

Case Study

“Anchoring” Family History Through DNA

Ugo Perego, Kaisa Bailey and Pekka Hellemaa go helix-hunting

WHEN KAISA BAILEY from Germany began collecting information for her family tree in 2002, the last thing on her mind was DNA testing. At that time, her sister reminded her about the “Hellman family story” with regards to the biological birth of their grandfather Karl (Kalle) Augusti Happonen, recorded as being born on 9 June 1867 in Kuopio, Finland.

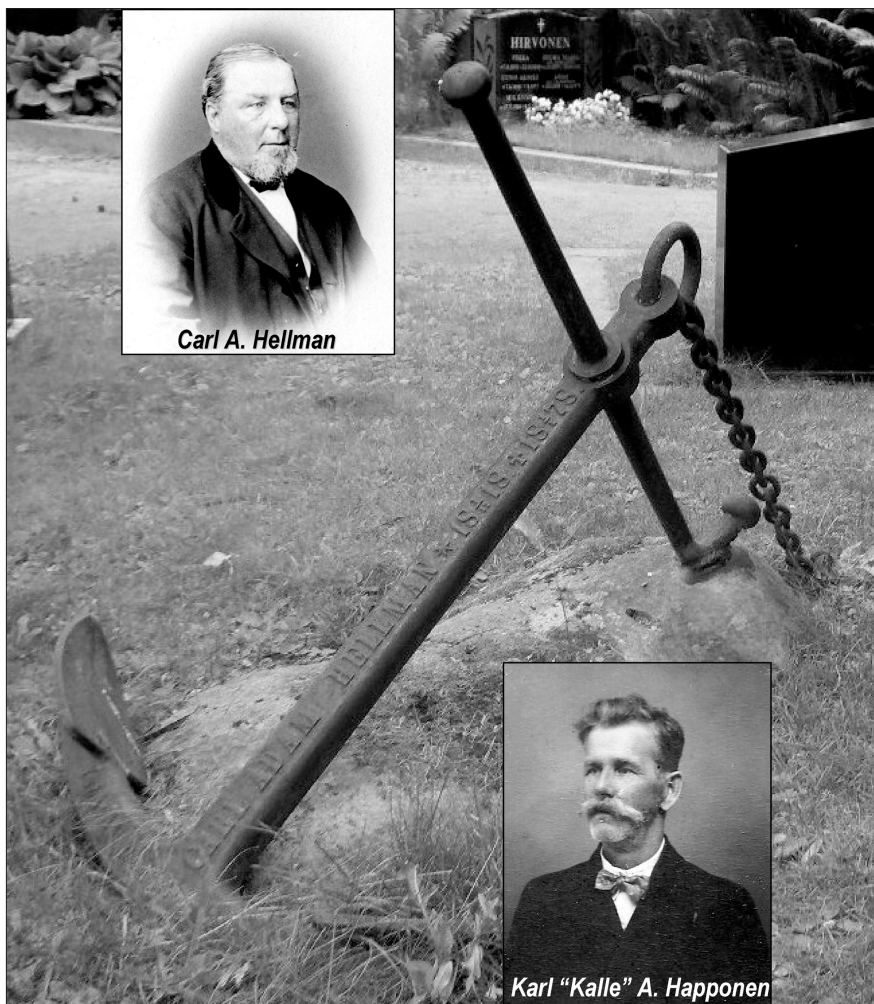
Since childhood, Kaisa was taught to remember her ancestors and to pay homage to their graves as occasions permitted. As part of her travels to the Kuopio cemetery, one of the graves regularly visited had a large anchor instead of a headstone with the following inscription: “Carl Adam Hellman *7.12.1818 †1.2.1878”. Carl Hellman was a sea captain and, based on the family tradition, the alleged father of Kalle Happonen. Kalle’s mother, Saara Maria Hämäläinen, married Aaron Happonen on 14 March 1868, when Kalle was nine months old. Saara’s name is the only one listed on his birth certificate and Kalle was given the Happonen surname about two months after the marriage to Aaron took place. Because Saara conceived a child out of wedlock, details about Kalle’s birth were not openly discussed for a couple of generations due to the shame surrounding such an event. However, after more than a century, Kaisa’s personal interest in genealogy took her on the path to discover her grandfather’s biological paternity.

Because of the lack of documents that could provide conclusive evidence about Kalle’s birth, Kaisa decided to contact the Hellman family in early 2006 through their website at <http://personal.inet.fi/yhdistys/oulun.hellman>. She was curious to know if anyone

in that group knew anything about her family rumor. It was about this time that the Hellman family genealogist Pekka Hellemaa became involved in the discussion. Pekka first wrote a short article describing the Kalle Happonen story in the family newsletter, hoping to gather some information regarding Carl Hellman’s possible illegitimate child. When no response came, Pekka suggested to Kaisa the employment of DNA

testing to verify her hypothesis. Pekka already knew the benefits of DNA testing as he previously participated in the National Geographic’s Genographic Project.

As indicated in the schematic family tree (Figure 1, next page), Pekka’s great-great-grandfather was Adam Hellman, born on 3 July 1778 in Lapväärtti, Finland. Adam and his wife Elisabeth Margaretha Cannelin had two daughters and three sons, including



The anchor grave marker of Carl Hellman. Inset: Hellman, and Karl “Kalle” Happonen.

Fredrik Mauritz (Pekka's great-grandfather and the only one with a known living posterity) and Carl Adam (the alleged father of Kalle Happonen). The change from the Hellman to the Hellemaa surname was the consequence of a mass movement to replace Swedish surnames with Finnish ones during the earlier part of the 20th century. Following this trend, Pekka's father received the new surname Hellemaa at the time of his christening. This was not a mere translation from Swedish to Finnish, but a new chosen surname with no relationship to the previous one. Nowadays, there are no known descendants from Adam Hellman carrying the original surname, which could have been part of the problem Kaisa faced in researching information about Kalle Happonen's biological father.

With regards to DNA testing, Adam Hellman could potentially be the most recent common ancestor (MRCA) to both Pekka and Kaisa, with the two being separated by eight generational events. Testing the paternally inherited Y chromosome of Pekka and then comparing it with the Y chromosome signature (haplotype) of one of Kalle Happonen's male descendants should elucidate whether Adam Hellman was the common patriarch to both family lines. Kaisa's brother, Juhani was an eligible candidate for the study on the Happonen side of the tree. DNA kits were requested from the Utah-based Sorenson Molecular Genealogy Foundation, www.SMGF.org, a non-profit research organization with the largest online database of correlated genealogical and genetic data. Later, one of Kaisa's cousins also contributed a sample to SMGF (the name is not disclosed because of privacy).

When the Y chromosome haplotypes for Pekka and Juhani eventually became available in the SMGF database (Figure 2), they were identical to each other in all, but two — DYS458 and DYS462 — of the 43 markers tested. DYS is an acronym for DNA Y chromosome segment. This fact created some

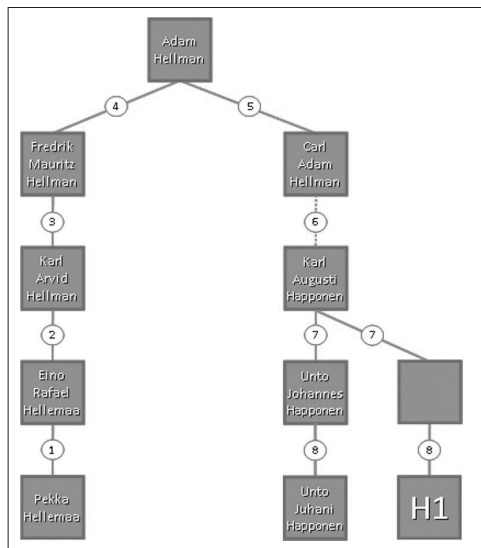


Figure 1, above: The Hellman-Happonen schematic family tree.

Figure 2, below: Y chromosome profiles.

ISFG Standards (SMGF.org)	Juhani Happonen	Kaisa's Cousin	Pekka Hellemaa	Adam Hellman Inferred Haplotype
DYS19	14	14	14	14
DYS385a	14	14	14	14
DYS385b	14	14	14	14
DYS388	14	14	14	14
DYS389I	12	12	12	12
DYS389II	28	28	28	28
DYS390	23	23	23	23
DYS391	10	10	10	10
DYS392	11	11	11	11
DYS393	13	13	13	13
DYS426	11	11	11	11
DYS437	16	16	16	16
DYS438	10	10	10	10
DYS439	10	10	10	10
DYS441	17	17	17	17
DYS442	17	17	17	17
DYS444	13	13	13	13
DYS445	11	11	11	11
DYS446	13	13	13	13
DYS447	23	23	23	23
DYS448	20	20	20	20
DYS449	30	30	30	30
DYS452	31	31	31	31
DYS454	11	11	11	11
DYS455	8	8	8	8
DYS456	14	14	14	14
DYS458	18	18	17	17 or 18
DYS459a	8	8	8	8
DYS459b	9	9	9	9
DYS460	10	10	10	10
DYS461	12	12	12	12
DYS462	14	13	13	13
DYS463	21	21	21	21
DYS464a	12	12	12	12
DYS464b	14	14	14	14
DYS464c	15	15	15	15
DYS464d	15	15	15	15
GGAAT1B07	11	11	11	11
Y-GATA-A10	15	15	15	15
Y-GATA-C4	22	22	22	22
Y-GATA-H4.1	20	20	20	20
YCAIIa	19	19	19	19
YCAIIb	21	21	21	21

confusion at first, as it appeared that two mutations could have been too many for the number of generations separating the individuals tested. A closer look at these two mutational events revealed that:

- The statistical calculation (TMRCA) of two individuals not matching at two markers is on average 13 generations. Pekka and Juhani are separated by only eight generational events, which is lower than the accepted average.
- Both markers experienced a "one-step" mutation. Y chromosome haplotypes are reported in number of repeats for each location (locus) tested. When random mutations occur between two contiguous generations, the likely outcome is the increase or decrease of the ancestral count by the order of one. In this case study, DYS458 mutated from 17 to 18, or vice versa, and DYS462 mutated from 13 to 14, or vice versa from the ancestral haplotype.
- Not all the Y chromosome markers experience random mutations at the same rate. Taken individually, some markers mutate faster than others. DYS458 is one of the markers with above-average mutation rates. However, DYS462 is a more stable marker with a relatively low mutation rate.

Based on these three considerations, it is still acceptable to assume a recent common origin for these two Y chromosomes. However, it is important to remember that similar Y chromosome profiles are not sufficient to pinpoint a specific common paternal ancestor. The MRCA for these two lineages could be older than Adam Hellman, or in other words, Pekka and Juhani's Y chromosome similarity could be the result of a common ancestor that lived a few generations before Adam.

To further clarify the issue of the two mismatching markers, we waited for the Y chromosome profile of Kaisa's first cousin to become available in the SMGF database. At that time, we were able to compare all three haplotypes (Figure 2) and determine the following additional information:

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- The markers shared by Pekka and Juhani were also a match to the genetic profile of Kaisa's cousin;
- Because Kaisa's cousin and Juhani have an 18 for DYS458 — which is different from that of Pekka — the ancestral value for this marker could not be determined at this time;
- However, DYS462 (the slower mutating marker) was a 13 for both Kaisa's cousin and Pekka's haplotypes. This means that 14 was the mutated value — a change that occurred either between Kalle Happonen and his son Unto, or between Juhani and his father (Figure 1) — and that 13 was part of the common ancestral haplotype.

Thanks to the additional haplotype available through Kaisa's cousin, the number of mismatches between the Hellman and Happonen lineages was reduced to one, leaving DYS458, the marker with higher-than-average mutational rate, as the only mismatch between the Hellman and the

Happonen lineages. The most likely time to the MRCA was therefore halved from 13 to seven generations — or approximately 403 to 217 years — fitting more closely with the hypothesis that Adam Hellman was the common ancestor to both Pekka and Kaisa.

This study demonstrated the usefulness of carefully-designed DNA testing and online genetic genealogy databases as a part of family history research. The DNA evidence combined with the limited genealogical and historical details surrounding Kalle Happonen's birth seem to weigh convincingly in support of Carl Hellman being his biological father. The Happonen family can now confidently consider themselves as part of the large Hellman clan, which counts today over a thousand living descendants from the Fredrik Hellman line. Kaisa's genealogical passion and determination was rewarded with the opening of a fresh chapter in her family history and, more recently, with the opportunity to travel to Finland and meet in person her

newly-found biological cousin, Pekka Hellemaa.

FC

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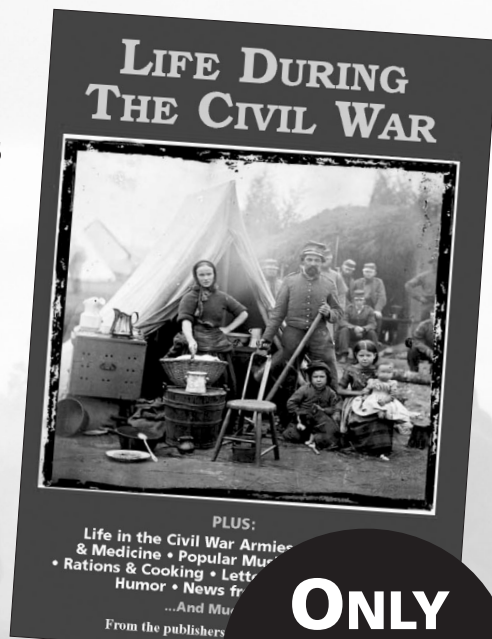
Pekka Hellemaa (pekka.hellemaa@gmail.com) is a retired computer programmer. He is the genealogist for the Hellman Family Association and a member of The Genealogical Society of Finland.

Kaisa Bailey (kaisa.bailey@hotmail.com) was educated in Finland as an operating room nurse in 1973. She is married and has two sons, and they are currently living in Germany.

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