"HOW THE KNOWLEDGE OF GENETICS CAN HELP BREED BETTER DOGS"

by Dr. Braxton B. Sawyer

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The scientific advances of the past twenty years exceed all the accomplishments of science prior to that time! Indeed, ninety per cent of the scientists who have whohave ever lived are living today, and their production of new information multiplies at a staggering pace, with the publication of over two million scientific and techinical articles each year. This explosion of factual data is reported to have doubled the world's information in the past ten years..It is projected to double again in the next seven years and then double again in another three and a half years.

Although the influence of various scientific developments are impressive and have already resulted in great changes in our way of life, they may seem almost trivial when compared to the monumental advances that have taken place in the field of Genetics. In 1952, Drs. James Watson and Francis Crick reported their findings on the structure of the DNA molecule (desoxyribose nucleic acid) which has literally opened the door to the understanding of the processes of life itself. Their announcement of the solving of the genetic code has had a tremendous impact on the scientific world and led to the award of the Nobel prize for this work in 1962..In a time of unequaled scientific advances in every field, this well may prove to be the one of maximum importance. The four major accomplishments of our generation are: (1) atomic power, (2) the computer, (3) space and exploration, and (4) the understanding of the DNA code. Many thinkers predict that the fate of future generations may well be most affected by the work on the genetic code.

This new breakthrough revealing new knowledge in Genetics has caused some of our leading scientists to predict that within the next ten years it will be possible for a house-wife to walk into a kind of commisary which would contain day-old embryos in frozen packets labeled to describe the sex, physical characteristics, type of temperament and IQ likely to be present in the full grown individual. After making a selection, she could take the packet to her physician and have the embryo planted into her uterus where it will mature for nine months like any "normally conceived" pregnancy.

This new genetic knowledge is not being classified as "top secret: and placed behind locked and guarded doors; but rather, it is being shouted from the housetops. Have you noticed the recent blazing headlines in the better known magazines that come into your home?

We, as dog breeders, will forfeit the greatest opportunity of our day and generation if we do not siphon our share of this new knowledge and use it in breeding better dogs.

Let me assume you that there are no hidden secrets nor classified information as we study the laws governing rapid and consistent improvement of our breed of dog. Let me further assure you that these laws are not dangerous; they are not complicated; they are not even immoral, illegal, nor fattening, and no special Federal Excise Tax has been imposed upon them (that is, up until 5:00 P.M. yesterday).

We shall now take up our subject of.....

HOW THE NEW KNOWLEDGE OF GENETICS CAN HELP BREED BETTER DOGS.....

1. HOW THE MECHANICS OF REPRODUCTION OPERATE

The canine species, of which our dog is a part, is a placental mammal--divided into two sexes, male and female. Both male and female are equipped with glands of reproduction. We call these glands "gonads." The two "gonads of the female are located in the ovaries, and in them are her eggs. The "gonads" of the male are located in his testicles, and, in them, are the "spermatozoa."

When the female puppy is born, her ovaries contain all the undeveloped and unripened eggs she will ever posess. When these eggs in her ovaries become fully ripe, little blisters will burst and flush the eggs into the Fallopian tubes. Her Fallopian tubes extend from the ovaries, which are anchored near her kidneys, to the two horns of her uterus.

When copulation occurs, there is the "tie." This is because the male dog has no seminal vesicles (storage tank), and prolonged copulation is necessary to pump the semen from the testicles of the male into the vagina of the female, the number being about 600 million spermatozoa during one copulation. The number of eggs expelled from the female ovaries at one heat period are usually the number of pups that result. These eggs remain in the Fallopian tubes; and the spermatozoa from the male, with little propelling tails, have to make their way from the vagina through the horns of the uterus and up into the Fallopian tubes of the ovariess where the eggs are waiting to be fertilized. The first sperm to touch one of these eggs buries itself and the "zygote" is formed.

When the eggs have all been fertilized, the remaining spermatozoa die and are expelled or absorbed by the female. These little one-cell puppies then descend from the Fallopian tubes down into the uterus; and there, they attach themselves to the walls of the uterus and the uterus provides heat, food and protection for their development. These embryos are not attached to the mother's nervous system; her blood does not flow through them; and every inherited characteristic they will ever have was sealed when the sperm touched the egg up in the Fallopian tube before it made its way into the uterus. The only part the mother plays from here on is to serve as an incubator for the growth of this separate organism.

A recent article in a leading magazine, published by the American Medical Assn., might help us here to understand more of the physical mechanics of reproduction. This article is entitled, "Eight ways To Make Babies." Some of the suggested ways are:

1. A woman whose Fallopian tubes have non-correctable destruction might have a surgeon to obtain eggs from her ovary, take sperm from her husband, fertilize them in a test tube, and then insert them into her uterus where they can develop and be delivered normally.
2. A man, going off to the armed services who would like for his wife to raise a family while he is gone, might deposit some of his sperm in a "sperm bank" and have his surgeon to fertilize his wife so she could bear children during his absence.
3. A woman whose ovaries cannot manufacture eggs might borrow an egg from her neighbor, have it fertilized by a sperm from her husband and bear a child.
4. One physician suggests that the time has come to extract sperm from top individual men of our society, store them in frozen "sperm banks" and fertilize women in coming generations in order to improve the race of human beings.
5. A man who is sterile might borrow some sperm from another male, and, by means of artificial insemination, impregnate his wife.
6. This article from the American Medical Association suggests that a couple might have an egg extracted from the wife and sperm from the husband fertilized in a test tube and then inserted into the uterus of the maid and, she, in turn, would bear the baby, and it be the child of the husband and wife and no relation to her, the maid. That would come under the heading of "new duties for the baby sitter."
7. And, finally, this panel of doctors suggests that science is further along than we realize with a method of developing artificial wombs where an egg and sperm can be extracted from woman and man and inserted into this artificial uterus that will

provide protection, warmth, and food for the embryo to develop into a normal baby.

Since this article appeared, the following two articles appeared in my local newspaper last week.

1. "The British government, long opposed to test-tube babies, recently relented and authorized an AID (Artificial Insemination Donor) hospital clinic. Partly to compensate for the expected decline in the birth rate since the passage of the Abortion Act. Most costly portion of the five treatments (said to be the average number required to insure pregnancy) is the fee to the donor- - usually around 20 pounds, $48.00. Some mothers-to-be ask only that the anonymous "father" be young and healthy. Others state their preferences in build, color. Whenever possible their wishes are granted. Authorities anticipate some 1,000 test-tube babies will be born in England this year."

2. "A leading British gynecologist says he is experimenting with a new technique of human artificial insemination in which the egg is fertilized outside the mother's body, then returned to the womb for gestation.

"Dr. Patrick Steptoe told television viewers one night, that he removed an egg from Sylvia Allen, 34, fertilized it in a laboratory with her husband's sperm and will plant it in the woman's womb.

"Mrs. Allen has been childless for five years of marriage because her Fallopian tubes are blocked. She appeared on the program."

A recent issue of TIME Magazine states, "An estimated 25,000 women whose husbands are either sterile or carry genetic flaws have been artificially inseminated in the U. S. each year, many of them with sperm provided by anonymous donors whose pedigrees have been carefully checked for hereditary defects. Some 10,000 children are born annually of such conceptions.

This should ever convince us that in the art of breeding, we are not mixing and mingling blood.

II. HOW THE MECHANICS OF HEREDITY FUNCTION

Gregor Mendel of Brunn, Moravia (Chechoslovakia), a clergyman and botanist, conducted some experiments (1853 - 1864) with garden peas in a little garden behind his church; and there, he found the answer to the question that humanity had been asking through the ages. At the time Mendel discovered these laws, however, he was somewhat like Columbus when he discovered America. Mendel returned from his experiments without knowing just what he had found. He wrote up his experiments for a scientific magazine of his day, "Local Society of Natural Science." This was 1966, and it went unnoticed for about thirty five years.

In 1900, Dr. L. H. Bailey of Cornell University, wrote a paper on this subject; and in the bibliography he attached to his research paper, he mentioned this article by Mendel. Dr. Bailey did not even read the article. He just included it in the bibliography. Dr. Hugo DeVris, of Holland, read Dr. Bailey's article and also read his bibliography. His attention was drawn to this reference to Mendel's article, and Dr. DeVris dug up the report and read it. There, he found the answer he had been seeking.

Today, this is known as "Mendelanism" or "The Laws of Mendelan Inheritance." Let me emphasize here that these are not theories from a 'would-be, way-out' scientist; but they are true, tried, and proven laws that are accepted by every biologist and scientist, and used by every successful breeder in all parts of the world.

Many breeders have bred great animals who have never heard of Mendel and his theories, but his laws operated for them, whether they were aware of it or not. And, these breeders usually breed one great animal in a lifetime; whereas, the breeder who will master these laws and abide by them, may produce a succession of great animals.

Probably the biggest stumbling block in learning these rules is the big words in which they are couched. When we glance at a book and see the table of contents dealing with chromosomes, zygotes, heterozygous, genotype, meiosis, etc., we are tempted

to close the book and run. But, when we pull up to a garage and the mechanic begins to talk to us about the ignition system, the transmission, the points, the fuel pump the muffler, etc., we find we have bothered to learn what these words mean.

Many people think the study of Genetics is so technical that it is beyond the comprehension of anyone except a scientist. This is far from the truth. These basic principles are quite simple and straightforward.

1. Chromosomes and Genes

Let it be emphasized that characteristics of any breed are not transmitted through the blood. The two dogs being mated do not give one-half of their characteristics to their puppies.

The fact is, the reproductive germ cell of each dog is building material, which has a built-in blueprint, and give it proper environment, it will develop into the exact building which its blueprint and specifications call for.

We know what bricks, cement blocks, mortar, sanfd, boards, nails, and lumber are. They are the building material with which the architects and builders construct buildings.

We now look at the building material our dogs possess. Each male and each female possess 39 pairs of chromosones -- a total of 78 in each of their reproductive germ cells. The fruit fly has 8; the pig has 24, and the human being 48.

We might call these chromosomes the 'crates', the boxes", or the 'cartons', etc., in which the genes are located. The genes are the building blocks and material. The chromosomes of the reproductive cells carry within them the factors which determine what the progeny of the organism shall be; and to be a successful breeder, we must know in which manner these factors are transmitted from parent to offspring.

The reproductive cell of the male has 78 chromosomes. Likewise, the reproductive cell of the female has 78. The genes (the building units) are contained within these chromosomes like peas in a pod. There are about 150,000 genes in each chromosome. The chromosomes of the parents split apart like the hulls of purple hull peas, and one-half of one chromosome of the male unites with one-half of the chromosomes of the female. Thus, one-half of the genes from the male has been mixed with one-half of the genes from the female, and that seals the individual.

This does not mean that the sire has emptied one-half of himself to be combined with one-half of the female, but it means that they have each given one-half of their genes to produce the puppies; and it could mean that the male gave his bad one-half and the bitch gave her good one-half. It could mean that the male gave his good one-half and the bitch her good one-half, or that both gave their bad halves.

We have already noted that the male has about 600 million spermatozoa at one service. Only one is needed for a puppy.

One batch of genes that a sire might have received from his daddy could be passed on to reproduce the puppy. In that case, that one puppy could be more related to the grandsire than to the immediate sire.

2. Dominant and Recessive Genes

Mendel found that if he crossed red flowers with white flowers, the first cross produced all red flowers. The second cross produced both redand white. I find the same results in breeding my Foxhounds. The pure dominant Black, White, and Tan mated to a White and Lemon all come Black, White, and Tan. But, when I make the next cross, they come mixed - - some are Black, White, and Tan. and some are White and Lemon.

If two recessives, White and Lemon colors are bred, they produce nothing but White and Lemon. Sometimes, we breed two Black, White, and Tan together and get some Lemon. This is because the Black, White, and Tan carried some 'recessive' genes. In other breeds, for example, red in Cockers is a 'resessive' color. Red bred to red in Cockers produces only red. Black is a 'dominant' color in Cockers; and pure 'dominant' black Cockers bred to pure 'dominant' black Cockers will produce nothing but black.

But, often we see black Cockers bred to black Cockers which produce black, red, and parti colors. This is because these blacks were not pure 'dominant' for blacks. We call them "hybrids".

The real nerve center of scientific breeding is right here. We must know what is meant by 'dominant' genes, and what is meant by 'recessive' genes, and how they manifest themselves, and how to sort them out.

A 'dominant' gene is one of a pair whose effects are expressed to the exclusion of the effects of the other.

A 'recessive' gene is one whose effects are underdeveloped, or buried, when it is associated with a 'dominant' gene.

Remember what we said a little bit ago about the red flowers? This principle which underlies color, shape, size, temperament, bone, muscle, feet, ears, and tail of our dogs. Fortunately, most of the qualities which we wantto perpetuate in our dogs are produced by the 'dominant' genes.

We referred to the genes as building units — some brick and some cement blocks. We said the building material of some of the dogs would be all brick, and some of them all cement blocks. We said others would be part brick and part cement blocks.

Suppoese we call the bricks the 'dominant' genes, and the cement blocks the recessive", genes. When we drive through the city, we see a beautiful solid brick home, that is, it appears from the outside to be solid brick, but, when we inspect closer, we find a lot of cement blocks covered with the brick. The cement blocks a are there doing their share to support the house, but they are covered up with the brick. There might be a house next door which looks to be constructed of solid brick; and upon close inspection, we find that it is solid brick all the way. We would call this house of solid brick pure''dominant,' and the other one 'hybrid'.

Two Black, White, and Tan Foxhounds can stand side by side, giving every appearance of being the same. One can be a pure 'dominant' for color, the other a 'hybrid'.

The scientific breeder is the one who knows how to select his foundation stock and how to cross and re-cross, and sort out his genes, eliminating the 'recessives' and building up the 'dominants.'

Finally, he comes up with a puppy that is built of brick, inside, ouside, foundation, and all. The cement blocks have all been cast aside. Then, when he has a sire solid brick through and through, and a dam solid brick through and through, mates them together, he can bet his life that every puppy will be made of solid brick.

This same principle holds true, not only as to color, but in every other trait of the dog.

III HOW WE CAN CONTROL THE MECHANICS OF HEREDITY

Suppose we decide to be serious and resolve to go home from here and throw away our 'old wives' theories and claim our share of this new knowledge and begin to put it into to action. How and where would we start?

1. Start By Carefully Selecting Our Brood Stock

"Selection" is the keystone of the arch in animal breeding. Our ultimate success or failure will depend upon our selection. According to all laws of probability, we will never get an individual dog that carries 100% of all the building material we want carried in all the departments. But to use the gambler's terms, we can 'stack the cards', we can 'load the dice,' and we can 'rig the machines,' in our favor and make them produce more and more of the type we want.

Don't forget what we we have already learned. We are not selecting individuals to breed on. We are not selecting bloodlines. We are not selecting pedigrees. All these are indispensable in our process of "selection", but we are selecting a deposit of genes.

The one purpose we have in selecting brood stock is to increase our bank stock of desirable genes. We cannot read the labels on the genes, so where do we start?

The quickest and most economical way for a beginner to start out at the top is to find a person who has spent 25 years and $50,000 building up the breed in which the beginner is interested. CAUTION!!!!! Never go to a breeder and say, "I am just a poor man or woman and cannot pay much for a dog. I am just looking for a pet.

What do you have in a lower price range, a cull, perhaps?" Be CAREFUL! That is exactly what you will get!

The experienced breeder will advise:

(1) Start by Carefully Selecting a Brood Bitch

There are good reasons why we should start with a bitch.

a. The American Kennel Club requires us to be the owner or lessee of the bitch before we can be a breeder of record.

b. The bitch contributes exactly one-half of the chromosomes which determine every puppy, and her influence on the puppies is exactly one-half. But more care must be exercised in selecting her than the male because she produces such a limited number of offspring as compared to the male.

c. It is easier to find a match for the bitch than it is vice versa. This is because the males have produced such a large number of offspring; and therefore make it easier to test them.

d. The cost will be considerably lower. When most inexperienced breeders start, they go pay a large price for a stud dog and then assemble around him a kennel full of mediocre bitches. That kind usually stays in mediocre business. The wise breeder will take one-half, or less, of the price of a top stud dog, carefully and scientifically select him a brood bitch that has a breeding deposit of the genes he wishes to use in building puppies, and then select a stud to match her; and from there, if he will ruthlessly cull the offspring, and judiciously select his breeding stock each generation, he will soon produce a kennel full of dogs that will make you nervous when you see him pull up to a show.

We have three courses of investigation as we select a brood bitch.

a. The Individual
b. The Pedigree
c. The Progeny

(2) Start by Carefully Selecting a Stud Dog

Our first consideration in selecting a stud dog is not that he has a big name, that he has won a lot of shows, that he is highly advertised, or that his pups are in great demand.

Our first consideration is, "Does he have the kind of blocks, bricks, and building units that exactly match the ones we already have in our bitch that will work together perfectly in building a firm, well put-together, symetrical, and well balanced building we are to call a new puppy?

The methods of selecting the stud dog are the same as we had in selecting our brood bitch -- namely, the three courses of investigation.

a. The Individual
b. The Pedigree
c. The Progeny

Having selected a brood bitch by using the above mentioned method of procedure, and then having selected the stud dog following the same procedure, the overwhelming probability is that we will come up with a sire and dam that are very much related to each other, and this opens up the big argument of INBREEDING, LINEBREEDING, OUTBREEDING, AND CROSSBREEDING.

So, this brings me to say what you have been wondering about -- the subject of INBREEDING.

INBREEDING in humans or animals merely doubles up what we have to start with. We find a very revealing story in the Bible concerning 'inbreeding' of human beings. In the Book of Genesis, we read a story of an old Syrian Tribesman, named Terah. Terah, had three sons - Nahor, Haran, and Abraham, and a daughter, named Sarah -- all of these by different wives. In the course of time, Abraham and Sarah, half-brother and half-sister, married and produced a son named Issac. Isaac married a girl named Rebekah, and Rebekah was Nahor's grandaughter. They produced a son,

named Jacob, and he married two of his first cousins who were also the great granddaughters of Nahor; and from this marriage, came sons who became the founders of the most persistent and influential nation in human history — namely, the Jewish race. Eight of the twelve founders of the Twelve Tribes had out crosses close up of Terah; and, then, they passed a law which established a tradition that their children should not marry into strange families. Of all the charges brought against the Jew from around the world, through the ages, no one has ever leveled the charge of "degeneracy." This simply means that Terah had some genes that somebody wanted to sort out and put in the bank, and this they did.

More recently, experiments have been made with some white rats. Miss Helen King of Wistar Institute started with four albino rats — two females and two males. Female "A" was bred to her litter brother. Female "B" was bred to her litter brother. Brother to sister mating was continued for 70 generations with no ill effects at all. In fact, the males averaged 18% heavier than when started; the females averaged 3.7% heavier; and fertility increased 7.5%.

In a personal letter just a few days ago from Fr. L. Butler, head of Ramsay Wright Zoological Laboratories, University of Toronto, he tells me of experiments with rats mated brother to sister for 200 generations.

Let me make it clear here that we do not breed kinsfolk just for the sake of INBREEDING, but we are breeding a dam to a sire whose banks of genes match each other.

When we go to two retail places which sell building material and find exactly the same size, weight, shape, color, brand and everything, a good guess would be that the retailers bought from the same factory.

So it is when our stud dog and brood bitch have a good reserve of the same kind of building blocks (genes), the chances are, they got them from the same individual or individuals listed a little way back in the pedigree.

This simply points up the fact that we want to build our house (the puppy) of all one kind of brick (genes), we are going to have to select these bricks (genes) from the same supply houses (ancestors.)

This further means that if an individual close up in the pedigree of our brood bitch has few or none of the exact kind of bricks we want, to breed back to him would be a complete failure in what we are trying to do. But, it also means that if our bitch has a supply of what we want, and a grandsire or a first cousin, or an uncle, or a half-brother is heavily endowed with what we are looking for, to breed back to them is our source of supply.

(3) Cull Ruthlessly

a. Cull at Birth
b. Cull at 6 Weeks
c. Cull at 6 Months
d. Cull at 1 year
e. Final Culling at 2 years with Test Breeding