
y_{max}	0.9624	-0.8921	1

The pairwise correlation coefficients for the Weibull model (Table G.4, “Pairwise Correlation Coefficients for the Weibull Model”) are very significantly lower and suggest strongly that this is the better model for the growth, with a limiting success rate between 10 AND 11%.

Table G.4. Pairwise Correlation Coefficients for the Weibull Model

	y_{max}	a	b
y_{max}	1	0.4777	-0.7324
a	0.4777	1	-0.9281
b	-0.7324	-0.9281	1

Finally we note that with the reduced chi-square values so close to zero, it is not realistic to use them as a criterion for model choice, that the pairwise correlation coefficients provide a much better distinction, and that the odds against generating the IOHNCATTERALLHETONLONSDALELANCASTER anagram by chance are at least 9 to 1.

References

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H. About the Author

Ron Catterall gained a PhD in Chemical Physics in 1964 and a DSc in 1976. He held faculty positions in the UK and the USA and worked at the Centre Européan pour les Recherches Nucléaires (CERN,Geneva), the Institut Laue-Langevin (ILL, Grenoble), the Tri-Universities Meson Facility (TRIUMF, Vancouver) and spent sabbaticals at the Science and Engineering Research Council (SERC) Daresbury Laboratory and the Atomic Energy of Canada at Chalk River, Ontario. In 1985 he changed to computing and after building and heading the Computer Centre at Sultan Qaboos University, became Head of Computer Services at the Imperial Cancer Research Fund (ICRF) in London for whom he built a nation-wide internet in 1988 and linked it to the Internet. In 1990 he was a founder member and President of the UK Internet Consortium, and was a member of the Executive and the Technical team building the European backbone for the Internet (EBONE) in 1991. In 1991 he founded IPNetworking Ltd in London offering Internet consultancy services to many major UK enterprises and organising the IPNetworking conferences which hosted the first Internet link to the Soviet block in 1991. In September 1993, the Joint Academic Network (JANET) in the UK finally committed to providing Internet services as their main function, and in September 1994 Ron moved to California as Director of World-Wide networking, remaining in that position until the final commercialisation of the Internet towards the end of 1995. He then retired to Oaxaca in Mexico, but as a consultant designed the networking infrastructure for the new research institutes at the Cleveland Clinic Foundation and the University Hospital at CASE Western University. Finally retiring in 2001, he concentrated at last on Middle English poetry, and was President of the Oaxaca Lending Library in 2002-4.