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Molloy
An Autosomal (Ancestry.com) DNA Case Study

www.irishorigenes.com

Dr Tyrone Bowes

INTRODUCTION

There are several commercial ancestral DNA tests that can be used to explore one's ancestry. By far the most popular is the 'autosomal test' which looks at bits of all of one's DNA and sheds light over ***all*** of one's recent ancestral lines. With autosomal DNA testing one will typically match many individuals (both male and female) and making sense of those relationships can be quite challenging. However, as with every DNA test the same golden rule applies, the more DNA that two people share the more recent their shared (paternal or maternal) ancestor once lived. In addition, many of one's autosomal matches will reveal surnames and placenames associated with their family tree, and those surnames and locations can hold clues as to where the various branches in one's own ancestral tree originated. The challenge of modern autosomal DNA analysis is linking a common location revealed in the autosomal DNA test result with a particular ancestral surname.

INTERPRETING THE AUTOSOMAL DNA RESULTS

An examination of test subject Molloy's 'autosomal' DNA test results revealed 28,231 genetic relatives, the vast majority of whom record ancestral information, see **Figure 1**. The locations revealed by the test subject's autosomal genetic relatives are ***NOT RANDOM***, given their respective population sizes, Ireland, and Scotland feature prominently in frequency and shared DNA, see **Figure 1**.

Autosomal DNA stats			
Genetic Relatives	**28,231**	**Percentage**	**Max. Shared DNA/cM**
>20cM Generic relatives	611	2.2	578
>20cM Ireland	129	21.1	329
>20cM Northern Ireland	67	10.9	329
>20cM Scotland	95	15.5	147
>20cM England	138	22.6	252
>20cM Wales	25	4.1	58
>20cM Germany	71	11.6	252

Figure 1: *Ireland and Scotland gave strong autosomal DNA signals. Autosomal DNA testing revealed 28,231 genetic relatives, 611 of whom shared more than 20cM of DNA. The locations recorded by those genetic relatives are NOT RANDOM, given their respective populations sizes, Ireland, and Scotland feature prominently in frequency and shared DNA.*

The Ancestral link with Ireland and Scotland

The locations recorded within Ireland and Scotland by the test subject's autosomal genetic relatives are not random, and a search of that ancestral detail for the 32 counties of Ireland revealed 6 DNA hotspots centred upon Donegal and Cavan in Ulster, Dublin and Wexford in Leinster, Cork in Munster, and Galway in Connaught, see **Figure 2**. An examination of the 1841 counties of Scotland detailed by the test subject's autosomal genetic relatives revealed 5 DNA hotspots centred upon Lanarkshire, Mid-Lothian, Angus, Aberdeenshire, and Invernesshire, see **Figure 3**.

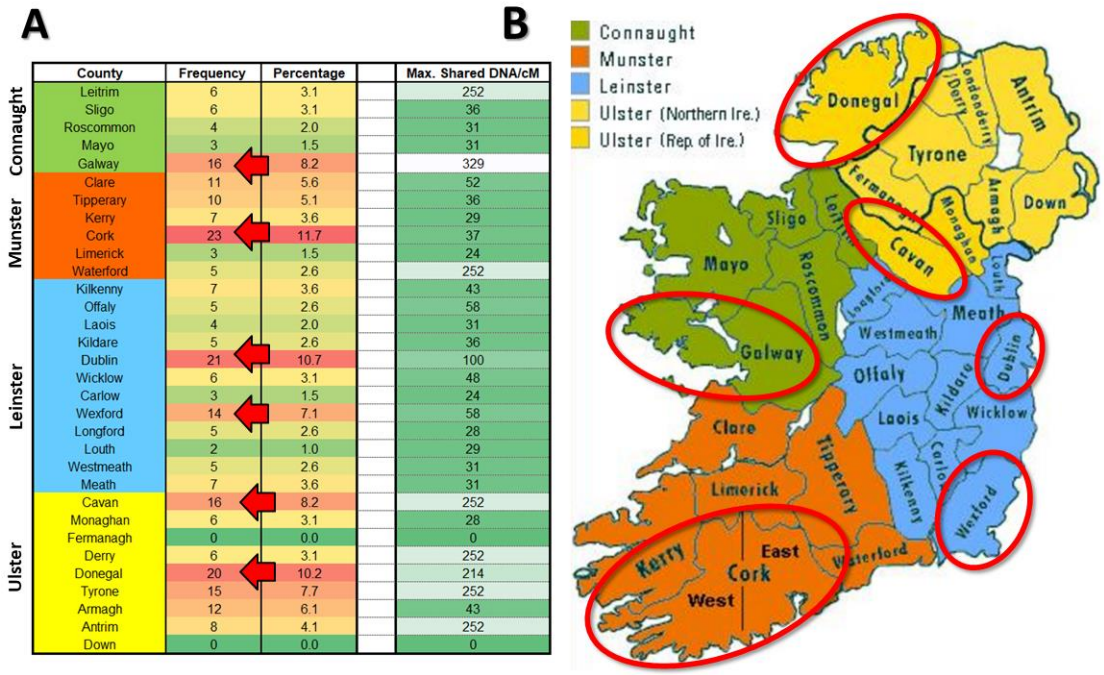

Figure 2: *Autosomal testing reveals 4 DNA hotspots within Ireland. An examination of the Irish counties detailed by the test subject's autosomal genetic relatives that share greater than 20cM of DNA reveals DNA hotspots centred upon Donegal and Cavan in Ulster, Dublin and Wexford in Leinster, Cork in Munster, and Galway in Connaught (**red arrows**, **panel A**, **red circles**, **panel B**).*

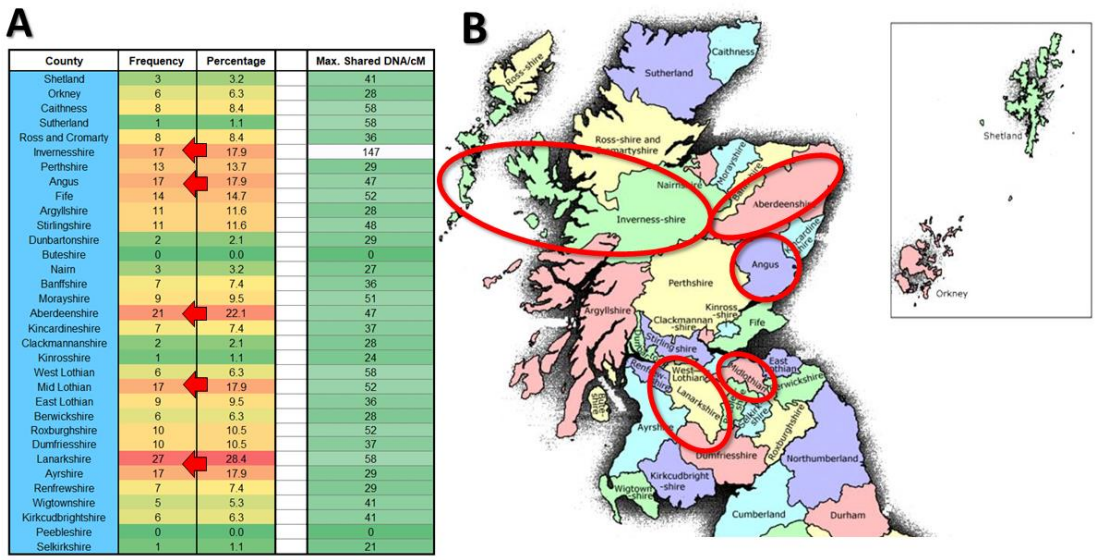

Figure 3: *Autosomal testing reveals 5 DNA hotspots within Scotland. An examination of the 1841 Scottish counties detailed by the test subject's autosomal genetic relatives that share greater than 20cM of DNA reveals that Lanarkshire, Mid-Lothian, Angus, Aberdeenshire, and Invernesshire (**red arrows**, **panel A**, **red circles**, **panel B**) emerged as DNA hotspots. The signals from Lanarkshire and Mid Lothian may be non-specific noise, the result of more recent migration to the cities of Glasgow and Edinburgh, respectively.*

Ancestral Surnames

The test subject's most recent ancestral papertrail reveals a mix of surnames of Irish, and British origin, see **Figure 4**. Distribution mapping demonstrates that surnames still concentrate in the area where they first appeared or in the areas where one's

ancestors first settled, see **Figure 5**. In Ireland, the descendants of Gaelic Irish, Normans, and Scottish mercenary Gallowglass were overwhelmingly Catholic in early census data, while those descended from 16th and 17th Century Plantation Scots and English were overwhelmingly Protestant. Irish census data reveals that the Darcy, McDonald, McLaughlin, and Molloy surnames are associated with Gaelic, Norman, and Gallowglass Ireland, while the Gordon, Hamilton, McClure, McDonald, McLaughlin, and Wilson surnames are associated with later 17th Century Plantation settlement.

Surnames arose in an agriculturally based society, and farmers with each surname can still be found concentrated in early census data in the area where their surname first appeared (Gaelic) or in the area where one's ancestors first settled (Gallowglass/Norman/Planter). Distributing mapping reveals that Catholic farmers named Darcy, McDonald, McLaughlin, and Molloy are associated with numerous locations throughout Ireland, some of which emerged as autosomal DNA hotspots, see **Figures 2** and **6**. Distribution mapping of Protestant Irish farmers named Gordon, Hamilton, McClure, McDonald, McLaughlin, and Wilson reveals multiple distinct groups spread predominantly throughout Northern Ireland, some of which are also associated with autosomal DNA revealed locations, see **Figures 2** and **7**. The Gordon, Hamilton, McDonald, McLaughlin, and Wilson surnames are associated with Scotland, and distribution reveals distinct groups throughout Scotland, some of which emerged as autosomal DNA hotspots, see **Figures 3** and **8**.

Surname	Ancestral Origin
Molloy	
D'Arcy	
McLaughlin	
Green	England
Gordon	
MacDonald	
Mason	
McClure	
Wilson	
Hamilton	

Figure 4: *Ancestral surnames and earliest recorded ancestral locations. Highlighted font indicates each surnames associated ethnicity or location of an earliest known ancestor: Irish/Ireland, Scottish/Scotland, Multiple-associated ethnicities, Scots Irish.*

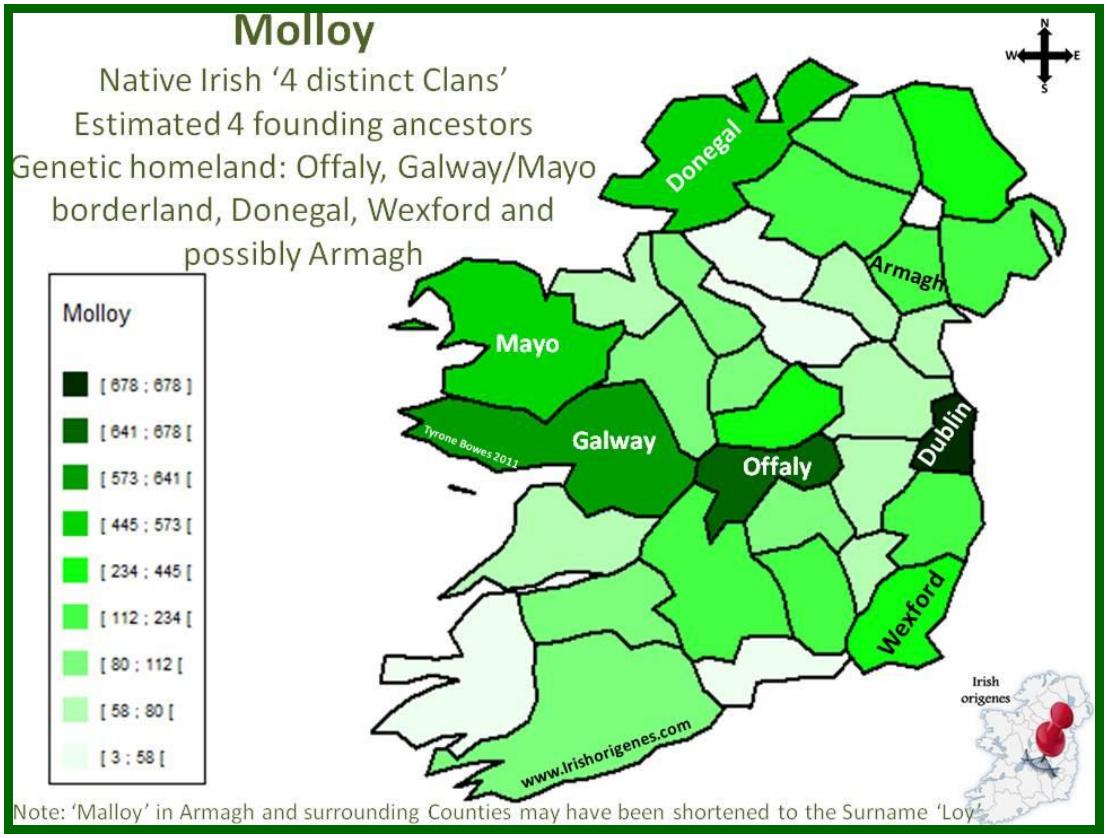

Figure 5: *The Molloy Surname in Ireland. Distribution mapping of all individuals named Molloy throughout the 32 counties of Ireland demonstrates clearly that the surname concentrates in in specific counties. Image taken from the Irish Origenes distribution map database, free to view at:* ***www.irishorigenes.com/surnames-database***

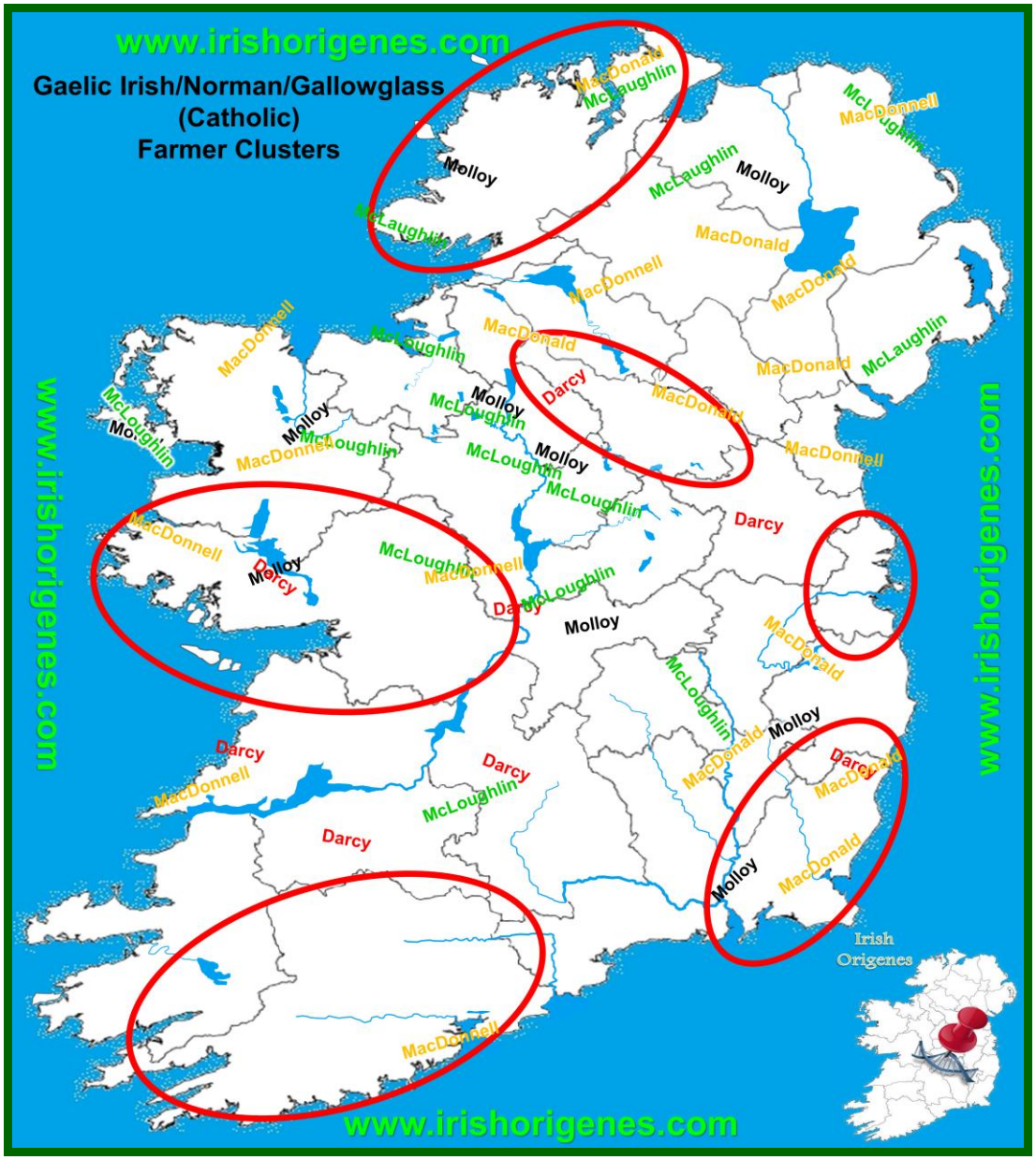

Figure 6: *Catholic Irish farming communities and Autosomal DNA revealed locations. Census data reveals that individuals with Gaelic Irish, Norman or Scottish Gallowglass surnames were overwhelmingly Catholic, while those with 16th and 17th Century Plantation Scottish or English surnames were overwhelmingly Protestant. The Darcy, McDonald, McLaughlin, and Molloy surnames are associated with Gaelic/Norman/Gallowglass Ireland. Distribution mapping of farmers (Catholic, male, heads of household) named Darcy, McDonald, McLaughlin, and Molloy in early census data reveals distinct groups spread throughout Ireland, some of which are associated with autosomal DNA hotspots (**red circles**). Each surname is positioned as it appears on the Irish Origenes Medieval Surnames map, the most common spelling is detailed in each location, free to view: **www.origenesmaps.com**. A surname search function is available at **https://analysis.irishorigenes.com/surnames***

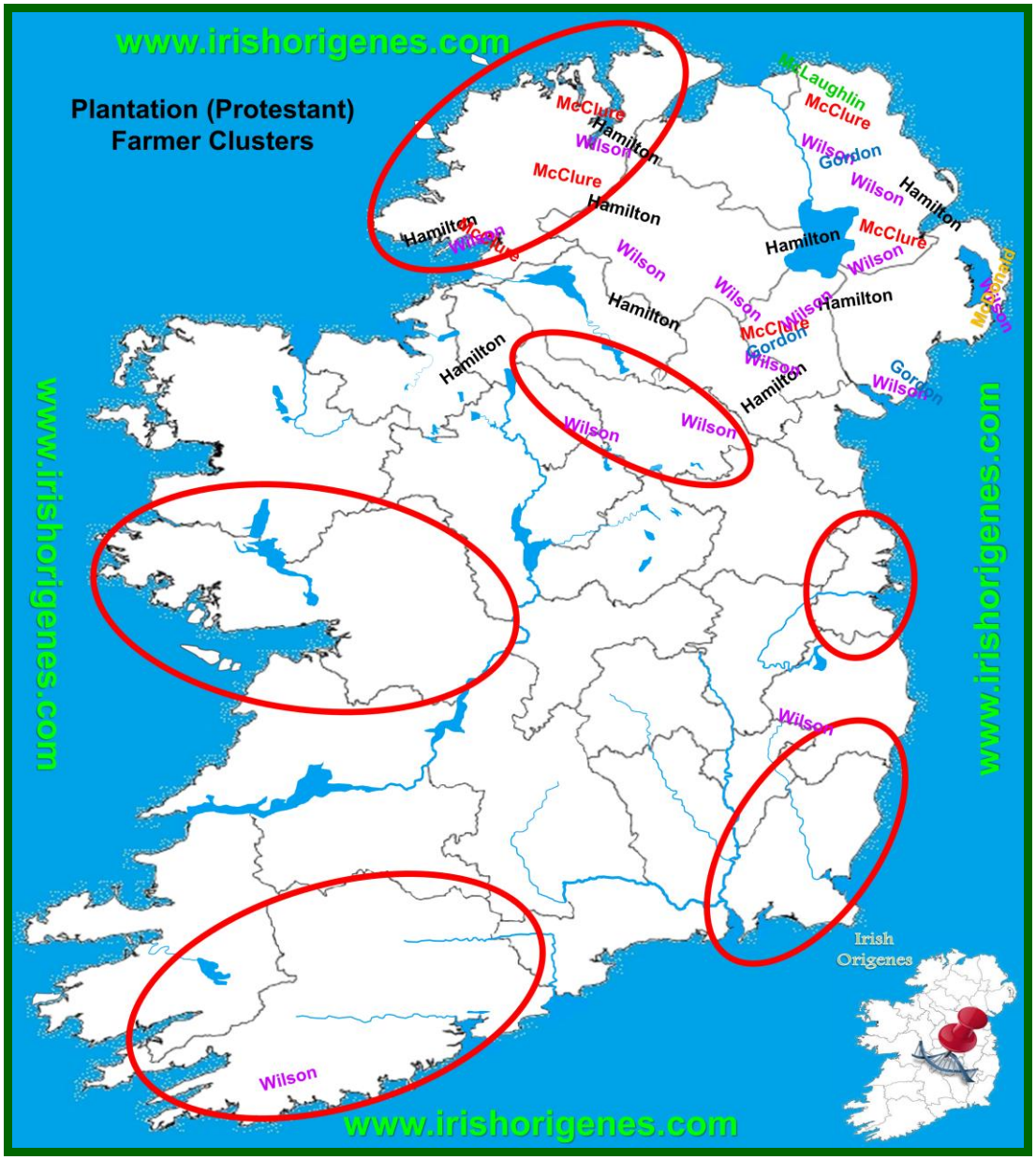

Figure 7: *Protestant Irish farming communities and Autosomal DNA revealed locations. Census data reveals that individuals with Gaelic Irish, Norman, or Scottish Gallowglass surnames were overwhelmingly Catholic, while those with 16th and 17th Century Plantation Scottish or English surnames were overwhelmingly Protestant. The Gordon, Hamilton, McClure, McDonald, McLaughlin, and Wilson surnames are associated with Plantation Ireland. Distribution mapping of farmers (Protestant, male, heads of household) named Gordon, Hamilton, McClure, McDonald, McLaughlin, and Wilson in early census data reveals distinct groups spread throughout Northern Ireland, some of which are associated with autosomal DNA hotspots (**red circles**). Each surname is positioned as it appears on the Irish Origenes Plantation Surnames map, the most common spelling is detailed in each location, free to view: **www.origenesmaps.com/**.*

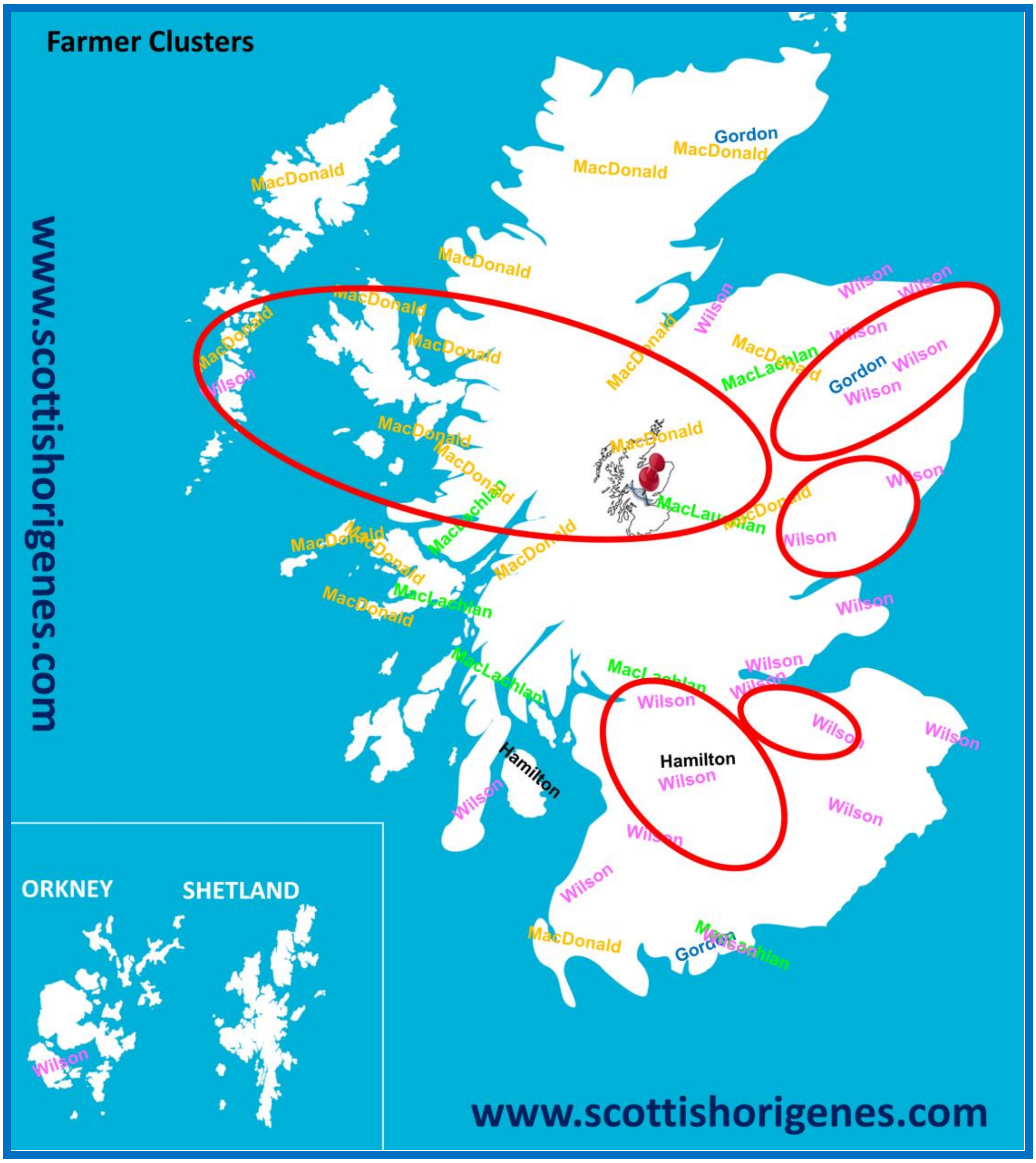

Figure 8: *The Scottish Gordon, Hamilton, McClure, McDonald, McLaughlin, and Wilson farming communities and Autosomal DNA revealed locations. Scottish farmers still concentrated in early census data in the area where their surname first appeared or in the area where their ancestors first settled. Distribution mapping reveals distinct groups of Gordon, Hamilton, McDonald, McLaughlin, and Wilson farmers throughout Scotland, some of which are found in, or near autosomal DNA hotspots (**red circles**). Each surname is positioned as it appears on the Scottish Origenes Surname map, the most common spelling is detailed in each location, free to view:* ***www.origenesmaps.com***

LINKING ANCESTRAL SURNAMES WITH AUTOSOMAL DNA HOTSPOTS

The ancestral information (surnames and locations) recorded by one's autosomal DNA genetic relatives are not random, reflecting the relationships that developed among one's most recent ancestral lines in specific locations. One can therefore search that detail for locations associated with the test subject's ancestral surnames. One can then compare the distribution of one's ancestral surnames with DNA revealed locations, together with autosomal search results to begin the process of linking each ancestral surname with its Irish and/or Scottish origin.

The non-random nature of the ancestral locations recorded by the test subject's autosomal genetic relatives can be easily demonstrated by examining the countries of Britain, Ireland, and Germany that are recorded in association with each ancestral surname, see **Figure 9**. Autosomal search results reveal Irish origins/links for the test subject's Molloy, Darcy/D'Arcy, McLaughlin, McClure, Hamilton, Gordon, and possibly Wilson ancestral lines, and ultimate Scottish origins for his McDonald, Gordon, McDonald, and possibly Wilsons, see **Figure 9**.

A search of the ancestral information recorded by the test subject's autosomal genetic relatives for the 32 counties of Ireland in association with the DNA revealed Irish-associated surnames revealed Plantation Scots McClure and Hamilton links with Southern Donegal (close to the Fermanagh border), Wilson links with both Antrim and Derry, and a McLaughlin origin within the borderlands of Donegal and Derry, see **Figure 10**. The emergence of 2 different locations associated with Scots Irish surnames like Wilson is not uncommon, and merely indicates that a migration has occurred (possibly from the farmland of Derry to Antrim). In contrast, only weak signals emerged for the Gaelic Irish Molloy and Darcy/D'Arcy surnames, and an ancestral link with both those surnames could not be confirmed through autosomal testing. It is recommended therefore that the test subject take a commercial ancestral Y-DNA test to confirm his paternal link with the Molloy surname. A search of the ancestral information recorded by the test subject's autosomal genetic relatives for the 1841 counties of Scotland in association with the DNA revealed Scottish-associated surnames revealed an ultimate Hamilton origin within Lanarkshire, and a McDonald origin within Invernesshire, see **Figure 11**. In contrast, no clear origin within Scotland emerged for the Wilson or Gordon surnames, see **Figure 11**. Census data reveals that the McClure surname, although of ultimate Scottish origin, only survives in Ulster in Northern Ireland as a direct result of the Plantation of Ulster. However, the distribution of Scottish Gaelic 'Mac' surnames indicates that the 'McClure' surname was originally from Galloway in Southwest Scotland, an area where Gaelic surnames are common, and where many Scots left for Ulster in the early 17th Century.

The Origenes Surname maps detail where farmers with each surname concentrated in Ireland and Scotland, and an examination of the Donegal and Derry borderlands as it appears on the Irish Origenes Medieval Surnames of Ireland map reveals his McLaughlins on either side of Derry City, see **Figure 12**. An examination of the surrounding area reveals at least two castles/towerhouses that are historically associated with Clan McLaughlin on the Inishowen peninsula, see **Figure 12**. The Irish Origenes Plantation Surnames of Ireland map details where Protestant farmers with each surname concentrated in early census data, and an examination of Southern County Donegal as it appears on that map reveals the test subject's Hamiltons and McClures in the farmland that lies to the west of Donegal town, and in an area colonised by Scots from Southwest Scotland, see **Figure 13**. Similarly, an examination of the Scottish surnames associated with Lanarkshire as it appears on the Scottish Origenes Surnames of Scotland Map reveals that the test subject's Hamiltons originated near the town of Hamilton and in an area littered with castles/towerhouses that are historically associated with Clan Hamilton, see **Figure 14**. The test subject's ancestral surnames and their autosomal DNA predicted origins are summarised in **Figure 15**.

Autosomal Search Results

Surname	Total		Ireland		Northern Ireland		Scotland		England		Wales		Germany	
	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM
Molloy	5	100	3	100	0	0	1	17	0	0	0	0	0	0
Malloy	5	17	1	16	0	0	1	17	0	0	0	0	0	0
D'Arcy	4	24	3	24	0	0	0	0	0	0	0	0	0	0
Darcy	4	24	3	24	0	0	0	0	1	12	0	0	0	0
McLaughlin	26	23	11	19	3	23	1	12	0	0	0	0	0	0
McLoughlin	9	41	3	18	1	13	2	14	2	41	0	0	0	0
Mclachlan	8	20	1	15	0	0	7	20	0	0	0	0	0	0
McClure	35	329	12	329	4	252	5	41	2	14	0	0	0	0
Hamilton	13	329	27	25	16	329	36	24	9	22	0	0	0	0
Gordon	74	29	9	29	5	24	16	27	8	20	0	0	0	0
MacDonald	80	38	4	28	1	14	41	37	2	24	0	0	0	0
McDonald	152	147	12	25	3	19	64	147	2	13	0	0	0	0
Wilson	378	252	36	21	23	252	63	37	80	34	2	14	0	0
Mason	129	147	4	14	0	0	3	116	31	41	0	0	0	0
Green	208	100	7	16	1	12	0	0	59	100	4	20	2	21

Figure 9: *Autosomal search results for ancestral surnames within Britain, Ireland, Germany, and Italy. The ancestral locations revealed by one's autosomal genetic relatives are not random, reflecting the relationships that developed among the test subject's various ancestral lines living in specific areas. Autosomal searching of genetic relatives that share greater than 12cM of DNA for the countries of Ireland, Scotland, England, Wales, and Germany for each ancestral surname and common spelling variants graded according to maximum shared DNA (cM) reveals Irish links or origins (**green arrows**) for the test subject's Molloy, Darcy/D'Arcy, McLaughlin, McClure, Hamilton, Gordon, and possibly Wilson ancestral lines, and ultimate Scottish origins for his Hamilton, Gordon, McDonald, and possibly Wilsons (**blue arrows**). Autosomal search results confirmed English origins (**red arrows**) for the test subject's Masons and Greens, and possibly Wilsons. Note: Wilson is a very common English, Scottish, and Scots Irish surname, and as a result it will give autosomal signals in all 3 countries.*

Autosomal Search Results

County	McClure		Hamilton		McLaughlin		Molloy		D'Arcy/Darcy		Wilson		Gordon	
	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM
Leitrim	0	0	1	17	0	0	0	0	0	0	1	17	0	0
Roscommon	0	0	0	0	1	16	0	0	0	0	1	12	0	0
Sligo	1	13	0	0	0	0	0	0	0	0	0	0	0	0
Mayo	0	0	0	0	0	0	0	0	0	0	0	0	1	12
Galway	1	329	0	0	1	18	0	0	1	24	1	15	0	0
Tipperary	0	0	0	0	0	0	0	0	2	16	1	12	0	0
Clare	0	0	0	0	0	0	0	0	0	0	1	17	0	0
Kerry	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cork	0	0	0	0	1	12	0	0	0	0	1	18	1	13
Limerick	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Waterford	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kilkenny	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Offaly	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laois	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kildare	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dublin	0	0	1	14	0	0	2	100	0	0	3	16	1	14
Wicklow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carlow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wexford	0	0	0	0	0	0	0	0	0	0	1	15	0	0
Longford	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Louth	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westmeath	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meath	0	0	1	13	0	0	0	0	0	0	0	0	0	0
Cavan	0	0	1	17	0	0	0	0	0	0	3	19	1	19
Monaghan	0	0	1	21	0	0	0	0	0	0	1	14	0	0
Fermanagh	1	252	2	329	0	0	0	0	0	0	0	0	0	0
Donegal	8	17	6	19	4	19	0	0	0	0	1	14	1	19
Derry	1	14	2	14	3	24	0	0	0	0	7	17	0	0
Tyrone	0	0	2	22	0	0	0	0	0	0	2	17	1	24
Antrim	0	0	1	52	0	0	0	0	0	0	5	252	0	0
Down	1	23	1	16	0	0	0	0	0	0	0	0	2	14
Armagh	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 10: *Autosomal search results for Irish-associated surnames within the 32 Counties of Ireland. The counties recorded by autosomal genetic relatives (that share greater than 12cM of DNA) in association with each Irish-associated surname revealed origins for ancestral lines (**green arrows**). Autosomal DNA testing revealed McClure and Hamilton links with Southern Donegal (close to the Fermanagh border), Wilson links with both Antrim and Derry, and a McLaughlin link with the Donegal and Derry borderlands. In contrast, only weak DNA signals emerged for the Molloy and Darcy surnames.*

Autosomal Search Results								
	Hamilton		McDonald		Wilson		Gordon	
County	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM	Frequency	Max. DNA/cM
Shetland	0	0	0	0	0	0	0	0
Orkney	2	12	1	12	0	0	0	0
Caithness	0	0	1	24	0	0	1	15
Sutherland	0	0	1	13	0	0	1	12
Ross and Cromarty	0	0	4	23	0	0	0	0
Invernesshire	0	0	22	147	2	16	1	19
Argyllshire	0	0	9	20	0	0	0	0
Perthshire	0	0	6	19	4	28	1	14
Stirlingshire	2	12	2	13	3	14	1	12
Dunbartonshire	0	0	0	0	0	0	1	12
Buteshire	0	0	1	12	0	0	0	0
Nairn	0	0	0	0	0	0	0	0
Morayshire	0	0	1	13	0	0	1	19
Banffshire	0	0	0	0	2	15	0	0
Aberdeenshire	0	0	1	15	2	19	3	27
Kincardineshire	0	0	0	0	0	0	1	22
Angus	1	12	2	21	0	0	1	12
Fife	0	0	3	24	8	23	0	0
Clackmannanshire	0	0	0	0	1	12	0	0
Kinrosshire	0	0	0	0	0	0	0	0
West Lothian	0	0	0	0	3	18	1	20
Mid Lothian	2	17	3	17	12	18	3	20
East Lothian	1	14	0	0	1	12	0	0
Renfrewshire	1	16	0	0	6	18	0	0
Lanarkshire	21	20	7	17	7	18	1	12
Ayrshire	3	22	1	23	8	21	1	12
Wigtownshire	1	17	1	12	2	21	0	0
Kirkcudbrightshire	0	0	1	28	1	14	0	0
Peebleshire	0	0	0	0	0	0	0	0
Selkirkshire	0	0	0	0	0	0	0	0
Berwickshire	0	0	0	0	3	28	0	0
Roxburghshire	0	0	0	0	1	13	0	0
Dumfriesshire	1	12	0	0	4	37	0	0

Figure 11: *Autosomal search results for Scottish-associated surnames within the 1841 Counties of Scotland. The counties recorded by autosomal genetic relatives (that share greater than 12cM of DNA) in association with Scottish-associated surnames revealed Hamilton origins within Lanarkshire, and a McDonald origin within Invernesshire (**blue arrows**). In contrast, no clear origin within Scotland emerged for the Wilson or Gordon surnames.*

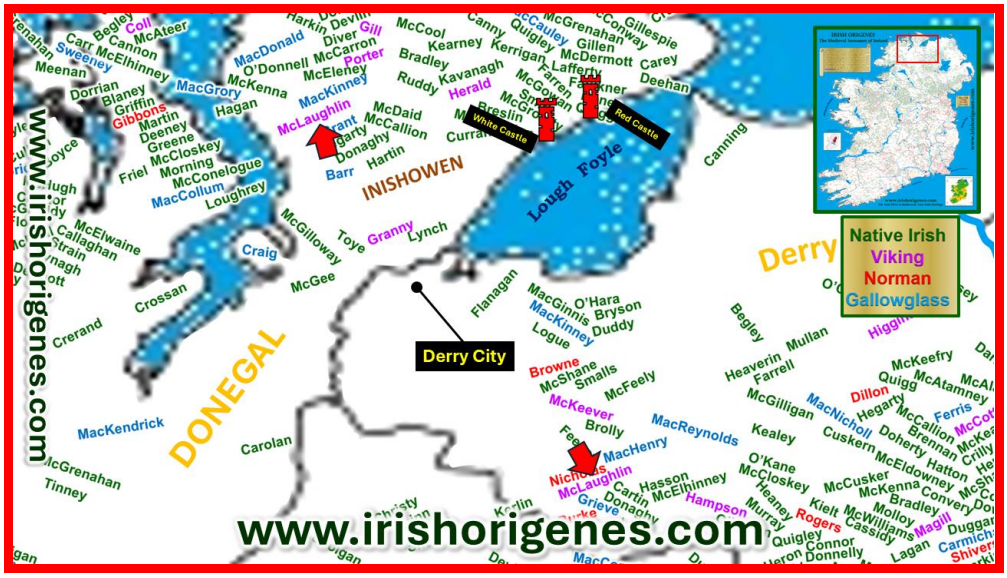

Figure 12: *The Medieval Surnames of the Donegal and Derry borderlands. Donegal dominates among the test subject's autosomal DNA results and an examination of the Donegal and Derry borderlands as it appears on the Irish Origenes Medieval Surnames of Ireland map reveals the test subject's McLaughlin ancestors (**red arrows**) surrounding Derry City and close to Inishowen where one finds the remains of at least two castles/towerhouses that are associated with Clan McLaughlin. Each surname is positioned in the location where farmers (Catholic, male, heads of household) with each surname concentrated in early census data. The most common spelling is detailed in each location. Detail taken from the Irish Origenes Surnames of Ireland maps, free to view at **www.origenesmaps.com** A surname search function is available at **https://analysis.irishorigenes.com/surnames***

Figure 13: *The Plantation Surnames of South Donegal. County Donegal emerged as an autosomal DNA hotspot and an origin for the test subject's Hamiltons and McClures who concentrate (**red arrows**) in the farmland that lies to the west of Donegal town and in an area colonised by Scots from Southwest Scotland. Each surname is positioned in the location where farmers (Protestant, male, heads of household) with each surname concentrate in early census data. The most common spelling is detailed in each location. Detail taken from the Irish Origenes Plantation Surnames of Ireland map, free to view at* ***www.origenesmaps.com***

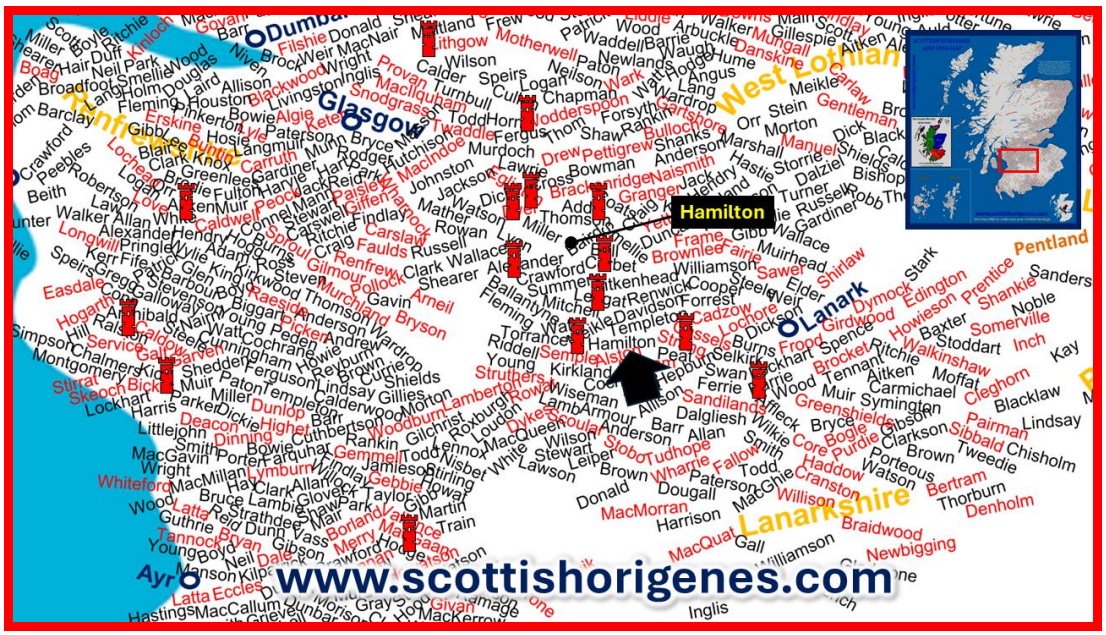

Figure 14: *The Hamiltons of Lanarkshire. Scottish farmers still concentrated in early census data in the area where their surname first appeared or in the area where one's ancestors first settled. An examination of the surnames associated with Lanarkshire which emerged as a prominent autosomal DNA hotspot reveals that the test subject's Hamiltons (**black arrow**) originated near 'Hamilton' town and in an area littered with castles and towerhouses that are associated with Clan Hamilton. Each surname is positioned in the location where farmers with each surname concentrate in early census data. The most common spelling is detailed in each location. Each surname is positioned as it appears on the Scottish Origenes Surnames of Scotland map, free to view:* ***www.origenesmaps.com***

Surname	Ancestral Origin	Autosomal DNA Revealed Origins	
Molloy		Dublin City, Ireland	
D'Arcy		Galway/Tipperary Borderlands?	
McLaughlin		Gaelic Irish, Inishowen, Ireland	
Green	England	England	
Gordon		?	
MacDonald		Invernesshire, Scotland	
Mason		England	
McClure		Planter Scots, Mountcharles, Donegal, Ireland	Southwest Scotland
Wilson		?	
Hamilton		Planter Scots, Killybegs, County Donegal, Ireland	Hamilton, Lanarkshire

Figure 15: *Ancestral surnames and Autosomal DNA revealed origins. Highlighted font indicates each surnames associated ethnicity, location of an earliest known ancestor, or DNA revealed origin: Irish/Ireland, Scottish/Scotland, Scots Irish, English/England, Multiple-associated ethnicities/locations.*

Confirming an ancestral link to an identified area

One must keep in mind that this is a scientific 'DNA' approach. The DNA does not lie, and commercial ancestral DNA testing of individuals (farmers) with the surnames of interest from the ancestral DNA hotspots would confirm the ancestral link to that location.

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