Breeding suris can be achieved by using two completely different methods. By breeding pure suris to pure suris, or by the controversial method of crossing suris with huacayas. When using the term pure suri I am referring to a suri that is carrying two dominate suri genes, or stated another way a homozygous suri (SS). There is sound scientific evidence that the suri gene (S) is dominant over the huacaya gene (s). There is also plenty of anecdotal evidence from suri breeders around the world to support this theory as well.

Simply Inherited Traits vs. Polygenetic Traits
Simply inherited traits are influenced by one or a few genes only. Because of the small number of genes influencing these traits selection for these traits is different than the selection used for traits influenced by many genes known as polygenetic traits. Luster for example is thought to be a polygenetic trait. Polygenetic traits are inherited and expressed in a quantitative additive manner. The degree of luster expressed in a given suri is the result of the total sum of all the luster influencing genes added together with in the given alpacas genotype.

By contrast simply inherited traits tend to be expressed as an “either - or” trait. Generally there is not a variable degree of expression. The trait is present or it is not. In the case of selecting for the suri gene the breeder would be interested in whether the alpaca was a huacaya (ss) or a Suri. If it were a suri is it a heterozygous suri (Ss) or a homozygous suri (SS). Consider the following mating possibilities.

A) If a breeder were to cross two heterozygous suris (Ss) enough times to have multiple offspring the ratio of homozygous, heterozygous, and huacaya offspring would be as follows:

25% SS (homozygous suri)
50% Ss (heterozygous suri)
25% ss (huacaya)

This is how and why huacaya offspring are sometimes produced from the mating of two heterozygous suris.

B) Breeding a homozygous Suri (SS) to a huacaya (ss) would result in:
0% SS (homozygous suri)
100% Ss (heterozygous suri)
0% ss (huacaya)

C) Breeding a homozygous suri (SS) to a heterozygous suri (Ss) would result in:
50% Ss (heterozygous suri)
50% SS (homozygous suri)
0% ss (huacaya)

SS = homozygous
Ss = heterozygous
ss = huacaya

A question that remains unanswered (at least for myself) is whether or not the suri and huacaya phenotype is a simply inherited trait. Why does cross breeding periodically result in an offspring of intermediate fleece type? I don’t have a good answer but I am sure that alpaca breeders will continue to experiment and ponder this question along with many other mysteries concerning the alpaca genotype.

Alpaca Breeding in the Altiplano of South America
In order to better understand this homozygous vs. heterozygous issue one needs to consider how alpacas have been bred for many generations in the high Andes of South America. In South America, huacayas and suris have been crossbred for hundreds of years. Approximately 80% of the alpaca population in Peru consists of small mixed herds under the control of unsophisticated peasant breeders. Upon examination of these peasant herds you will generally find llamas, huacayas, and a few suris all being reared and bred together in a single herd. These herds are very none uniform, consisting of a wide variety of looking animals. One is hard pressed to identify them as either a llama or an alpaca. Llamas x alpaca crosses are commonly referred to as huarizos. It can be difficult to class the alpaca looking animals as either suri or huacaya as well. I call this type of an alpaca an intermediate fleeced alpaca, as it is neither a good suri nor a good huacaya.

The other 20% of the Peruvian alpaca herd is managed by larger, more sophisticated breeders, which are often co-ops. These are the Peruvian herds with the best and purest alpacas. Virtually all the alpacas imported from Peru originated from these herds. In a wide open, undeveloped, and unfenced land, these selective breeding programs are challenged to prevent the introduction of un-wanted genes into their breeding programs. In the fall of 2003 I attended the International Camelid Fiesta in Arequipa, of which the Peru National Show was the main event. I was wandering around in the alpaca pens one day and observed a female huacaya that had won a championship in the ring the day before. She had just given birth to a suri cria that morning. Obviously she had been bred intentionally or unintentionally to a suri macho. Her new suri cria is a heterozygous suri, carrying one huacaya gene and one suri gene. It's phenotype is a suri, it looks like a suri and one could not tell it from a pure suri by looking at it. However, it will not breed true to the suri phenotype, it has the potential to produce a huacaya offspring.

Don Julio Barreda who owns the Accoyo ranch is highly regarded world wide as a breeder of exceptional alpacas, both suri and huacaya. As a young man in the 1940’s Barreda decided that suris and huacayas were different breeds and should be bred pure. He began constructing fences of stone on his property and breeding suris to suris and huacayas to huacayas. He developed hand written pedigrees by observing breedings and tracking offspring. He then started selecting for size, fiber production and fineness, thus began his now famous Accoyo herd. Accoyo suris bring a significant premium in the US today, primarily because most breeders consider Accoyo suris to be the purest or most homozygous suris in the world.

Note: Don Julio Barreda passed away in 2006.

In the late 1990’s US breeders were paying a premium for colored suris, South American breeders did what the economic law of supply and demand predicted they would do. They began producing low cost colored suris by cross breeding suri machos with colored huacayas females. The resulting colored heterozygous suri offspring were sold to importers, which in turn sold them to US breeders. In the US today approximately 10-15% of the suri x suri breedings produce huacaya offspring. Huacaya offspring are even more common when breeding colored suris together.

I do not believe in cross breeding of suris and huacayas. But some breeders do cross breed, so lets look at reasons that have been quoted by others as rational to cross breed.

Advantages of Cross Breeding

1) Cost

Using less expensive, low quality colored huacaya females and crossing them with male suris you can produce low cost colored suris. If the male you use is a pure or homozygous (SS) suri you will produce 100% suri offspring. If the male you use is not pure suri, if he is heterozygous (Ss), you will produce 50% suri and 50% huacaya offspring.

2) Introduction of important suri genes into the huacaya population.
   a) Luster gene
   b) Low medulation gene

3) Introduction of important huacaya genes into the suri population
   a) Color genes
   b) Density genes
4) Hybrid vigor

Hybrid vigor is a well-documented genetic phenomenon that results when out-crossing completely unrelated animals or plants. Hybrids are generally quite robust and require less care. The Corriedale sheep was developed in New Zealand by crossing two different breeds of sheep. It is a rather large robust sheep breed known for its easy care and breed commercially for its wool and meat. Mixed breed alpacas may make favorable commercial alpacas for fleece production.

Disadvantages of Cross Breeding

1) The primary purpose of breeding registered is to produce livestock that breed true to type. Crossbreeding produces heterozygous suris that do not breed true to type. An ARI registered suri with a huacaya in its pedigree is severely discounted in the US market place today.

2) Breeding up is Expensive and Time Consuming

The resulting suri offspring of a suri x huacaya cross is called a first generation suri or F1. Remember that 100% of the suri offspring will be heterozygous suris (Ss). Only F1 females should be retained in a breeding program. All F1 males regardless of their appearance or phenotype should be culled thru gelding, and not allowed to breed. It is imperative that the F1 females be breed only to homozygous suri (SS) males. The resultant offspring from this F1 (heterozygous suri) x homozygous suri (SS) male is called a first backcross (BC1). Many breeders mistakenly call this a 2nd generation or F2. A true F2 is the result of F1 x F1 = F2.

I know this is getting a bit confusing but bear with me, I hope it will clear up.

The BC1 males must again be culled from the herd and not allowed to breed. The BC1 females are again breed to a homozygous suri (SS) male.

F1 x SS = BC1
BC1 x SS = BC2
BC2 x SS = BC3

Etc.

At the third backcross (BC3) generation you will be at 93% pure suri offspring if you are sure that you have always used a homozygous suri male. 7% of your offspring will still be heterozygous suris (Ss) and capable of producing huacaya offspring. Assuming that the generational interval is 3 years it will take a total of 12 years for your herd to become 93% pure suri after your first cross breeding. It is at this BC3 generation that you can even consider using your male offspring as a suri herdsire.

3) You Must Use Only Homozygous Suri Males.

Whether you are breeding pure suris or breeding up to pure suris it is imperative that you use only homozygous suri (SS) herdsires or you are going backwards.

4) Cross Breeding may Diminish Typical Suri Traits

A percentage of offspring resulting from crosses are of an intermediate fleece type. There is some anecdotal evidence that the percentage of intermediate fleece types increases with subsequent generations if one breeds F1 x F1 = F2 suris, and even a higher percentage if one crosses F2 x F2 = F3 suris. An intermediate fleece type alpaca is difficult to determine if it is a huacaya or a suri. In other words neither the huacaya nor the suri phenotype is expressed completely. It is important to note that at this time there is no scientific evidence that this is the case, only experiences and reports from breeders.

Suri fleece is more lustrous and softer than huacaya fleece, it grows 1-2 inches longer in a given year, and generally lacks modulation. Will these commercially important traits be maintained in crosses? These types of traits in sheep and other fleece-producing animals are polygenetic. Meaning that multiple genes at multiple locations on the chromosomes control them. Polygenetic traits are inherited in a quantitative manner. If these traits are polygenetic in suris, which it is
generally believed that they are, these traits will likely be diluted in the crosses. Resulting in suris with less desirable fleece characteristics. Some breeders believe that suris and huacayas are simply the same breed with different fleece types. Others believe that suris are a different breed altogether, exhibiting differences in metabolism, personalities, vigor, etc. These are some of the unanswered questions that continue to fuel the controversy of cross breeding.

5) Hybrid Vigor is not heritable.

In the process of back crossing to homozygous suri (SS) males, much of the hybrid vigor gained in the initial cross may be lost.

6) Many of the advantages of cross breeding can be obtained with intense selection pressure within a breeding program.

   a) You can select huacayas for bright fleeces and low modulation without the introduction of suri genes into the huacaya population
   b) You can select suris for color and density without the introduction of huacaya genes.
   c) You can achieve hybrid vigor by crossing suris that are unrelated or that originated from different regions or countries within South America.

Is the cross breeding of suris x huacayas a genetic short cut that is destined to result in frustration for the breeder, and prove to be a detriment to the breed, or is it a viable tool for the genetic improvement of the alpaca?

Ultimately the market place will provide the final answer this question for us. Time will give us a more clear answer to this question. It is human nature to experiment and seek answers. I am sure that a few breeders will continue to experiment and seek an answer to this question as well as other genetic secrets of the mystic alpaca.

As for us at Latah Creek one of our major goals is to breed pure homozygous suris. We believe that a strong case has been built over the years that crossing suris and huacayas will only lead to catastrophe. We are very proud of the fact that we have had over 200 births from our suris over the last seven years without a single huacaya birth on our ranch. Our herd consists of approximately 125 ARI registered suris.

References.
1) BAYCHELIER P. – Homozygous suris in alpaca breeding - Alpacas Australia, Issue 42, Summer 2003, pages 30 to 34