The Bachman / Baughman D.N.A. Project

A style of writing known for millions of years only by God, but which was read by humans for the first time only fifty years ago, can now spell out precisely where many of the Bachmanns and Baughmans originated.

For several branches of the Baughman family in America—and as well in the Alps of Europe where the Bachmann tree first took root—a single heritage of DNA runs through them all, spanning not only the borders of several Swiss cantons, but even an ocean.

During a Baughman family reunion held in Virginia's Shenandoah Valley in 1994, a sample of hair follicles was carefully sealed in archival sleeves and placed inside a time capsule. The hope was that when descendants opened the cylinder in the year 2194, they would be able to test those specimens and, with the sure-to-be sophisticated methods of the future, learn much about us. Back in 1994, it didn't seem feasible or affordable or even worthwhile for ordinary folks to attempt such analysis.

When the first such testing was announced in 1995, it was only applicable to mitchondrial DNA, a very specific fragment of unchanging chromosome passed on from grandmother to mother to daughter. Unfortunately, because of naming traditions in western culture, this test would have only pointed to each maiden's father's name, so often the most difficult to find and worst documented by family historians.

Within another three years, geneticists began their headlong pursuit of analyzing the entire human genome, and on the way, stumbled upon the same unchanging quality in the male Y chromosome. When any father has a son, he passes on the genetic instruction for maleness through this gene. All of the men who are part of that chain inherit the same unique genetic code.What makes the Y chromosome special though is that it does not reshuffle when sperm meets egg. It does not become a blend of the father and mother, as all of the other genetic traits do. Its telltale structure remains intact, more descriptive than a signature or a fingerprint.

Upon the announcement of this scientific breakthrough, the idea for this project took hold, which was probably the most difficult part of the whole process, that is having the nerve and the faith to want it to happen. Then, many other challenges took form:

How tricky would handling the DNA samples be? Would a doctor have to draw blood, or would more strands of hair be enough? Would the DNA all have to be prepared at that same time? Would such specimens degrade in transit? Where would we find a scientist willing to analyze such specimens? How much would it cost? Would we have many choices in this? How accurate and reliable could the tests be?

Besides the concern of "Can it be done?" many more questions followed: What exactly did we hope to learn? Who all would volunteer to be tested? How could we find descendants who would help fill in the many blank spots in our traditional research so far? Where should we begin searching? How should we approach total strangers? How can participants keep their privacy and sense of control over the project? Should we keep expanding the project's scope, even after our basic curiosities are satisfied? Should we try to help Baughmans and Bachmanns from other lines? How long should we continue welcoming new participants? What surprises remain out there for which we should always remain open and continue searching in new ways?

Dr. Ueli Bachmann of Richterswil in Switzerland became an early advocate for the study, and during a visit by J. Ross Baughman to his office in October 1998, drew and froze a blood sample for future study, without even being sure at that point how it would be handled.

Professor Bryan Sykes, a geneticist at Oxford University in England, astounded the world in 1993 with his test of the Ice Man of the Alps. Through a test of the mummy's well-preserved DNA, Sykes established that the 5,300-year-old man was the direct ancestor to 75 percent of all living northern Europeans.

To bring his findings to life, Sykes cut through the scientific anonymity of one test subject, an avid amateur historian named Marie Moseley, who shared the exact same DNA trace markers as the Ice Man. What surprised even the professor was how emotionally moved Marie became, how connected she felt to her newfound ancestor. The stirring that Miss Moseley felt in her bones, and described to the world's press, inspired Bryan Sykes to reorient his academic study of human ancestry through men and women alive today. [31: 6]

In later celebrated cases, Sykes found the living descendant of a cave man's bones in Cheddar, England, and helped establish the paternity of President Thomas Jefferson to a line of children born by the slave Sally Hemming. He also positively identified the remains of the last Russian emperor, Czar Nicholas and his family, as well as colorful desperados such as Jesse James, Butch Cassidy and the Sundance Kid.

In May of 2000, Sykes took his laboratory's services into the private market under the name Oxford Ancestors. A wealth of updated information can be seen on his website www.oxfordancestors.com, so no exhaustive effort will be made in this report to repeat all of it.

His method for harvesting samples was very simple and much less painful than drawing blood through a needle or yanking out hair follicles. A sterile, pencil-thin brush was rubbed on the soft epithelial cells inside the cheek, catching and collecting hundreds of them on the short, soft bristles. The whole brush was slipped back into its sterile packing sleeve and shipped off in the self-addressed envelope.

The first correspondence amongst Baughman and Bachmann family members to undertake such a project occurred in December 2000 placing them in the vanguard of these private efforts. The first Baughman specimen dispatched to Oxford bore the postal date of 1 July 2001.

By 1 November 2002, due to a relatively expensive costs per-person, only 150 families in the world had yet attempted such studies. By 15 May 2004, worldwide DNA surname projects had mushroomed to 293.

One group of Layman donors working with Sykes numbered 34. Two descendants of Benjamin Layman who died during 1788 in Shenandoah County, Virginia, are of greatest interest to Baughman research, namely John Reese Layman and Paul Edward Layman. Their great6-grandfather, Benjamin Layman married Barbara Baughman, daughter of John Baughman from Hempfield Township, Pennsylvania. Mary Layman, their eldest

daughter, married Henry Baughman, Jr. [5: 49-58&267] The Layman men's most basic Y-line chromosome reads out as 15-12-22-11-11-14-9-17-14-11. [19]

The largest such study at Oxford brought 57 far-flung members of the Kay, Kaye and Key families together through his laboratory. The genetics department at Leicester University, also in Great Britain, has gathered specimens from 100 members of the Clare family, although they are relative latecomers to this frontier of scientific research. [24]

An alliance of Canadian Mennonites formed in July 2004 to gather DNA on 21 surnames, including Funk, Landis, Light, Miller and Stahly.

Deciphering the Blueprint

In the broadest view, the new science of genetic genealogy makes it possible to know which tribes and families arrived first in any given territory and which managed to survive the difficulties of life during the Stone Age. The pattern of chromosomes passing from every Bachmann father to his son yields a sequence which also happens to profile the Aurignac, the first modern humans to inhabit central and western Europe. [33] The name Aurignac derives from an archaeological site in the Pyrenees Mountains on the southern edge of France where the culture first came to light. [2]

The arrival of these Paleolithic hunters from the ancient Fertile Crescent seems to date back 40,000 years, shortly before the last Great Ice Age. A competing human species, the Neanderthals, already lived there, dating back for 300,000 years. They co-existed with the Aurignac for some 16,000 years. A study of Neanderthal DNA proves that they slowly died out, contributing nothing fresher to the family tree of modern Europeans other than a distant cousin some half million years earlier. [33]

DNA, more formally known as dioxyribonucleic acid, writes the blueprint that allows life to reproduce itself. The alphabet of every DNA secret contains only four letters. The initials A, G, C and T symbolize the proteins adenine, guanine, cytosine and thymine, which pair off into rungs on a long stringy ladder. These four letters are just as versatile, subtle and accurate as the binary code of zeroes and ones used by computers. Three billion of them line up to make the design code for each human being. [7: 11]

Protein sequences of varying lengths add up into groupings similar to words, and these are called genes. So far, only about 30,000 of these genes have functions that are recognizable to scientists.There is a chance that the rest are worthless junk, or perhaps these sequences hold other yet unknown instructions for how we turn out.

Scientists learned how to tinker with genes, at first in hope of arresting inherited disease, but on the way they bumped into DNA switches for a surprising range of outcomes. [25]

The Bad Hair Gene: By eliminating one out of the ten genes that control the patterns and alignment of hair follicles on mice—a gene nicknamed Frizzle6 —research scientists at Johns Hopkins School of Medicine in Baltimore drastically changed the appearance of their test subjects. On normal mice, most hair follicles grow in parallel patterns, giving the appearance of smooth, well-groomed fur. Without Frizzle6, the whorls and swirls crop up in random, chaotic patterns, giving the mice a chronically mussed and unhealthy appearance. According to Dr. Jeremy Nathans, one of the study's authors, humans share the same ten genes in common with mice. [12]

The Obesity Gene: Nine hundred people in the Salt Lake City area with a gene dubbed HOB1 have a far greater propensity for heart disease, Type 2 diabetes, high blood pressure and obesity than the general population, according to Steven Stone and a team of researchers at Myriad Genetics based in Utah. [14]

The Alcoholism Gene: When twins share the CHMR2 gene in a region of chromosome 7, their heightened risk for alcoholism is significantly higher, according to a study by the psychiatric geneticist Alison Goate of the Washington University School of Medicine. [1]

The Depression Gene: The gene known as 5-HTT holds the code for a protein that escorts serotonin through the brain and sweeps away leftover chemicals that would otherwise clog the receptor sites. Both anxiety and depression can thus be managed by the healthy neuro system, but people who have an ineffective or mutated 5-HTT gene are much more prone to suffer from long-term unemployment, debt problems, physical violence, interpersonal problems and homelessness. [9]

The Mothering Gene: By toggling off a single gene, either mother or baby mice will lose all interest in bonding. According to a study crafted by Dr. Francesca d'Amato at the National Research Council Institute of Neuroscience in Rome, the gene in question controls how or if the brain responds to naturally occurring brain opiates, and without this connection, they will cease to bond as normal mice do. The exchange of maternal caresses are not just psychologically soothing for both the giver and receiver, but physically therapeutic as well. [27]

The Promiscuity Gene: Researchers at Emory University in Atlanta inserted a single gene responsible for a social-bonding hormone into the brains of notoriously promiscuous meadow voles. All on their own, the voles' bodies began to produce the hormone. They immediately started cuddling with their mates and ignored other females. "This shows that a single gene in a single part of the brain can have a profound impact on social behavior," said Dr. Larry Young, the study's author and one of Emory's leading neuroscientists. [35]

The Race Gene: A Dr. Tony Frudakis and Dr. Mark Shriver of Pennsylvania State University have identified genetic markers called SNPs that are diagnostic of a person's ancestral continent of origin, 34 thereby sealing the controversial concept of race determined on a genetic basis rather than as a social construction. [32&20]

The Political Gene: Researchers from the University of California–Los Angeles scrutinized C.A.T. scans of neural activity for Republicans and Democrats while they watched campaign ads for their favorite candidates. Although the self-declared political preferences were at first kept secret from the scientists, an unmistakable difference in two kinds of thinking appeared immediately. One group showed active limbic systems, signifying emotional, "gut responses." Their perceptions registered in a part of the brain called the amygdala, on a level below the level of conscious control.

Another clear population remained cerebrally cool, unper-

turbed by messages or images of real or imminent violence.

The limbic voters turned out to be Democrats, while the unflappable voters were Republicans. [17]

The God Gene: The gene located at site VMAT2 controls the flow of mood-regulating chemicals called monoamines in the brain, a crucial measure of people's capacity to reach out beyond themselves, to see everything in the world as part of one great totality," according to the molecular biologist Dr. Dean Hamer of the National Cancer Institute. [18]

Another important concept of DNA and behavior describes how the 30,000 genes work, not as simple determinants but rather as an intricate trellis or lace-work of "if-then" relays. When a first set of conditions exists, a second trigger and effect may cascade from it. This arrangement promises much more than a laundry list of characteristics, but rather a compounding range of predispositions or outcomes.

Every human cell contains 46 chromosomes that are organized in pairs, a mixture from which half were contributed by the mother and half from the father.

It so happens that the 23rd pair of chromosomes will determine the gender of the individual. The mother always contributes an X chromosome, while the father can contribute either an X or a Y. If this contribution turns out to be a Y chromosome, the fertilized egg becomes a male, but a second X chromosome from the father guarantees the fertilized egg will become a female.

The male-determining Y chromosome consists of about 60 million DNA protein pairs, making it the largest block in the human genome. When a cell is ready to divide itself and reproduce, the long strands of DNA come apart just like a zipper. This process leaves exposed, split rungs upon which free-floating proteins in the cell's cytoplasm will bond, turning the two halves of DNA into two new whole strands, enough to outfit a separate cell.

Because the Y chromosome never splices with each new generation from a mother's family inheritance, in a scientific process referred to as "recombining," it remains virtually unchanged even across hundreds of generations.

The rate at which Y chromosome DNA pairs accidentally change, or mutate, allows scientists to start a slow but very reliable clock for tracing ancestry. [2] The discovery in 1997 of an ingenious way of reading DNA with chromatography, called the y polymorphism test, caused a revolutionary explosion in genetic research. In effect, a new metronome allowed the history of every living thing to be mapped out and compared. [13]

When all the chromosomal numbers between two individuals line up exactly, DNA confirms matching genetic identity with an extraordinarily high degree of certainty, defeating chance by a measurement of many millions to one.

For example, one of the Y chromosome rungs named DYS19 consists of various lengths identified as 11, 12, 13, 14, and so on. A spontaneous copying error might happen at any time, but because the reproductive role of the Y chromosome is so simple and unchanging, the odds of a 12 mutating into a 13 is only about once in every 25 generations, or roughly 625 years. [10]

While DNA can prove a match between two individuals, it does a much less precise job of excluding or defining degrees of difference between two other people. The reason is the wide range of time during which a change, or mutation as scientists call it, might occur. It may have happened 625 years ago, on average, or possibly at that most recent moment of conception included in the study.

Because of thousands of years of intermixing in Europe, it is very rare to find an individual who matches all two dozen of the defining markers held by Aurignacs. Out of a recent, very well-organized and scientifically random sample of 340 people, only one individual provided a perfect match. [31: 212] Eleven percent of modern European males do, however, share at least some small trace of the connection.

The DNA profile that an entire group holds in common is called their haplogroup, while the particular code for any single family line is called a haplotype. [13] The Bachmann/Baughman genetic markers, or haplotype, match perfectly to eighty percent of those belonging to the original haplogroup of Aurignacian migrants.

As can be seen through the project's collated DNA chart on page 10, several Bachmanns have a definitive Y chromosome fragment, also known as a microsatellite, located on the DYS426 marker. When this spot reads out at a value of 12 and a nearby marker DYS392 is any other value than 11, the easiest rule of thumb indicates that an ancestor arrived into Europe with the Aurignacian haplogroup. When the DYS426 marker reads at 11, which it does for a couple of branches of the Bachmann tree, their direct paternal ancestor arrived in Europe thousands of years later with the next wave of migrants, known as the Gravettians. [10]

Aurignacs migrated from the Fertile Crescent across Turkey, the Bosphorus and on into Europe. Their name derives from a Basque village in southern France halfway between Toulouse and the Spanish border where the first proof of their existence came to light in 1860.

This slow progress westward took generations to achieve, and whenever the climate cycled back into frigid temperatures, they retreated towards the Middle East. The Alpine mountain chain became a better final destination. Its overall elevation and snug valleys happen to shelter a stable and very mild micro-climate. For reasons not entirely understood yet, by the time that these modern humans arrived near Lake Zürich, Neanderthals had become a rare sight.

The Aurignacs stood slightly taller than the Neanderthals and had a much slimmer build. Thousands of years had adapted their bodies to the Middle Eastern warmth, where the ability to disperse heat rather than conserve it gave them an evolutionary edge.

A quarter million years of colder Europe favored those Neanderthals who were stout and compact, better able to survive the lingering Ice Ages. The large Neanderthal nose could better warm up cold air before the lungs took it in.

These physical differences cannot alone explain why the Neanderthals died out. No evidence has surfaced of a pitched battle. They did not yet have the weaponry or mobility for military ambition. Survival must have been their first preoccupation. It required another 16,000 years before the last of the old breed

perished in southern Spain. Higher levels of communication and social organization likely favored the newcomers. [31: 208]

Although the Aurignacs' population never likely rose above several hundred, they thrived by gathering wild plants and hunting animals. They could make fire, blades of sharpened stone or ivory, and leather clothing. Their rudimentary calendars made accurate note of the moon's phases. They believed in the value of long-distance trade and formal funerals for their dead. They expressed themselves with jewelry, beadwork and other body ornamentation, along with monumental painting, etching, sculpture and instrumental music. Their little carvings of bulls, humans and other creatures provide the oldest existing proof of human creativity.

The Aurignacs became the first successful modern humans to colonize Europe. As a testament to wanderlust and endurance, this same culture appeared almost simultaneously in northern Asia, and from there a group migrated on to the Americas, although the precise route they took is unclear. [13]

The minimum chromosomal requirements for inclusion in the Aurignacian haplogroup embrace 90 percent of the Basques, the oldest group of Europeans.They arrived in the Pyrenees Mountains and have long retained their headstrong, private ways and a language quite unlike any other in Europe. [29]

The incidence of this haplogroup forms an intriguing trail of DNA bread crumbs across ancient Europe and the Fertile Crescent. Traces of it can be found among 30 percent of the mountain folk in the Urals and southern Caucasus, also with 20 percent of the Saami of northern Scandinavia, and among 17 percent of the people living in the Taurus Mountains of northern Iraq. [29]

In the nomenclature of research scientists, the Aurignacians carry the name HG1(the first haplogroup, also known as R1b, or by its genetic variation codes M173 and Eu18). A later wave of Caucasians, namely the Gravettians (HG2, also known as I or M170), arrived from the Middle East about 26,000 years ago. [29]

Gravettians brought along several technological advances, including much-improved spear points of flint, and cupped wooden sticks for launching spears with greater accuracy and strength. They lived near the favored migration routes of bison, and for many weeks out the season would follow them from one temporary camp to another.

The Gravettians are known for their statuary of women, such as the Venus of Willendorf found in Austria, or for the jewelry they fashioned from shells, and the many uses they made of mammoth bones. The Gravettian haplogroup appears at its most frequent and concentrated occurrence amongst 40 percent of the Saami people of northern Scandinavia. [29] It has been hypothesized that Aurignacians and Gravettians lived side by side in Central Europe for a few thousand years, maintaining their separate cultures despite intermittent exchanges. [31: 214]

Six percent of today's Europeans can trace their parents back to the Gravettians. [31: 220]

Other Neolithic farmers (HG3; also as R1a) followed into Europe some 8,000 years ago, and their genes appear most frequently among people rooted along the coast of the Mediterranean Sea. [26: 1156]

Beginning 24,000 years ago, the last Ice Age sent mile-thick glaciers across most of Europe, pushing back the Aurignac and Gravettian tribes eastward from Central Europe into Austria and the northern Balkans. Those who had settled in northwestern Europe retreated to Spain, and the easterners went to the Ukraine. When the glaciers melted away 16,000 years ago, all of these Paleolithic people spread back across the land. [2]

Many Seeds Thrown from One Root

Fortunately, another vital key to Bachmann and Baughman genealogy also appeared in writing, although in the far more customary style through pen and paper. As soon as he found his footing in the New World, Hans Georg Bachman sent a letter back to his father in Richterswil, Switzerland. For many reasons, such letters were rare in the 18th Century. Across the thousands of immigrant families that made the trip, it is even more rare in the 21st Century to know with absolute certainty about the existence of such a letter.

Three centuries ago, most ordinary people could neither read nor write. Without organized governmental post offices, the sending of any letter, even over a short distance, was a chancy, informal business. The cost of sending a letter was also quite dear, and anywhere from two months to twelve months delay would have been usual. It is also understandable why many migrants, especially those hounded into leaving, might prefer to never think of their old lives again; and on top of that, most of the letters sent from America that encouraged families to desert the homeland got confiscated by the authorities. In the case of the Bachman family and many other Mennonites, it was actually a crime to pursue such contacts or for the recipient to keep such a indisputable piece of disobedience to the state.

Given all of these hurdles in the short-term life of a letter, it is also amazing to think of how easily that fragile paper can become soaked, soiled, faded, torn, burned or lost. Add in the unreadability of cramped, medieval styles of handwriting, with crude, irregular spelling and forms of words and folk expressions that even Swiss experts can't readily translate into modern German. If such a letter had ever been saved in America, it would also be understandable for later generations who couldn't make out what it said to then devalue it. One generation discards what the next generation would have treasured.

Hans Georg Bachman's letters apparently no longer exist, but the simple fact that they were written has been preserved in the official state records of Canton Zürich. When ordered to make the best census possible of all who had left his parish, Pastor Felix Vogler of the Reformed Church mentioned these letters in enough detail to imply that he had seen them himself. [11]

Besides their rarity, these letters are even more valuable to Bachmans and Baughmans interested in family history, because they provide the crucial link between a family well-documented thereafter in America with exactly where their parents had originated.

When small populations of people are isolated from the outside world, perhaps by rugged geography or their own choice of social values, it becomes interesting to measure how inbreeding could threaten the long-term genetic health of the group.

Mennonites and Amish communities in Europe began from very small set of perhaps 200 families. [22] After a dozen or two dozen generations, they are beginning to see disturbing numbers of children with the Ellis-Van Creveld Syndrome which typically expresses itself through extra digits on the hands and feet, and in dwarfism.[15] Another point mutation triggers the Crigler-Najjar Syndrome, promising jaundice and brain damage. [3: ix]

A researcher from the University of Chicago, Dr. Carole Ober, predicted that she would find even more collisions of genetic disadvantage by studying another tightly knit Anabaptist community still thriving today.

Stated in a more down-to-earth way, how have young singles among the Mennonites or Hutterites chosen their mates? When it comes to finding a balance between comforting familiarity versus the new and exotic partner, how were such fine distinctions made without better clues to go on than instinct.

Ober discovered that spouses read the genetic suitability of their partner through a keen trust of smell. An ingenious test proved that a person's fragrance attracted partners on a chromosomal level.

The genes she zeroed in on produce proteins that dictate the body's immune reactions. Familiar cells are accepted readily in the body, while, for the sake of self-defense, foreign cells are immediately attacked. Biologists refer to these controllers as the MHC genes. Ober's experiment proved that Hutterite women could smell the difference in men's MHC status.

All the men in the test avoided pets, deodorants, spicy foods or sexual activity, in fact anything that might cause or foster distracting smells on their bodies. Then they wore t-shirts non-stop for two days and placed the shirts in boxes where they could be smelled but not seen.

The women had no idea of the purpose of the test, but were asked to compare ten scents tucked into identical boxes that ranged from clove to damp cardboard, as well as the test t-shirts, bleach and other common household odors. The women were asked to rate each scent on four key attributes: familiarity, intensity, pleasantness and spiciness. They were finally asked, "Which box would they choose if they had to smell it all the time."

Despite the fact that the odor from the t-shirts remained extremely faint, women readily distinguished the scents of one man from another, and rated their favorites as "very pleasant."

The MHC genes that a woman preferred came close to matching her own genetic father, but not so close as to be identical. These subtle increments could be charted and double-checked by counting the number of alleles on each t-shirt donor's Y-chromosome. No woman was attracted to the scent of a man genetically drawn from her mother's side of the family.

These results validate the theory on how both extremes of inbreeding and outbreeding are avoided. Marrying a close relative risks creating a child who might inherit two recessive copies of a troublesome gene. Outbreeding has often been stereotyped as the healthier direction, but can also carry disruptive, unknown health risks. Just as a fingerprint can positively identify an individual, Ober's research revealed the existence of odor-prints for every person's genetic signature. [16]

The Y chromosome DNA test can confirm whether or not specific individual men share a common ancestor. Men with a matching surname, even those who shared a common geographic or familial setting, may not share a single genetic ancestor for a wide variety of reasons.

A direct line of paternity may have been blurred by combined households of unrelated people, especially before the 15th Century when surnames became common.

Conversely, while a single ancient grandfather gave the same Y chromosome to several sons during the era before surnames, they might have easily split off to begin differing households with different surnames based on geographic designators, such as Heinrich by the Brook, or Hans at the Hill. Today, that could lead to men of differing last names, each with long, well-documented pedigrees, having exactly the same Y chromosome.

"When a son bears the surname of his father but does not carry his genes, there are only a few explanations available," wrote Sykes in his second book, Adam's Curse. "The most straightforward, and innocent, is that the son has been adopted and taken the surname of his adoptive father. Of course, the same happens to adopted girls, but they will most likely not transmit this name to their children and they will certainly not pass on a Y chromosome either. Y chromosomes are only ever passed between father and son. Women just don't have them.

"The second explanation is that the entire family adopts a new surname. This was not a common practice in medieval [times]... That leaves us with the third and final explanation for the discordance between surname and Y chromosome – infidelity by, or possibly rape of, the woman.

"If a young girl is old enough for romance, but not for marriage, or if a match does not meet with a family's full blessing, she may have remained in the household with her new baby, and her maiden name for both of them.

"If a woman has a child with a man other than her husband," Sykes continued, "the link between name and genes is broken. If the child is a boy, he will inherit his father's surname but not his Y chromosome. That will have come from his mother's lover, or from her assailant, and not from her husband. When he has sons of his own, it will be this man's Y chromosome that is passed on. Even if there are no non-paternity events in later generations, the link between the Y chromosome and the original surname cannot be rescued." [28: 12]

Sykes mapped out 48 modern individuals into several lines of his own family, all originating from Yorkshire, what would have originally been a quite small settlement in northern England. He calculated the divergence of "non-paternal events" at 1.3 percent per generation. Of course, this only represented the average for one family over the course of seven centuries. [28: 14]

A 1999 study by the American Association of Blood Banks hoped to estimate how many newborns in the general public had been exposed to the HIV/AIDS virus. One of the more surprising results from the report showed that out of the 280,000 cases, 30 percent of the fathers whom women named on birth certificates could not possibly have been the genetic father of their new babies. [23] A study cited two years later by the National Conference of Commissioners on Uniform State Laws restated these findings to somewhere between five and ten percent. [21]

As an interesting coincidence for the Bachmann family, the root word for Professor Sykes' surname, namely "sike," happens

to also mean "brook." At first, Sykes guessed that many distinct genetic lines could easily happen to have this same ordinary surname. It turned out, however, that in the geographic center of his study, at the village of Flockton on the River Colne, there was only one original haplotype. It was the oldest, dating back to 1286, and it was his. [28: 17]

Interpreting the Project's Results

During the 1990s, some of our most rigorous family historians quite properly urged cautiousness over speculation.

"I couldn't be persuaded by anything other than hard, documented records," maintained veteran researcher James C. Baughman. His idealism kept him hoping that one day a long-lost family Bible would be discovered with a list of names, dates and places. Meanwhile though, what to make of such a common name in the German language? Bachmanns appeared in just about every Swiss canton and every valley in southern Germany. Old oral traditions in the family overflowed with romanticized, self-replicating rumors.

Were other Bachmans related to our core group who came to America in the 18th and 19th centuries and who all turned into American Baughmans? Many circumstantial clues and coincidences suggest a family tie.

Not to be ignored, for example were those uncanny bridging of names from Switzerland to Pennsylvania, including Saucon Township neighbors like the Pughs, the Laymans, the Stricklers and others who traveled along to Virginia.

DNA findings prove that sometime before the 15th Century, descendants from a single Bachman grandfather trace back in his earliest appearance to 1359 in the mountain village of Finstersee in Canton Zug. His sons spread out to the parishes around Lake Zürich named Wadenswil, Richterswil and Hinwil.

These became the Lehenhof Bachmanns of both Reid Brook and Hinwil, appointed as bailiffs for knightly castles and headquarters; as well as the Ammann Bachmanns of Einsiedeln, entrusted with the treasure of medieval Switzerland's leading monastery.

DNA mirrors quite well how one ancient Bachmann coat of arms became peppered amongst differing shields assigned to the same surname. A further surprise, however, is just how intermingled these genetically contrasting clans became, sometimes even sharing the same house with each other.

Anabaptist families from this same genetic branch left Switzerland and settled in Alsace [4: 59-69]; then moved on to Ibersheim near Worms along the Rhine. [4: 70-72] In America, some emigrated to Lancaster County,[4: 77-92] or some found their future beside a swamp in Lehigh County, Pennsylvania; [4: 94-96] Shenandoah and Botetourt [5: 41-58] counties in Virginia; Charleston in South Carolina. Today, our families from all over use both versions of the Bachmann and Baughman surnames.

A second branch, differing by only one mutation on three chromosomal markers, lived in Canton Aargau at Zofingen. [4: 57-58] Those Bachmans sent a grandson to Greenbrier County in present-day West Virginia; [5: 106-107] and then to Kentucky. Although these Kentucky Baughmans owned slaves, one branch of African American Baughmans from their household show no trace of shared DNA.

This is the same as what happened at the Lake Zürich household known as Breiten, where two branches of the family shared one house but were not blood related. In Lancaster County, Michael Baughman [4: 81] had no direct blood tie to nearby John.

Hans Georg arrived in 1715; Heinrich Bachman arrived in 1739; Johannes Bachman arrived from Alsace circa 1830. The written, historical records for all these men stop short of a traditional, genealogically proven, blood tie, although 21st Century science has proven that they all inherited an identical male chromosome from a single great grandfather— sadly unnamed —who had to have been common to them all.

As a matter of interest, the principle line of Baughmans in Virginia all have a double dose of Bachmann DNA. Besides Henry Baughman at Holman's Creek, another grandfather, John Baughman of Hempfield Township and Saumsville, also has historical facts and patterns which tie him to Lake Zürich, particularly with the line of Hans Georg of Saucon Township.[5: 258&267]

Another nagging riddle about the family can be put to rest with DNA: Did the Mennonites and Amish in Alsace named Bachmann hail from Bern or Zürich?

One family there headed by a Johannes Bachmann lived for generations near Tagney, east of Metz on a farm called Bistrof. The earliest known of their line was Jacob Bachmann, born in 1755. They lingered near the Rhine for a century longer than the many emigrants who sailed for Pennsylvania while it was still a British colony.

In 1838, the American ship Erie docked in Baltimore and let off Alsatian families from the Christian Augsburger Settlement at Markirch bound for Butler County, Ohio. In America, they formed a rather liberal branch of the Amish known as the Hessian Mennonites. Four generations later, their direct descendant named Kenneth E. Baughman turned out to have the identical Y-chromosome with the American and Swiss descendants from the village in Canton Zürich named Richterswil.

Baughman family research enjoys the efforts of several keenly motivated and highly qualified participants. One is Philip Ritter, PhD, a staff researcher at the Stanford University School of Medicine who also happens to descend from the Lake Zürich Bachmanns. He offers the following context on his website, which summarizes and clarifies the background given so far in this chapter.

"Since surnames tend to be inherited in the same manner as Y chromosomes (from father to son, or patrilineally), Y chromosome testing lends itself particularly well to surname studies. The Y chromosome is inherited more or less unchanged from father to son to grandson, indefinitely.

"The term 'unchanged' must be qualified by 'more of less' because mutations occasionally occur. If it were not for these accidental variations, all males would have identical y-chromosomes, making their examination quite useless for genealogical purposes. By looking at specific locations on the Y chromosome (known as markers among genealogists), we can compare individuals and

support or disprove suspected genealogical relationships.

"This science has great usefulness for the genealogist. One approach is to use Y chromosome testing to focus on certain well-defined puzzles or hypotheses. Several ancestral Bachmanns lived in the same area of the same village in 17th Century Switzerland. A reasonable supposition would be that they might share a common ancestor from which they inherited their surnames. By comparing the Y chromosomes of descendants of each of the ancestral Bachmanns, we should be able to substantiate the hypothesis of a common Bachmann ancestor.

"Another approach can broaden the study, whereby any interested male sharing the surname is invited to add a specimen of DNA. Our Bachmann/Baughman study has evolved in this direction. The testing companies encourage this approach by giving discounts to surname groups and publicizing the fact that specific surname groups exist. As the number of participants grow, some who share a surname will be found to have previously unknown link to each other through a (possibly unknown) common ancestor.

"This approach is particularly useful when you have a combination of individuals with deep patrilineal lineages and others with fairly shallow knowledge (say to about the year 1800) but hopes of finding connections. Even if the results are negative, knowing that two branches sharing the same last name do not share a common ancestor may result in less time wasted searching for possible connections that do not exist.

"Because females have no Y chromosomes in their own bodies to examine, they cannot participate directly in studies such as this one. However, if they wish to research their father's patrilineage, they can help sponsor their father or a brother or any other patrilateral relative of their father.

"There are a number of different kinds of mutations, being the changes in the genetic code referred to as markers, that can occur when DNA is copied within a cell and passed on to the next generation. Short-tandem repeats, called STRs or microsatellites, are the markers tested in y-chromosome studies. They occur at specific places on the y-chromosome, which are often referred to as loci, and are given names such as DYS391. STRs occur when short segments of DNA sequences get repeated over and over along a portion of a chromosome.

"For example, the DYS391 marker is made up of repetitions of the sequence G-A-T-A. Once an STR is present, it may change by adding or subtracting one or two repeats when they replicate. The frequency of change ranges from an estimated two mutations per 1000 generations up to nearly four mutations per 1000 generations for each STR.

"Over a long period of time, individuals will have at least some differences in the patterns of repetition. By looking at 25 markers, there is about a 50 percent chance you will find at least one mutation across 9 or 10 generations, or at least one change that differs between 4th cousins. When tested, the DYS391marker shows values that range anywhere between 7 and 14 repeats, with a reading of 10 or 11 being most common among Europeans.

"As of the year 2004, over 200 STRs have been identified on the Y chromosome, but not all are variable enough to be distinctively useful for the genealogist. Testing companies currently gauge from 10 up to 43 different STR markers.

"While individuals must check STR markers to find their haplotype, larger populations define their haplogroup through slower, broader mutations called SNP, referring to base substitutions called Single Nucleotide Polymorphism. Compared to STRs, these mutations are extremely rare, and are believed to occur only once in all of human history. SNPs allow the archaeologist and anthropologist to trace ancient migration patterns.

"Even though most of the Richterswil Bachmann/Baughman families are close to the most common values of the Aurignacian haplogroup R1b, the differences are unusual enough that they have no exact matches among the 22,560 people in the FamilyTree DNA database. There are three people that are one step away and 25 that are two steps away."

The one marker that makes the Richterswilers so rare is the DYS389ii-i site with a rating of 15. Searching for people who vary by only one step away, for example those with a rating of 14, turns up a much larger population of 148 test subjects in the FamilyTree database.

"This is pretty good evidence that the DYS389ii-i is what makes [Bachmanns] distinct from much more frequent haplotypes in the R1b haplogroup. That is reassuring, since it means that if someone with the name Bachmann/Baughman showed up matching other Richterswil Bachmanns, including the same value for DYS389ii-i, it is most likely because of the common ancestry and not convergence to the same haplotype."

Two more Bachmann/Baughman markers from the expanded FamilyTree test, namely DYS385 a & b, further deepen the rarity amongst all other descendants of the Aurignacs. The Bachmann reading for DYS385b comes out at 15, but by looking one step over at those who rated 14, we find a much larger group of 576 matching individuals.

"The Layman set of values is 11 steps away from the modal Richterswil Bachmann values. The 14 at DYS425 is also very unusual and the values are only five away from the Hans Heinrich descendent (0954 in the on-line chart) who has 14 at DYS425.

"That is still too far for common ancestry, but may indicate a common haplogroup. Unfortunately, 0954's haplogroup could not even be guessed using Thit Athey's haplogroup predictor. The Layman subject does a little better with the haplogroup predictor, which points toward G as the most likely, but with E3a the next possibility. According to FamilyTree DNA, G may have originated in India or Pakistan, and then dispersed into central Asia, Europe and the Middle East, probably with the spread of agriculture. E3a is an Africa lineage, and is less likely.

"Our Hamman project has a large set of confirmed G2 haplogroup descendants, while the African American in the Bachman project is almost certainly E3a. The Layman values are 7 steps from Gregory (0657) in our Bachmann project. I would go with G, but only as an estimate.

"The markers on the Y chromosome used for family history studies are unrelated to any physical or medical traits. This means there is little danger if the privacy guarantees of the testing companies were somehow breeched. The single largest potential risk of Y chromosome tests is the possibility that a participant will discover that he is not biologically related to

someone else in the way expected. Unexpected non-matches can occur, and some people may find this disturbing or even traumatic, especially if a 'non-paternal' event may have occurred within recent generations.

"Not every genealogical puzzle can be solved with DNA, and it is important that participants in such studies realize that there is no guarantee that the results will be as desired or expected. However, under the appropriate circumstances, genetic or molecular genealogy can be a powerful tool to substantiate or disprove hypotheses where traditional documentation is weak or non-existent."

The Professor's Postscript

"The Bachmann DNA chart shows exactly what you would and must expect, what you will find for a study of this size and scope," said Professor Sykes during an interview on 1 May 2004 in Washington, D.C. "The sequence in your core group of 10 individuals stands as the original Bachmann haplotype south of Lake Zürich. This core branch has, all tolled, just three mutations, and this certainly falls well within the rates of chance.

"Because of this detailed, matching genealogy you have, we can be sure that one of these mutations happened within the last 122 years. That's only four generations, the blink of an eye in terms of DNA. Similarly, the change for the donor from Finstersee could have happened at any time during the past 500 years or so. Such minor changes could not possibly be an 'extra-paternal event' because the odds of them coming out so close in every other way from the expected paternal DNA would be totally remote.

"The second branch, although still within the same haplogroup, shared a common male ancestor many centuries earlier, perhaps as much as 1,000 years ago. But they are still quite closely related.

"Then we see a group of three individuals from the Gravettian Culture, or what we call the Wodan Haplogroup. They differ from the first group by a total of 12 allele variants spread across six different markers. There would have to be some 24,000 years of separation between them and the core members of the first haplotype.

"Elsewhere on the chart, several of the dissimilar individuals had different paternal ancestors belonging to a set we call Haplogroup 2, which arrived in Europe much later from an Anglo-Saxon/Germanic DNA stock.

"One of those individuals, the Hans Bachmann who traces his roots to Hinwil, has an extremely rare combination of three chromosomes, namely the markers that turned up 21, 14 and the final 10. His ancient paternal ancestor is not even European, but more likely Asian. In all of the 10,000 individuals I have tested so far, no one else matches that combination.

"Another test subject, this fellow [Steven R. Baughman], also has a very rare combination. This mutation [from the specimen donor Richard J. Baughman, descended from Christian] is noted on the chart because the DYS425 marker had a double-peak. We don't guess which one it should properly be. It's neither one nor the other.

"The African-American participant [Martin J. Baughman] has two markers that are quite rare, the first 16 and the 21, which when combined with the rest of his profile places him in Haplogroup 8, which is exceptionally rare. If he has European paternal ancestry, he doesn't match any of the 3,500 English-rooted surnames in our research so far, from which many of the slave-holding households of early America would most commonly derive. The only other person in our entire data bank that he matches is a British citizen who traces his origins to Kingston, Jamaica." [8]

"I suspect that we'll find many, many behavioral traits that are hiding in what has been so far dismissed as mere junk DNA. Before too long, the research community will give us much more complete sequences, and the complexities of inherited traits will be revealed.

"I must say, I really enjoy seeing this kind of rarified science being used for truly practical, family history research. If I hadn't applied it to my own family, on a whim, it never would have received notice and become such a popular notion.Your study was among the first to follow mine, and the parallels have turned out remarkably."

~ J Ross Baughman
March 2006

This report has appeared in large part as Chapter 9 within the author's fifth volume of Bachmann and Baughman family history, entitled *The Chain Rejoined.* It also appeared in an abridged form as an article in the April 2005 edition of Pennsylvania Mennonite Heritage, published by the Lancaster Mennonite Historical Society. The charts connected to this report will be updated as new donors step forward to test their DNA. Sites on the internet will showcase the expanding results in slightly differing formats:

http://www.stanford.edu/~philr/Bachman/BachmanResults.html

Also of future interest may be the Layman study:
http://home.lightspeed.net/~slaymon/LaymonLinesFrame1Source1.htm

The Mennonite DNA project may be reviewed at:
http://www.mmhs.org/int/reimer.htm

Or contacted through group administrator
Amelia Riemer: reimer@canada.com

The two DNA testing services employed in this study may be studied further at:
http://www.oxfordancestors.com/
http://www.familytreeDNA.com

The Bachman/Baughman test results have been integrated into the world-wide study undertaken by the National Geographic Society, which may be reviewed at: https://www3.nationalgeographic.com/genographic/

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AURIGNACIAN / OISIN HAPLOGROUP										
	DYS19	DYS388	DYS390	DYS391	DYS392	DYS393	DYS389i	DYS389ii-i	DYS425	DYS426
William K. Bachman, Jr. *(Hans Jacob, Old Castle, Kt. Zürich)*	14	12	24	11	13	13	10	15	[12]	13
Johann J. Bachmann *(Feusisberg, Kt. Schwyz)*	14	12	24	11	13	13	10	15	12	13
Josef W. Bachmann *(Hinwil, Kt. Zürich)*	14	12	25	11	13	13	10	15	12	13
Rudolf Bachmann *(Schönenberg, Kt. Zürich)*	14	12	24	11	13	13	10	15	12	13
Johann B. Bachmann *(Finstersee, Kt. Zug)*	14	12	24	11	13	13	10	15	12	13
Spencer Baughman *(Heinrich, Old Castle, Kt. Zürich)*	14	12	24	11	13	13	10	15	12	13
J. Ross Baughman *(Heinrich, Old Castle, Kt. Zürich)*	15	12	24	11	13	13	10	15	12	13
Jacob Baughman *(John, Alsace)*	14	12	24	11	13	13	10	15	12	13
William H. Baughman *(Heinrich, Old Castle, Kt. Zürich)*	14	12	24	11	13	13	10	15	12	13
Harding T. Baughman *(Heinrich, Old Castle, Kt. Zürich)*	14	12	24	11	13	13	10	15	12	13
William C. Baughman II *(Hans Jacob, Old Castle, Kt. Zürich)*	14	12	24	11	13	13	10	15	12	13
Blaine Bachman	14	12	23	11	13	13	10	16	12	12
Ellis Bachman *(Zofingen; Johannes, Pennsylvania)*	14	12	23	10	13	13	09	16	12	12
John Bachman	14	12	23	11	13	13	10	16	[12]	12
Peter Bachmann *(Zofingen, Kt. Aargau)*	14	12	23	11	13	13	09	16	12	12
Harry C. Baughman *(Zofingen; Kentucky)*	14	12	23	11	13	13	09	16	12	12
John W. Baughman *(Zofingen; Kentucky)*	14	12	23	11	13	13	09	16	12	12
Charles I. Baughman	14	12	23	11	13	13	09	16	[12]	12
Oren C. Baughman *(Martin, Pennsylvania)*	14	12	23	10	13	13	10	16	12	12
Clarence O. Baughman *(Christian, Pennsylvania)*	14	12	24	11	13	12	10	16	M†	12
GRAVETTIAN / WODAN HAPLOGROUP										
Gottfried Bachmann *(Hans Heinrich, Old Castle, Kt. Zürich)*	14	15	23	10	11	12	10	17	12	11
Hans J. Bachmann *(Hans Heinrich, Old Castle, Zürich)*	14	15	23	10	11	12	10	17	12	11
Heinrich K. Bachmann *(Hans Heinrich, Old Castle, Zürich)*	14	15	23	10	11	12	10	17	12	11
David H. Bachman *(Michael, Pennsylvania)*	14	14	22	10	11	13	10	16	12	11
Johann J. Bachmann *(Hans Rudolf, "Ösli," Breiten)*	16	12	24	11	13	13	11	16	12	12
Robert Bachmann	15	12	21	10	11	15	09	17	14	10
Julian L. Baughman *(African-American, Kentucky)*	16	12	21	10	11	13	10	17	12	11
Harold L. Baughman	15	12	23	10	13	11	10	18	[12]	11
Obadiah Baughman	15	13	23	10	12	15	10	16	12	11
Virgil A. Baughman	15	12	24	11	13	12	10	16	12	12

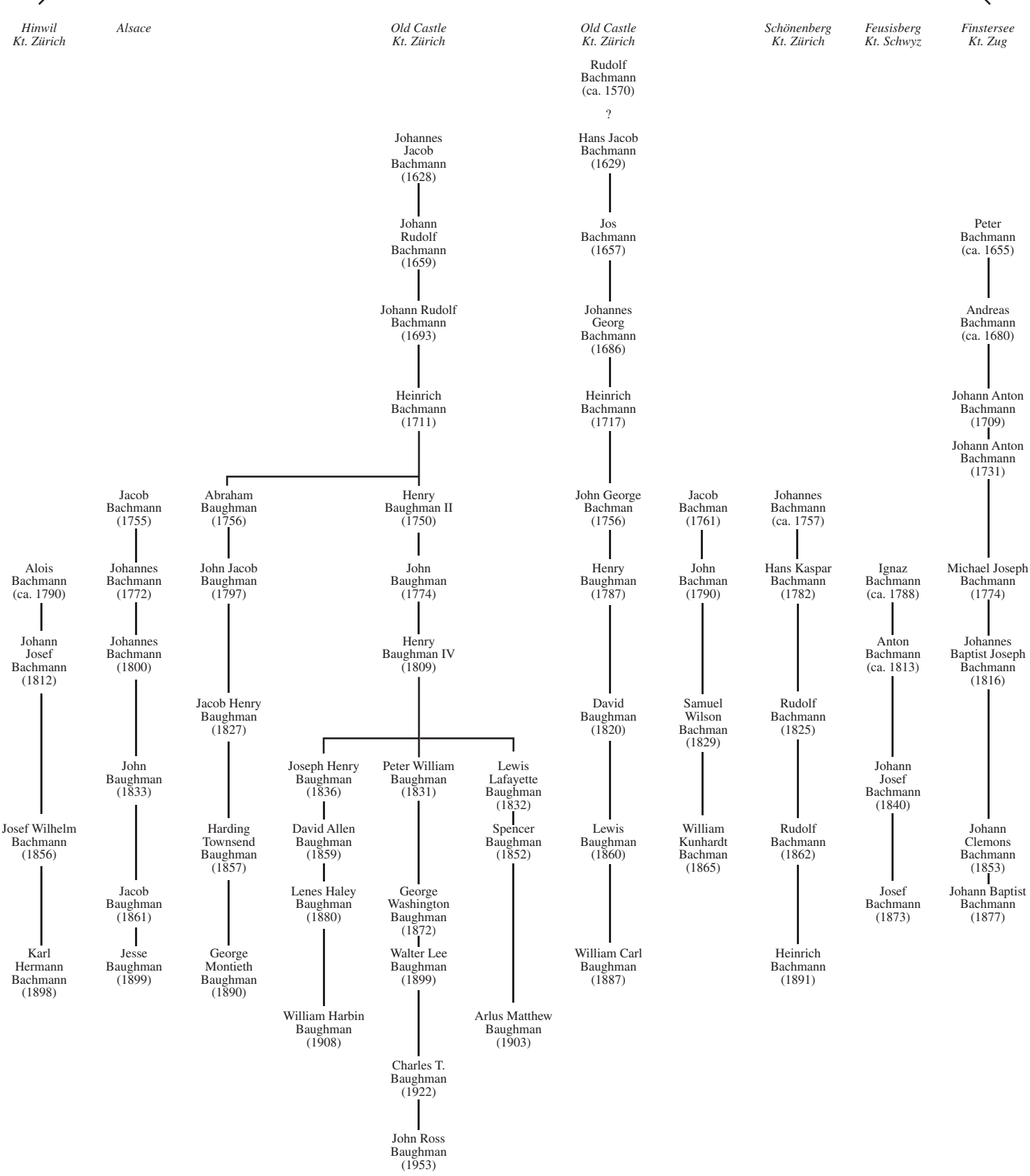
* Harry F. Baughman & Ross Baughman (*DNA lab results not yet posted as of May 2005)*

† Ambiguous mutation [0] Bracketed results indicate an implied result.

The Baughman / Bachmann Dna Project

Illustrating Shared Genetic Chains of Y-Chromosome Descent Between Historically Documented American and Swiss Lines

A Single Grandfather in Common



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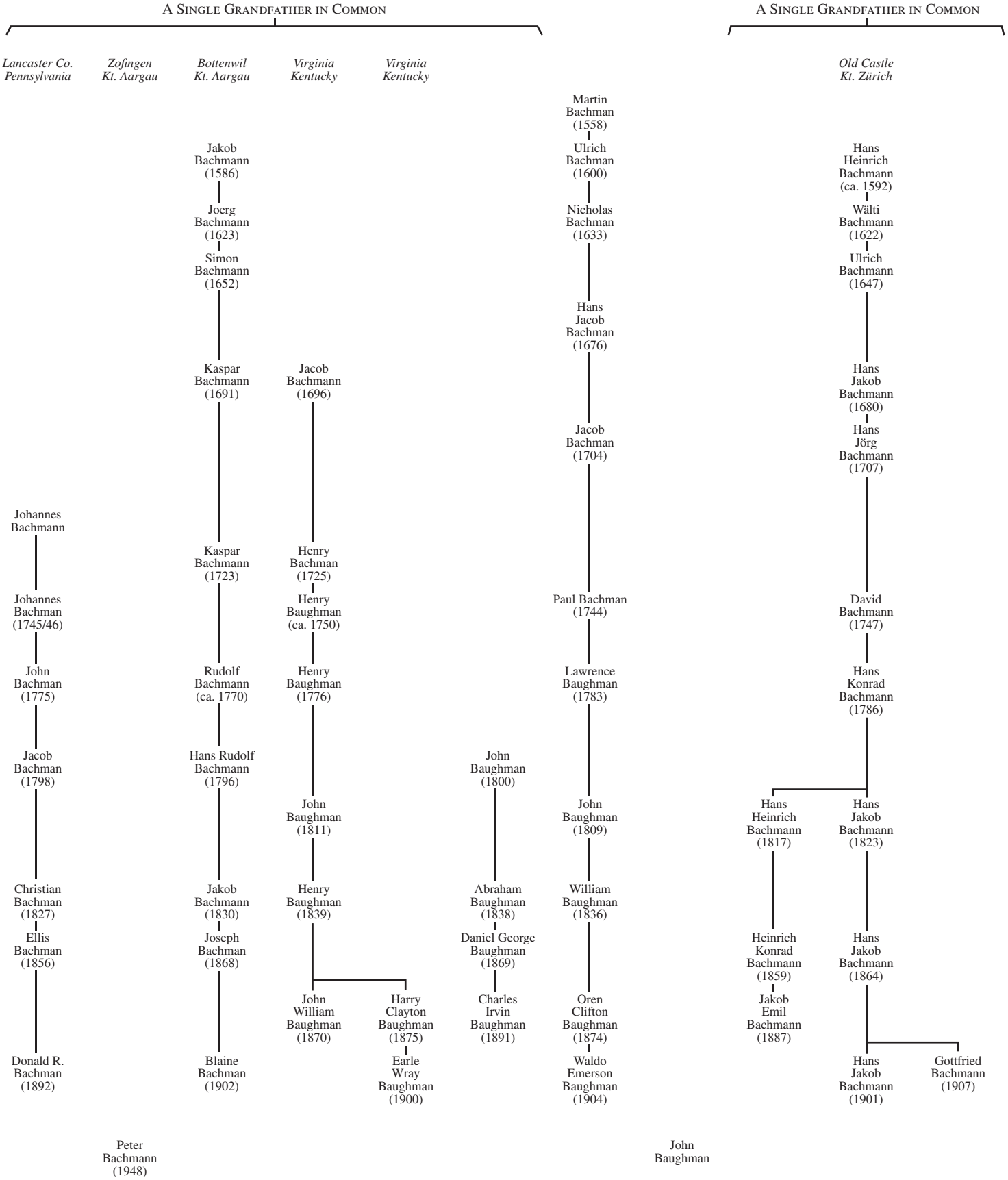

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