

Joseph Smith DNA Revealed: New Clues from the Prophet's Genes

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I am very pleased to be here today. The purpose of my presentation is to summarize almost 10 years of looking into the Prophet's genes. Some of this material has been previously presented elsewhere or published.¹ However, I have been asked to present it again, polished and updated, and so bear with me if you have already heard some of this information before. The rest of the presentation will cover some novel data regarding some of the things I feel I learned from the Smith family DNA that might shed some light about their ancestry.

A question that was asked to me before I even came up here to speak was "How accurately can DNA be used for ancestry?" What I would like to impress on your mind today is that DNA is not an instrument that completely replaces traditional genealogical research, but it does provide an added level of understanding and an increased level of confidence in the research results based on the specific context you are working on. You might have a genealogical or historical question, a hypothesis, like some family rumors that you would like to test, and DNA might come in handy in that situation. Rarely would you just take DNA alone and find the answer you were looking for.

With regards of delving into Joseph Smith's genetic history, everything started back in 1999-2000 when I first began working with Professor Scott Woodward as a student at BYU, and I have continued my association with him to this day. There were a couple of things that led us to study the DNA of Joseph Smith's family. First, we were about to begin a large study with the objective of building one of the largest databases of correlated genealogical and genetic data. We wanted to be able to use DNA to assist people with their genealogical research, and in order to do that we needed to calibrate the system. What better place to do so than Utah, where you have extended families with good genealogies and multiple individuals from each family that you could ask for a DNA sample. The Smith Family was definitely one of them. Hyrum Smith alone has approximately 15,000 living descendants. I attended a couple of Smith family reunions and asked people to give me a DNA sample. As I did so, I learned for the first time an interesting paradox about this family and the second reason why we started looking into this family DNA: Joseph Smith, who taught us how important it is to do family history and genealogy, had a major brick wall – and probably more than one – with regards to the origin of his paternal line (the Smith line).

In 1991, Elaine Nichols – who was one of the specialists on the Smith family history – published an article where she concluded that the available genealogical data about a possible English origin of Robert Smith – the first ancestor of Joseph Smith Sr. and Joseph Smith Jr. to arrive in

New England – are very sketchy.² There is some certainty about Robert Smith, possibly born in 1626, showing up in Boston, Massachusetts, in 1638 as an indentured servant to another man. Think about it: we have a 12-year-old boy without siblings, without parents, working for somebody else as an indentured servant in Boston at the beginning of the 17th century. All of this is kind of an unusual genealogical situation. It may have been common at that time, but it's definitely something worth a closer look.

At that time we thought, “Could we reconstruct Joseph Smith paternal genetic profile, and then, as we work on the larger DNA genealogy project, could we collect DNA samples from Smiths in England – particularly in the area where we think Robert Smith came from – and perhaps find a similar genetic signatures that could help in bridging the gap between the Utah or ‘Mormon’ Smiths and those in England?”

In order to understand this work, there are a couple of things you need to become familiar with regards of the science involved. For this study, we relied on a particular marker that is passed exclusively from father to son. Only males have this marker and it is inherited along the straight paternal line – which is also the surname line in many western cultures. Therefore, our original hypothesis was to reconstruct this particular marker for the Smith family and link it to this specific family name with the hope to find other Smiths carrying the same genetic profile, possibly in England. The way to go to do something like this is to look at the available genealogical records and identify male descendants carrying the Smith surname that link back to Joseph Smith Jr., or one of his paternal relatives along the father-son lineage. This particular DNA marker is called the Y chromosome.

We first looked around for Joseph Smith's posterity to see if we could find any living, direct, male descendants on an unbroken paternal line. Ideally, for studies like this one, you would need 2 or 3 individuals sharing Joseph Smith Jr. as the most recent common ancestor (MRCA). Basically, starting with Joseph Smith Jr., if we could obtain a DNA sample from a couple of his sons' living descendants, we would be able to confidently reconstruct his Y chromosome. This would be as accurate as taking a sample directly from Joseph Smith Jr. himself. Luckily, we found some individuals that matched the requirements we were looking for. This wasn't very easy because, although Joseph Smith had 11 children with Emma (two adopted), only four biological sons grew up to adulthood, and only two of them are survived by a living biological posterity. There are few hundred descendants, but you can trace all of them to Alexander Hale Smith, who was an apostle in the Reorganized Church (now Community of Christ), and Joseph Smith III, who was the first president of that church. We collected DNA from representatives of each of the two male lines and obtained matching Y chromosome profiles that allowed us to infer with accuracy Joseph Smith Jr.'s own Y chromosome. This was exactly what we hoped for. There are instances in which the genealogy does not match the DNA because of an undocumented adoption or illegitimacy. In other words, you have the right genealogy, but the wrong DNA. This is called the “milkman syndrome” or, in more scientific terms, a non-paternity event (NPE). Luckily the markers matched so we knew that the genealogical information was

also correct and we now know what Joseph Smith Jr.'s Y chromosome looks like. If I would have had Joseph Smith right here, standing next to me, and I was able to get a cheek swab from him, the DNA obtained wouldn't be any different from the profile we reconstructed from his living descendants. This is how accurate this information is.

Remember that our goal was to reconstruct this Y chromosome so that we could go back to England and find similar genetic profiles and resolve the ancestral question about this family. However, as we were meeting with different Smith family members, we also learned that this marker could not only be used to learn something about his ancestry, but also to study his posterity as well. This wasn't the original hypothesis we wanted to test, but sometimes, as you work on a project, there could be some interesting and unexpected spin off from the original research. The new application has to do with identifying possible biological children born of Joseph Smith through women other than his first recorded wife, Emma Hale. Joseph Smith Jr. introduced and practiced polygamy to some extent particularly during the Nauvoo era. However, the question that no one has been able to resolve to this day is, "Where are his children from these relationships?" We know of all the children from the relationship with Emma, but where are the ones born from other women? There are several statements that are floating around that have been recorded, even several years after Joseph Smith's death, suggesting the possibility that so and so could have been a biological child of the Prophet from a polygamous relationship, but no one could ever confirm any of them. Over the years I have been keeping a provisional list of all the alleged children that have been associated with Joseph Smith Jr. I call it provisional because about every other month I receive a phone call or an email from somebody who says, "I am Joseph Smith's descendant through so-and-so," so this list keeps growing. Some people might disagree with the names included in this list. However, I have only included those that can be backed up by a source, either a book, a journal entry, or a family tradition that is generally accepted by a significant number of individuals. In my mind, these are all resources that have the power to create some confusion or add uncertainty with regards to a particular family tree, thus leaving people with doubts about their ancestry and their possible connection to Mormonism's first Prophet.

As of today, I have been able to study five individuals from this provisional list and I learned something about their true paternity. The first case I had the opportunity to address few years ago dealt with Moroni Llewellyn Pratt. In her book *No Man Knows My History*, author Fawn Brodie speculates that Moroni was Joseph Smith's son, based on a number of her assumptions.³ I was not familiar with this situation until I received a phone call from one of Moroni Pratt's descendants. The person that called me believed that Joseph Smith was his ancestor and not Parley P. Pratt, the recorded father of Moroni. That was my first experience with regards to looking into Joseph Smith's "other" children. Since then, a few more people have contacted me with similar questions. I soon realized that not all the cases were as strong and that there were some obvious discrepancies in some of the accounts. Before considering working on a specific case study, I would ask questions like, "When was this alleged child born?" or "How did you

learn about this story?” Logically, the child under consideration must be born within 10 months from Joseph Smith’s death. In the case of Moroni Pratt, the recorded birth date is December 7, 1844, which fit within this timeframe since Joseph was martyred in June of that same year. After learning of the Brodie’s reference I agreed to look into this case since I already knew Joseph Smith’s Y chromosome profile. The next step was to reconstruct Moroni Pratt’s paternal genetic profile and then compare it to the data we already had for Joseph. The first person I tested was the individual that called me since he was a direct male descendant of Moroni. With his help and looking at some public directories, I identified another descendant of Moroni Pratt through a second son so that we would have at least two independent lines represented in this study and have Moroni as their MRCA. Again, the objective here is to avoid the milkman syndrome, or in other words exclude any possible non-documented instances of NPEs. The goal is to know for sure. If I had tested only one line, but something happened in any of these generations, the DNA results would have been misleading. The two Pratt individuals tested had identical Y chromosome profiles and therefore we know for sure what Moroni Pratt’s paternal genetic signature looks like. By comparing the newly reconstructed Moroni Pratt Y chromosome with the one we already had for Joseph Smith Jr. we were able to finally answer a family history question that had been perpetuated for the past century and a half.

You’ll notice there are several numbers that are the same, but there are also some that are different. Geneticists have been able to do a number of tests – this is all based on statistics, of course – but they tested a number of father and son pairs.⁴ The Y chromosome, this marker, is passed from father to son. It is passed almost unchanged, but occasionally there are random mutations that kick in. Geneticists have been able to essentially estimate how often, on average, these mutations take place. Therefore they came to the conclusion that it’s on average one mutation every seven generations based on the number of markers tested for the Y chromosome. If you look at the number of possible generations separating Moroni Pratt and Joseph Smith, considering that each mutation could have taken place approximately every seven generations, you can easily see how we miss the mark of these two individuals’ historical time frame. Based on the number of mismatches we are looking at an approximate MRCA that lived almost 1000 years ago, long before Moroni and Joseph’s time. That’s when, most likely, the two lineages came together under a common paternal ancestor. Basically, what these data are saying to us is that Joseph Smith could not have been the biological father of Moroni Pratt. However, the question remains, “Are we sure that Parley P. Pratt was the father?” I could answer this question because in order to find the second Moroni Pratt descendant for this study, I went through the BYU phone directory – thinking, “Where could I find a lot of Pratt descendants? At BYU” – looking for potential DNA donors and finding some from different Pratt lines. Calling up these people was an interesting thing; picture this: calling up somebody who doesn’t even know you, and they hear this funny accent on the other side of the phone, and this guy start asking you for some DNA.... Well, I guess I’m a pretty good salesman because I did get what I needed! Some of these individuals descended from Parley P. Pratt’s additional wives and not through Moroni’s line. In addition to the two Moroni Pratt descendants, I was able to add two new lineages, two

paternal lineages that tied back to Parley P. Pratt. I compared the first two Y chromosome haplotypes from descendants of Moroni Pratt with the additional two and they were all identical, showing that Parley P. was indeed Moroni's biological father. The genetic markers shared between these four individuals confirmed Parley P. Pratt as their MRCA, which are also the same that Moroni would have had. So end of story. If you own a copy of Fawn Brodie's book, you can now write in the correct information and make history straight.

At that time, we also looked at two other cases. We had a similar situation with Zebulon Jacobs; Richard Van Wagoner mentioned him as being a possible child in his *Mormon Polygamy*.⁵ Also there was this individual who descended from an Orrison Smith claiming that Orrison was the son of Fanny Alger and Joseph Smith. We know Fanny Alger was pregnant when she left Kirtland, but I don't think anyone knows much about this child and any possible descendants.⁶ The father could have been Joseph, but we don't really know a lot about this situation. I guess this individual had this information passed through the generations as a family rumor. So we tested his DNA as well. The conclusion is that the Y chromosome for each of these three cases clearly shows an independent paternal lineage from that of Joseph Smith Jr. Each one of these cases could be confidently eliminated as a child of the Prophet Joseph Smith through polygamous relationships.

This presentation is built following a chronological order. This is my personal work with Joseph Smith DNA over the years. We're jumping from one thing to another, sharing the progress of this work based on the time and opportunities I had to dedicate to this particular project. Remember this is mostly a hobby, not the main focus of my job (although what I have learned from it could be applied to other situations). The research work on the three paternity cases I just presented was conducted between 2003 and 2004, and published in 2005 in the Fall issue of the *Journal of Mormon History*. In the meantime, there has been some progress regarding Y chromosome analysis that I was able to apply to this study, particularly I was able to extend Joseph Smith's Y chromosome profile from the previous 24 to the current 43 markers. In other words, we almost doubled the amount of genetic information we now know for this particular historical figure. Why is having an extended Y chromosome profile important? The more markers you have, the more accurate you can be with things like the molecular clock, the number of generations estimate, and for matching purposes. I told you we might run into some difficulties. Here is an example. We observed that between two of the lineages of Alexander Hale, in the two individuals we tested there was a mutation that took place in one of the branches (DYS439). Now we know that Joseph Smith still has an allele value of 12 at this particular location (this might not be very interesting to you, but it is a very interesting thing to me so I'm going to share it with you anyway). Joseph Smith had a 12 because we have a descendant of Alexander Hale with this marker value and here we have a descendant of Joseph Smith III that has it too. Only one of the descendants of Alexander Hale that was tested has a value of 11. We know that the ancestral value was 12 and the 11 value is the mutation. On a different location of the Y chromosome (DYS449) we have a different situation where both lines of Alexander Hale

have a value of 30, but the line from Joseph III has a 31. Now here we cannot be confident regarding the ancestral value that Joseph Smith had. I'm kind of a meticulous person when it comes to science and I like to be precise and know for sure. I wanted to find out if Joseph Smith Jr. had an allele value of 30 or 31 at this location so that I could have the most complete and accurate Y chromosome signature for him. Later in the presentation I will talk about the importance of accurate and extended Y chromosome profiles, called haplotypes and how haplotypes with similar characteristics can be grouped together in haplogroups. Both haplotypes and haplogroups can provide valuable information regarding a person's recent and deep past. Individuals in this room that may have different Y chromosome signatures might still fit into the same haplogroup, as long as they share some specific genetic characteristics. This might not mean a lot to you right now, but it will later on in the presentation. The reason I mention this is that during the time of extending Joseph Smith's Y chromosome from 24 to 43 markers, we also compute these values to predict Joseph Smith's likely haplogroup, which turned out to be R1b. This short, apparently meaningless "code" was an important step toward discovering some valuable information regarding the Smith ancestry. Now, back to Joseph Smith's haplotype.

How did I go about to find out what Joseph Smith Jr.'s original value for DYS449 was (either 30 or 31)? The answer came from testing additional Smith lines closely related to Joseph. Rather than looking at Joseph Smith Jr. as the most recent common ancestor (MRCA), I moved up one generation to Joseph Smith Sr. Based on DNA samples I collected at various Smith family reunions, I had access to genetic data from direct paternal lineages that were shared with Hyrum and Samuel Smith, two of Joseph Jr.'s brothers. I noticed that 30 was the recurring value that could be traced back to Joseph Smith Sr., so 31 was the mutation that took place in the Joseph Smith III line. Now I know for sure that Joseph Smith also had an ancestral value of 30 at this particular location of his Y chromosome and I have a very accurate 43-marker Y chromosome profile for him. This was what I was doing until somebody contacted me and asked me to check another case mentioned in Fawn Brodie's book about Oliver Norman Buell also being Joseph Smith's child. Actually Fawn Brodie focuses a lot on this one. There is a statement – I don't know how accurate it is – that his mother, Prescindia Huntington, said that she admitted that she didn't know whether or not Oliver was Joseph Smith's or her husband [Norman Buell]'s child. Then Fawn Brodie goes further with her comments and she says that the physiognomy from a picture of Oliver Buell, "seems to weigh the balance overwhelmingly" on the Smith paternity. How many times we do the same thing with our genealogy? We look at a picture; we see, for example, Native American features in our great-great-grandmother and we think, "Maybe she was a Native American because she looks like one." We tend to judge a lot somebody's ethnicity or background or how they could be related (or not related) to us based on what they looked like. You can see the same thing between Joseph Smith III and Oliver Buell; if you take the beard off from this particular picture there is quite a bit of resemblance – even the hairstyle is the same. These are the page numbers in case you have a copy of that book.⁷

This case was a little more complex. I actually liked that because I had to take a different approach than what I did for the previous case studies. This time I could not find two direct descendants whose most recent common ancestor was the man with the uncertain paternity – Oliver Norman Buell. The only two people I could find linked back only to a grandson of Oliver, and therefore I could not exclude the possibility of the “milkman syndrome” (NPE) between the two remaining generations. All I had for sure was the genetic profile for the grandson of Oliver, but I could not resolve Oliver’s paternity case once and for all. So I turned to our database of combined genealogical and genetic data. It’s a public online database that included correlated genealogies with Y chromosome markers. I decided to give it a shot and ran these numbers (Oliver Buell’s grandson Y chromosome markers) to see if I would find any matches in the Sorenson Molecular Genealogy Foundation (SMGF) database. Lo and behold a little miracle happened when I found another Buell in the database who shared, out of 43 markers, all but 3 of them with Oliver Buell’s grandson. We have the same surname, very similar Y chromosome haplotypes, but there are 3 differences that cannot be ignored. So, is this individual in the SMGF database related to the other two Buells that I have already tested, or is it just a coincidence that we have the same surname and a very similar Y chromosome profile? The genealogy submitted by this individual to the SMGF database was good, but not sufficient; I could only go back to 1772. I could not find, at this point, a connection between the two Buell genealogies. I took this information to the professional genealogy team in our organization and I asked if they could attempt extending these pedigrees and find a possible genealogical connection (common paternal ancestor to the two lines). And they were able to do that. The genealogists extended the genealogies all the way to a Samuel Buell, whose brother was John Buell, who was the ancestor of the individual in the database we just saw. The common ancestor now is their father, Samuel W. Buell born in 1641, almost 400 years ago. The 400 years interval would have allowed the three observed mutations to occur. The genealogical time and molecular clock are very similar for these two paternal lineages. Because the genealogists said that these individuals are related, because the Y chromosome is similar, and because the surname is the same, we can now say something about Oliver Buell’s DNA as well. It’s not that the DNA is right, then it goes wrong, and then it is right again. Although I don’t know Oliver Buell’s DNA, the fact that I know it for these three people, it can be inferred for Oliver with a high degree of confidence. Because the three mutations could not be determined for the Buell’s profile, I excluded them from the comparison with Joseph Smith’s haplotype. We also predicted the haplogroup for the Buell line, and it turned out to be haplogroup I1b2a. Remember Joseph Smith was a different haplogroup (R1b), so that’s already the first indication that these two lineages are not closely related. When the haplotypes – Joseph Smith and Oliver Buell – are placed side by side they are very different. Totally unrelated people along the father-son line. Based on these data we could confirm that Oliver was indeed a Buell and not a Smith. Again, I hope you wrote down the page numbers so that you can go back to your copy of Fawn Brodie’s book and write in the correct information.

A small parenthesis I would like to open: to me this is all about making history right. I have absolutely no problem with the fact that Joseph Smith practiced polygamy or that he was married

to other women in the full meaning of being married. I know there is a lot of discussion about “spiritual marriages” versus “physical marriages.” How I feel for Joseph Smith has nothing to do with the extent he practiced polygamy. To me is interesting to know that there are literally hundreds, if not thousands of people, descendants from these individuals I have discussed thus far, who were wondering, based on what has been written, whether they are descendants of Joseph Smith. So here you have a chance to tell these people how things are based on the genetic data.

Another story is about Mosiah Hancock. A journal entry stated that one day Clarissa Reed went to Joseph Smith and told him that “Our Mosiah is dying.” This “our Mosiah” could be “our” meaning “me and my husband (Levi)” or “our” meaning “me and you (Joseph).” The family rumor is that this was Joseph. I talked with other historians, including Keith Perkins, a retired professor from BYU (and a descendant of Mosiah Hancock), and confirmed this rumor. There are several people (including descendants of Mosiah Hancock) that are convinced that Joseph Smith could be Mosiah’s biological father. Same story: let’s find some descendants. However, I learned that one of Mosiah Hancock descendants along the paternal line already paid a commercial company to get his DNA done and have it printed on a nice certificate. I guess some people like to put their degrees on the wall and some people like to do the same with their DNA. I said, “Well, that saves me some time and some money; would you send me a copy of that certificate? We’ll start with that.” Only 12 markers (paternal line); only 12 markers, only one descendant. We might not have enough data to really know. I can share 12 markers with many of you and not be related because it’s just too few that we are using for comparison purposes and we could share them even if we are not related to each other (at least closely related). It’s called identical by state (IBS – two haplotypes that coincidentally experienced the same set of mutations over time) versus identical by descent (IBD – two haplotypes that are identical or very similar because they come from a common paternal ancestor). I decided to give it a try and use the 12 Hancock markers to query the SMGF database. I knew there were several Hancocks in our database because I was actually looking to resolve John Hancock’s paternity (Mosiah’s recorded brother), who Fawn Brodie mentioned as another possible child of Joseph Smith. Unfortunately, I don’t have any answer regarding John’s paternity yet. I’m still looking for his descendants so that I can test their DNA; if you know of any direct paternal descendants of John Hancock, please let me know. Returning to Mosiah’s case: we have seven exact matches in the whole database for these 12 markers. These are all Hancocks except one individual. This could be an individual that is related to the Hancock family but the surname was changed for unknown reasons (an NPE?); or he just matches the DNA by chance (IBS) to the rest of the Hancocks. The fact is that we have one, two, three, four, five, six individuals who are Hancocks and the most recent common ancestor for all of them pre-dates Mosiah. We can be pretty positive that what we are looking at here is a Hancock profile. Furthermore, by comparing these 12 markers with Joseph there are a considerable amount of them that differ. By matching to the Hancocks and not to Joseph Smith’s Y chromosome profile, we can be pretty sure that Mosiah was indeed a Hancock and not a Smith. This information is going to be published in this year’s volume of the

John Withmer Historical Association Journal.⁸ Now we have five of these individuals crossed off from the provisional list. Of course, it's a list that continues to change, but one by one we might get through most of them. There will probably be some cases we are never going to be able to resolve, particularly children that died in infancy. They did not have the chance to grow up to adulthood and have children of their own, and so we don't have living posterity to test. I'm not really in the business of going around digging up graves and testing babies' bones. I think there is a limit to what is right to do. Another limitation is that since these are people that died approximately 150 years ago, there could be uncertainty about the exact location of their remains. You might be testing the wrong bones. Also, there are other issues involved with testing ancient DNA and the results are often pretty sketchy, particularly with regards of nuclear DNA (including the Y chromosome). You start making a lot of 'if' situations that I just don't like to deal with.

Now, let's go back to the original question, "Can we say something, after almost 10 years, about Joseph Smith's paternal ancestry based on his DNA?" We have the 43 markers for his Y chromosome haplotype that you saw several times during this presentation. The question is where in England – if in England – he came from. The assumption is based on the fact that the man – his name was John Whittingham – who took young Robert Smith to Boston, Massachusetts, (Robert was 12 years old at that time) also owned land in the Kirton area, in Lincolnshire, England; therefore, it has been hypothesized that Robert Smith was also from Kirton. If you go to the online database at FamilySearch.org and look for Joseph Smith's pedigree, you find Kirton, Lincolnshire, England, as the terminal place of his paternal ancestry, although there is no strong genealogical evidence to support it, with the exception of the assumption I just explained. However, John Whittingham was not a relative of Robert Smith, as far as we can tell. My first step was to look closely at England. Let's see if we can verify whether Robert was really from Kirton. I ran the Smith Y chromosome markers through our database and I could not find any matches with other Smiths with English ancestry in our database. The only Smiths that would be a close match to the haplotype I was using for this query were the Smiths who I already knew were close relatives to Joseph Smith Jr. through his grandfather Asael Smith. Because I went to all these Smith reunions, several descendants of Asael Smith contributed DNA samples to our large study and now they are all in the database. I see a lot of people in this room with big question marks on their heads. This will make more sense in a minute. The other thing I did was to investigate a separate large study combining the Y chromosome of all the Smiths from Northeastern United States.⁹ As you may already know, the Smith surname is based on a trade. Those that were blacksmiths, locksmiths, and goldsmiths eventually were given Smith as their last name. 1% of surnames in the United States and 1% in the UK are Smith. It's the most common surname in Anglo-Saxon countries. Also, in 1600 the most common first name was Robert. You're looking at a very common individual, truly a needle in a haystack. On the Northeastern US Smith DNA website they have extensive Y chromosome and genealogical data for 272 Smiths. These are people researching their Smith ancestry that originally settled in New England, Pennsylvania, New York, New Jersey, and Ohio. I ran Joseph Smith Jr.'s Y

chromosome profile there and I found only one match out of all the 272 available. However, this one match was from an individual with a terminal paternal ancestor born in Vermont in 1800 (last name Smith). Joseph Smith was born in Vermont in 1805. I asked our genealogists if they could find a link between the two lines since the state, the surname, and the Y chromosome haplotype matched, but they could not find anything and especially they could not extend the new Smith line outside of the US. Maybe Craig Foster here in the audience can later help me extending the genealogy of this individual. What we have here, with regards to “Mormon” Smiths, is an apparent rare lineage. Common surname, but rare since the DNA does not match any other Smith. So, I decided to go to the source. I accessed the online white pages for Kirton, Lincolnshire, and found approximately 1100 households that are listed as Smith. I wrote to each one of them. True story. I sent 1100 letters to Kirton, Lincolnshire, with an explanation of my study and the swabs to provide me with a DNA sample. At that time I had a friend living in England and through her I purchased 1100 UK stamps to send letters from the UK to the United States. I wanted to make it as easy as possible for any potential donor to return their DNA to me. I also offered in my letter to return to them their DNA profile for free if they were willing to participate. I prepared 1100 envelopes with my letter, swabs, instructions, and a self-addressed, stamped envelope to return the swabs. In the following months I received approximately 35 swabs back from the 1100 I sent out (ca. 3% response rate). I was hoping for a 5-10% response, but it was understandable. What would you do if you get such a letter in the mail from a guy with a funny name asking for your DNA? But a few people were brave and sent me their DNA so that I could have a genetic representation of the Smiths from Kirton. The results? Zero matches. No one was even close to Joseph Smith’s haplotype. That was the best I could do in finding an English connection for the Smith line and it was quite disappointing.

My next approach was to leave out the surname and to focus on the genetic markers instead. I wanted to think outside the box. Where else is this DNA found besides Lincolnshire, or even England? I used a free website that allows plugging in all the Y chromosome numbers and based on some general common patterns it determines the clade or group (haplogroup) a Y chromosome lineage belongs to.¹⁰ It’s called a haplogroup predictor. It is called predictor because it’s not always 100% accurate and it only provides a low resolution haplogroup assignment. But it is a good place to start. It gives its best guess. There is a percentage of confidence given. In the Smith case it was a 100% fit for the R1b haplogroup. We looked at this before when we were discussing Oliver Buell’s paternity. Why is it important to know the haplogroup? Because haplogroups are in many cases geographic-specific. For example, individuals that belong to haplogroup E3a are mostly of African ancestry. Haplogroup I indicates Scandinavian ancestry. J is typically found in the Middle East. It has been linked to some Jewish groups. I’m a C which is Asian. Don’t ask me why; I’m trying to figure it out for myself. It will be next year’s presentation! Haplogroup R1a has its highest frequency in Eastern Europe and R1b is found prevalently in Western Europe. It is the most common Y chromosome lineage in Western Europe – almost 50% of the male population belongs to this clade. There are several trees that show how all the different haplogroups are related to each other. R1b is a sister clade to

R1a because one is found in Eastern Europe and the other one is found mostly in Western Europe and they split in the past at about the same time (same age). You can find both haplogroups in both places (Western and Eastern Europe), but they have a different frequency distribution that indicates their likely ancient origin. As a general rule in population genetics, where you find the highest frequencies, you can assume that is where the haplogroup originated – where it came from -- because it's been there longer and it had more time to propagate in a larger section of the local population. Here I have a frequency map for haplogroup R1b. You can see that the two darkest areas are located in the Iberian Peninsula and in the British Isles. As a reminder, we are looking at where R1b is found because Joseph Smith's Y chromosome haplotype was predicted as part of this haplogroup. Remember? All of the people matching his Y chromosome haplotype shared a close genealogy with him back to Asael Smith, who was his grandfather. Also, these genealogies, as posted on FamilySearch.org, end in England based on the assumption we discussed earlier.

Let's leave the haplogroup part aside for the moment and go back to the SMGF Y chromosome database.¹¹ As you can see, this time I searched only for matches to the Smith Y chromosome profile, leaving the surname box empty. The current size of the Y chromosome portion of the database contains over 23,000 profiles. I looked at the first 150 matches that were either an exact match or a close match to Joseph Smith's Y chromosome. This is the distribution I found: 22 of these people are Smiths related to Joseph Smith through Asael Smith - same family, of course they match. 35 had a terminal paternal ancestor from Ireland, 12 from Scotland, eight from England. They are all close matches, between 1 to 4 markers off, but the surnames are different; they are not Smith. Also, two from Denmark and then there were 72 others that did not have enough genealogical data to take them outside the United States. However, as you can see, many of these surnames are clearly of Irish and Scottish origins. Here you see how many generations or how many years ago we can estimate a common connection between the Smith line and some of these individuals in the database based on mismatches: 34 out of 36 markers, we estimate a common ancestor 400 years ago; 33 out of 36, 600 years ago; 32 out of 36, 800 years ago. These are all statistical estimates as it has been explained to you earlier. Why is this significant? It is because Robert Smith shows up in North America about 400 years ago. We are trying to find a common ancestor with this line somewhere past 400 years ago. Therefore I'm not expecting to find perfect but only close matches. The centuries separating the different lineages analyzed back to a common paternal ancestor would have allowed some of these mutations to kick in.

We're almost done here, so bear with me for a few more minutes.

Here is an example of a query page; it shows the range of matches between 90 and 100 in the list. Several of them have Irish origins. Not as many English matches to the Smith haplotype. This was quite surprising to me. Could it be that Joseph Smith's paternal lineage was truly Irish in origin? That's a possibility. Maybe it's not English. Maybe it's Irish. How can I confirm that? There is another test you can do on the Y chromosome, which is called a SNP test (single nucleotide polymorphism – pronounced “snip”). You look at specific single changes in the DNA

that are very stable over the years. They are not susceptible to recurring mutations. They are like genetic milestones. We found that the Smith DNA tested positive for a SNP called M222. Here we are going back to the schematic Y chromosome haplogroup tree we saw earlier and focusing on the branch called R1b. You can subdivide the R1b branch into smaller branches, and some of them are also very specific geographically. These are all the sub-branches of R1b. What are we doing here? We are increasing the level of Y chromosome resolution. If something is not clear on the surface, you can zoom in with the SNP testing. And where is this M222 marker found? Luckily someone has studied it already and there is a distribution map available that shows where the highest frequency of individuals carrying the M222 variant live today. The darker red area on the distribution map is where this marker is found at its highest frequency. It is found in northwest Ireland and in smaller frequencies in lowland Scotland, which makes a lot of sense since most of the matches found in the SMGF database using the haplotype had genealogies ending in Ireland and some in Scotland. We have two pieces of evidence now: the haplotype matches and the SNP data that confirmed the sub-branch within R1b (called R1b1b2a2e)¹² with the highest frequency in northwest Ireland.

Additionally, I remembered a paper that was published a couple of years ago that dealt with a particular genetic signature found prevalently in this part of the British Isles. Some of you might have heard of Niall of the Nine Hostages. He was a warlord of the fifth century; a legendary figure from which about five centuries of Irish rulers descended. The researchers involved in that study believed that the high frequency of this particular genetic signature in this region of Ireland is the legacy left by the royal Irish family and their large posterity.¹³ Of course, this makes a lot of sense: if you have money and power, you can also have lots of children, one way or the other! (A similar study was done on Genghis Kahn). I compared the reconstructed profile for Niall of the Nine Hostages with the one I have for Joseph Smith and discovered that they were very similar, considering the time frame. There are only three mutations and they are only one-step mutations. Usually when a mutation takes place along a radiating Y chromosome lineage, it increases or decreases by a factor of one. Then after few more generations it can change again by the same factor and you'll have a two-step mutation. The researchers included in their paper a list of common Irish surnames that have been associated with this particular royal family and genetic signature. As you can see, many of these are similar to those that showed up when querying the SMGF database (O'Neil, O'Rourke, etc.). We are talking about a very rare haplotype, which is found at a 20% frequency in the Donegal region of Northern Ireland. Earlier we saw that the haplogroup marker M222 was also found in the same geographic area. We have two genetic "witnesses" and Joseph Smith has both of them. Based on the data presented, I would like to propose the idea that perhaps Robert Smith, this 12 year old indentured servant, could have been of Irish descent. Perhaps just a couple of generations earlier his family lived in Ireland. And you know the history, the struggles of impoverished Irish families looking for economic relief and moving to England. They were not welcomed in England and perhaps this family adopted a new surname to blend in – and what better surname then the most common one in England.¹⁴ What if Robert Smith was not a Smith a couple of generations back? The reason I

say only one or two generations back is the scarcity of Smiths (and non Smiths) carrying this particular genetic signature in England. They simply did not live in the area long enough to leave a genetic legacy that survived today due to a reduced family introgression that disappeared quickly following genetic drift.

In summary, this is my assumption: Joseph Smith was probably not a Smith at some point in the past along his paternal line, but he was something else, another surname. Also, he was most likely of Irish descent on the paternal line. Remember we are talking about one branch of the family tree here, but it is an important one as it is the surname bearing lineage.

I'm not going to dwell too much on this next part of the presentation because my time is almost up, but there is another marker I would like to mention to you and this one follows the maternal line. It is called mitochondrial DNA (or mtDNA). I was able to find a sister of Joseph Smith that had a living female descendant along the unbroken maternal lineage. I asked for a sample and tested the DNA for the mtDNA. It's only one individual, but most of the time, even when there are some doubts about the identity of the father, we can be pretty sure about the mother. We had to test a female relative of Joseph Smith because even though he would have had this type of DNA, he did not give it to any of his children. It only goes through the maternal line. The mother passes it to all of her children, but only the daughters will transmit it to the next generation. So that's why I needed to find a maternal lineage that would eventually tie back with Joseph Smith's common maternal ancestor (in this case Lucy Mack). Lucy Mack gave her mitochondrial DNA to all of her children, boys and girls, but only the daughter passed it on to the next generation. We don't have enough time to spend on this, but the point is that we reconstructed this particular genetic profile for Joseph Smith as well, first with a partial sequence and then we proceeded to sequence the complete mtDNA genome (highest level of resolution attainable for mtDNA analysis). Mitochondrial DNA lineages can be grouped together in haplogroups in a similar fashion as Y chromosome haplotypes – although the nomenclature does not overlap. Joseph Smith's mtDNA belongs to haplogroup H, the most common European female lineage.¹⁵ It has a similar distribution and frequency in Western Europe as the male counterpart R1b (Iberian Peninsula and British Isles have the highest frequency peaks). Now, taking the two outermost branches of Joseph Smith Jr. pedigree chart, we know something about the Irish connection on the paternal line, and we also have his maternally inherited mtDNA profile.

Recently a photograph presumably of Joseph Smith was made public. Scholars are still trying to figure out if it is indeed Joseph in that picture. I bring this up because, in good or in bad, there is a tremendous fascination with the person of Joseph Smith Jr. We want to know everything about him – what he said, what he did, what he looked like – and I am not different in that regard. For the first time in history, we are able to generate a very good genetic profile about him using Y chromosome and mtDNA data. We know something about both his maternal and paternal haplogroups. We know his complete mitochondrial DNA sequence, as well as his extended 43-marker Y chromosome haplotype. We demonstrated how this information was relevant in addressing issues surrounding his posterity and his ancestry. But this is not the end of the story.

There are other paternity cases that may be addressed in the future, new extended genetic profiles that could be reconstructed about him or his immediate family. We could also find new applications for the genetic information we already have about him. For example, there are a number of remains or items – like hair samples, or bones, or pieces of clothing presumably from the martyrdom with blood stains – that might be analyzed. We are not sure about the origins of these items, but DNA might provide some valuable clues. Lastly, the next big project I am working on is to establish the paternity of Josephine Lyon Fisher, daughter of Sylvia Session. This is a complex case, because you cannot use either Y chromosome or mitochondrial DNA data as she didn't receive them from her father. She has her mother's mitochondrial DNA (and we don't need to prove who she was) and, being a female, she did not receive the Y chromosome from her father. I have already collected DNA samples from approximately 120 individuals who are direct descendants of Josephine and I am looking at what is called autosomal DNA, which is much more difficult to analyze. Hopefully in the next year or so there will be some answers about this case study. This is probably the strongest of all the cases in the current provisional list linked to Joseph Smith. It is based on an affidavit her mother left at the end of her mortal life stating that "You are Joseph Smith's daughter."¹⁶ I would love to demonstrate if this was a biological or a spiritual statement – something like, "in the eternity you are his." But we'll have to see about that. Thank you for your time.

Question 1: John Winthrop is said to be the common ancestor of Joseph Smith, Parley Pratt, and others. Do you have any evidence for or against it?

Answer: This is something you can only prove genealogically. Because as you can see, Winthrop is a different surname, and so - although he is a common ancestor to the Pratts or the Smiths or to others - does not share a paternal line with John Winthrop. And so you cannot use the genetic markers that we know for sure belong to Joseph Smith to prove that connection from a genetic point of view. We have to trust the genealogical data on that. But I'm pretty confident that it is, because John Winthrop was an important figure in US history, so there is not really reason to doubt. I'm sure a lot of you in here are John Winthrop descendants but don't know that.

Question 2: What do you think of the claim from Carey Boren that he is a descendant of Joseph Smith through Isaac Morley's daughter Lucy Diantha?

Answer: I don't know - bring him over and let's test him.

Question 3: What has been the reaction of the families involved in your study as the results came out, or do they know yet?

Answer: I have permission to share these results. As you noticed though, I did not put any names of individuals who have been tested. This is just part of common ethics. You just do not put the genealogy and the genetics up of individuals who are born within the last 100 years. We keep

that anonymous. There was not a particular individual that we spotlighted here. But with regards of the family knowing that their ancestor was not a Smith descendant but somebody else, I think they were kind of relieved. I had permission to share this information, but they told me many times, "I don't really care; I just want to know." That's the common theme. I did have a couple instances, though, that I did a DNA test for other situations and the family was very upset because they had visions and dreams that said they were linked to Joseph Smith and they were convinced that that was it and the DNA was wrong. Like Blake Ostler said, not all the scientists agree with each other. But there are things you can be confident about in science and I'm pretty confident about the results that were produced in these cases. If the family is not happy I'm not going to talk about those things or promote them or publish them or so on.

I tell them it costs money to do this type of test. All of the money is donated. Because of the work I do, I have access to this type of equipment and the type of tests that would cost a lot of money to do if you do them commercially. So essentially we do these things in house. But the reality is when I do that, I say, "I'm going to spend the time to do this, and we'll use some of our resources to do that, I would like to be able use this information perhaps for a publication," and I think people like to know that. If they say no or yes, based on that we'll do the study. Most of the cases they're happy, they're willing to share that.

Question 4: Since there are so many of Hyrum's descendants in the church, why didn't you use his descendants rather than Joseph's for your study?

Answer: I used them both. I used Samuel; I have descendants of John Smith, who is a brother of Joseph Smith Sr.; and Silas Smith, who is the clan that settled down in Arizona. We used all of them. In fact, we used a lot of descendants of Joseph Smith Sr. who are not Smith. We tested individuals where it goes down to a male-female-male line so the last name will be different. But we're still interested in that. This is a work in progress; we're testing a lot of the Smith descendants to continue to expand on this knowledge.

Question 5: How would you respond to the position that it is a double standard to accept DNA testing that helps Joseph Smith but not to accept DNA testing that supposedly refutes the Book of Mormon?

Answer: We're talking about apples and oranges here. They are two completely different things. For the case studies presented today we have a frame of reference, we're looking at specific markers within a family, we know exactly how these things are transmitted, and we know what the DNA of the individual that we're starting with looks like. With the Book of Mormon, we don't know what Lehi's DNA looked like. We don't know a lot of other things. I really like some of the things that have been written on FAIR lately. FARMS has a good book with papers on the subject out there if you want to read it. But the bottom line is that the studies presented today and the Book of Mormon/DNA issue require two different approaches. They are not the same thing. How do you accept one thing and not the other? DNA is used for medicine, for pharmaceutical

purposes, for archaeology, for anthropology (which is more like the DNA and Book of Mormon issue), for ancestry, and for genealogy (these last two are more in line with what I showed today), so you can't just use the word DNA loosely and think that you would have the same outcomes every time and especially that you can use the same parameters for all these types of studies. The limitations and the issues that you need to deal with are very much different. I'm very confident about what I showed to you today, and if there are any geneticists out there that would like to duplicate the results I have obtained, they are welcome to do so. This is as good as it gets in applying DNA to resolve questions about genealogy, ancestry, and history.

¹ Perego UA, Myres MM, Woodward SR. "Reconstructing the Y-Chromosome of Joseph Smith: Genealogical Applications" *Journal of Mormon History* (2005) 31: 42-60.

² Nichols EC. "Corrections to Joseph Smith's English Ancestry: The Parentage of Robert Smith of Boxford, Massachusetts" *Utah Genealogical Journal* (1991) 19: 138-143.

³ Brodie FM. *No Man Knows My History*, pp. 345, 484.

⁴ Walsh B. "Estimating the Time to Most Recent Common Ancestor for the Y Chromosome or Mitochondrial DNA for a Pair of Individuals" *Genetics* (2001) 158: 897-912; Kayser M, et al. "Characteristics and Frequency of Germline Mutations at Microsatellite Loci from the Human Y Chromosome, as Revealed by Direct Observation in Father/Son Pairs" *American Journal of Human Genetics* (2000) 66: 1580-1588.

⁵ Van Wagoner RS. *Mormon Polygamy*, pp. 48-49.

⁶ Compton T. *In Sacred Loneliness: The Plural Wives of Joseph Smith*, pp. 35-35; Brodie FM. *No Man Knows My History*, p. 345.

⁷ Brodie FM. *No Man Knows My History*, pp. 301-302, 460-462.

⁸ Perego UA, Ekins JE, Woodward SR. "Resolving the Paternities of Oliver N. Buell and Mosiah L. Hancock through DNA" *The John Whitmer Historical Association Journal* (2008) 28: 128-136.

⁹ <http://smithconnections.com/index.cgi> (accessed July 2008).

¹⁰ <http://www.hprg.com/hapest5> (accessed July 2008).

¹¹ <http://www.smgf.org/pages/ydatabase.jsp> (accessed July 2008).

¹² Now called R1b1b2a1a2f2. See http://www.isogg.org/tree/ISOGG_HapgrpR09.html (accessed August 2009). For a map showing the distribution of the R1b sub-branch characterized by the SNP M222, see <http://www.vizachero.com/images/R1bClades.pdf> (accessed August 2009) and <http://www.familytreedna.com/public/R1b1c7/default.aspx> (accessed August 2009). For a schematic tree of all Y chromosome lineages, see <http://www.isogg.org/tree> (updated July 22, 2009).

¹³ Moore LT, McEvoy B, Cape E, Simms K, Bradley DG. "A Y-Chromosome Signature of Hegemony in Gaelic Ireland" *The American Journal of Human Genetics* (2006) 78: 334-338.

¹⁴ In modern Ireland, particularly in large cities, the surname Smith is very common nowadays. However, we are talking about 16th century Ireland here. Smith is not an autochthonous surname of Ireland and its presence in that

country today is the result of migrations that took place over the past couple of centuries. See also Edward MacLysaght *The Surnames of Ireland* (1997, Dublin, Ireland – Colour Books Limited); Brian Mitchell *A New Genealogical Atlas of Ireland* 2nd Ed. (2002, Baltimore, Maryland – Genealogical Publishing Company); Gabriel Ward Lasker *Surnames and Genetic Structure* (1985, Cambridge, UK – University of Cambridge); *Special Report on: Ireland – The 1659 Census* (The Irish Family Journal – Kansas City, Missouri).

¹⁵ Achilli A, et al. “The molecular dissection of mtDNA haplogroup H confirms that the Franco-Cantabrian glacial refuge was a major source for the European gene pool” *The American Journal of Human Genetics* (2004) 74: 910-918.

¹⁶ Compton T. *In Sacred Loneliness: The Plural Wives of Joseph Smith*, pp. 183, 681.