Understanding Line Breeding, In-Breeding and Scatter Breeding

A line is a family that is inter-connected by breeding close relatives who all have ancestors in common within the first three generations of each parent's pedigree. A line reproduces family traits such as soundness, health, size, body structure, temperament, eye color, coat type, color patterns, and pigment, or any lack thereof. Inbreeding or line breeding magnifies what is already in the gene pool. It is natural for herd animals like deer, and horses to inbreed in the wild, as it is for pack animals such as dogs, wolves and coyotes. Feral dogs the world over tend to have the same physical characteristics. It is only when humans become involved in breeding dogs for specific purposes that their physical characteristics take on those of the various breeds. It is only by inbreeding that breeds are developed.

It is impossible to line breed scatter-bred dogs, but they can be inbred, i.e. breeding littermates is inbreeding, but, as there is no family line behind the sibling parents their offspring are not line-bred. An out-cross is breeding unrelated dogs of the same breed. Continuous out-crossing is called scatter-breeding. Scatter-breeding dogs may produce an outstanding individual, but it's next to impossible for it to reproduce those same fine qualities in its offspring. Back-crossing is breeding back to a great-grand sire, or great uncle, or great grand-dam, or great aunt. The younger dog, or bitch carries this dog, or bitch, or it's sibling in his/her pedigree. It's a great way to bring older traits forward again, and refresh the gene pool without going outside the line.

The offspring draw 50% of their genes from their sire, and 50% from their dam. The reason that dogs within a litter look different is because no two have inherited the same genes, in the same combination, unless they are born from the same sac, and are monzygotic, or identical twins. The tighter the gene pool the narrower the differences among littermates. Breeders must take genotype, and phenotype into consideration when planning their breedings. Genotype is the genetic composition of the animal, in other words the combination of alleles it possesses. There are two alleles, one from each parent, which occupy the same position on homologous chromosomes. Homologous chromosomes have the same pattern of genes along the chromosome, but the nature of the genes may differ. In diploid nuclei, pairs of homologous chromosomes can be identified at meiosis (cell division). In animals all the cells except the reproductive cells are diploid. Two sets of chromosomes are present, one set from the female parent, and one set from the male parent. Reproductive cells formed as a result of meiosis are haploid. Fusion of two such cells restores the normal diploid number (XX or XY). One allele is often dominant to the other allele which is called the recessive. The dominant allele determines which aspect of a particular characteristic that the dog will display. The aspect of the recessive allele only appears when two such alleles are present, as in the double recessive condition. As an example, in AST's blue coat color was the result of a recessive allele. Breeding blue, to blue caused a double recessive that has become as a dominant allele in aspect. In many programs blue has become the dominant color. This same principle holds true for red nose, or liver, a variant dilute.

Phenotype is the observable characteristics of the dog, or what you see. It is determined by the genes, and by the dominance relationship of the alleles. Phenotype can also be determined by the dog's environment, and nurture. For instance if a dog's ears are cropped, or its dew-claws removed, nurture is the reason for the difference in its appearance. If a dog is starved, it won't have the same appearance as a dog that has been nurtured. Phenotype is a combination of genotype, environment, and nurture, all playing a role in the dog's appearance.

Breeding sound, healthy dogs that are closely related increases the odds for reproducing very similar genotype, and phenotype. The key words here being sound, and healthy. It also unmasks masked genetic traits. Dogs, like humans, have two kinds of sex chromosomes, the X chromosome, which is similar in size to the other chromosomes, and the Y chromosome which is smaller. Two X chromosomes makes a female, and one X, and one Y make a male. Sex chromosomes not only carry genes that govern the development of sex organs, and sexual characteristics, they also carry other genes which are unrelated to sex. They are called sex linked genes. They govern coat color, eye color, and pigment, or lack of pigment. The reason that stud dogs get blamed more often that the bitch for defective puppies is that females have two X chromosomes. If one carries an abnormal allele it is likely that its effects will be masked by a normal allele on the other X chromosome. Males, only having one X chromosome, their abnormal alleles will not be masked. A female with an allele for a defective condition that is masked by a normal dominant allele may not suffer from the condition, but as a carrier pass on the defective allele to the offspring.

Scatter-breeding masks defects, but they will eventually surface with devastating effects upon the breed. Line breeding tests the strength of a breeding program. A gene pool is only as strong as its weakest