Tom's Genetics Page

Barless	Indigo	Dominant Opal	Recessive Opal	Reduced	Smokey	Dilute
Recessive Red	White	Sex-linked Matings	The Pattern Series	Epistasis	Auto-sexing	"Silver"
Pale	Almond	Crest	Wild Type	Brown	Neck frill	"Drizzle"

- (If color name is highlighted at the beginning of its description, click on it to see a picture.)

DISCLAIMER: In recent years much has been discovered by the professional geneticist regarding inheritance. We now must cope with terms such as "copy number variance", which refers to the number of copies of a specific gene on a chromosome, "epigenetics", which refers to changes that are due to causes other than simple gene mutation, and "co-dominance", which I would hope is self-explanatory. What follows below is a treatment of "classical" or Mendelian genetics as applied to the domestic pigeon.

BARLESS: Barless is an autosomal recessive gene. "Autosomal" means it's not on the sex chromosome, and "recessive" means the bird must possess two of these genes (one from each parent) for the characteristic to be visible. A barless blue pigeon looks like an ordinary blue bar or blue check, except it does not possess the black markings (bars or checks) on the wingshields. Here is a photo of a pair of barless consisting of a true silver cock and a brown hen. Barless ash red (homer men call it "barless silver") looks like an ordinary silver red bar, but without the red bars. Such birds are often confused with spread ash, which looks very similar to barless ash. They are completely different genetically, however. If you have what you think is a barless ash red, you can test to see if it is really genetically barless by mating it to a blue of any pattern. If you ever obtain any black youngsters out of such a pairing, you can be sure that your ash is actually the spread factor rather than barless. (Black is the same as "spread blue.") If you obtain only birds that look like the ash parent, you can also be sure it is not barless because barless is recessive and if barless is mated to a bird that is barred or

checkered and the latter does not carry the gene for barless, the young cannot be barless. Back to top of page

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INDIGO: Indigo is an autosomal dominant gene. Since it is dominant, any bird that carries it will show it and therefore it is very easy to follow. Indigo, in its heterozygous state, gives a blue pigeon a purplish hue and changes the bars or checks from black to a plum color. It also washes out the tail bar so instead of being black the tail bar is lighter than the rest of the tail. Indigo combined with black (blue plus the spread factor) yields the typical "Andalusian Blue" seen in many breeds. In the homozygous state, indigo on a blue base mimics ash red, and such a bird resembles an ash red with a slightly darker ground color. On a black base, homozygous indigo yields a bird with a near-white ground color and darker lacing. Indigo in combination with brown gives a bird that very closely resembles an ash red, but with richer wing markings and some tell-tale lacing on upper tail coverts. Indigo with ash red is virtually indistinguishable from ash red, although when combined with spread often gives a rich mahogany effect.
It has been noted by several fanciers and reported in the literature that indigo noticeably enriches the color of recessive red. Back to top of page

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DOMINANT OPAL: Dominant opal is an autosomal dominant gene. It is extremely variable in its expression, ranging from slight washing out of the bar and check pattern all the way to white bars and checks. At the same time the tail bar may be washed out or it may be nearly black. One way to identify dominant opal is by the light-colored shaft of the tail feathers. The most common expression of dominant opal is a light greyish-brown in place of the normal black bars or checkering. Another common effect is that the normal blue groundcolor lightens up to a steely gray. The white bar or white check effect is more likely to occur if the gene is in combination with indigo, although that combination does not always yield the same results.
Dominant opal in combination with ash-red is often indistinguishable from ordinary ash red. When combined with black the results range from a very attractively laced bird with silvery groundcolor, to an overall gun-metal gray, all the way to what has sometimes been described as "dark mud" which is a washed out black with some lightening effects near the base of the feathers. Back to top of page

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RECESSIVE OPAL: Recessive opal is another autosomal recessive gene. It causes the bars and checks, as well as the tail bar, on an otherwise blue pigeon to become much lighter. That lightening effect is extremely variable, and the wing markings can range anywhere from a medium grey rather than black, to a greyish-tan, to a "bronzy" black, to a pink or reddish hue. The last often mimics the color of ash red, including the absence of a tail bar. When this happens, some fanciers are led to believe that they have produced a red check out of a pair of blue checks, which is genetically impossible. In such a case the checkering on the wingshield is often edged in gray. If such a psuedo-red check (or pseudo-silver) is mated to a blue that does not carry the gene for recessive opal, all young will be blues. It is not uncommon for the inexperienced fancier to confuse recessive opal with dominant opal. Click here to see a photo of the extreme red phase of recessive opal. Click here to see two of his 2007 offspring, still in their juvenile plumage, and note how similar they lolk to "silver red bar" (ash red bar). Here is one of those same young birds as a 2-year-old. Back to top of page

SMOKEY: Smokey is the gene responsible for what most Racing Homer flyers call "slate". It is a simple autosomal recessive that is very common in homers. This gene causes the normal blue pigment to wash out to the point that the bird's ground color is a duller gray than the normal blue-gray of a blue bar or blue check. It also causes the pattern on the wingshield, as well as the tail bar, to be less well-defined. The gene got its name when someone commented that it looked as if the pigeon was being viewed through a thick layer of smoke. One of the tell-tale signs of smokey is that the albescent (white) strips along the outer edges of the two outer tail feathers are not there. Also, smokey pigeons will usually have a much lighter beak than that of an ordinary blue pigeon. Smokey in the presence of ash red is believed to be responsible for some of the "plum" colored reds seen in some lofts. The smokey gene is believed to be very common in the Janssen and Trenton strains of Racing Homers. It is also common in Russian Tumblers and several other breeds. Back to top of page

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REDUCED: Reduced is a sex-linked recessive gene. Since it is sex-linked, it need occur just once in hens (hens have only one "active" sex chromosome), but in cocks it must occur twice. Reduced causes blue pigeons to have a light, frosty ground color - often with a silvery crescent on the crop area - with pinkish-colored bars and checks. Reduced checkers are the most attractive. Reduced barless are the least attractive, because they have no bars or checks to show off the effects of this gene. Reduced ash red in either bar or check pattern gives the closest thing I have seen to a pink pigeon. Back to top of page

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DILUTE: Dilute is also a sex-linked recessive gene. It changes a blue pigeon to a "true" silver (as opposed to the silver of the racing homer, which is actually ash red bar), or as many US racing homer men call it, "dun bar" or "dun check". An ash red dilute is a yellow check or "cream" or yellow bar, and a brown dilute is a khaki, which in the bar and check patterns is often confused with dilute ash red. The former, however, will always show a dark tail bar while the latter will have a lighter tail bar or no tail bar at all. Back to top of page

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PALE: Pale is a sex-linked recessive gene that is allelic (at the same location on the chromosome) to dilute. The effect of pale is to lighten the overall color of the pigeon, with the effect being somewhat lighter than the intense color but not quite as light as the dilute. Pale is seen frequently in gold Modenas and the Gimpel (Archangel) breed. It has been moved to other breeds as well. Back to top of page

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RECESSIVE RED AND RECESSIVE YELLOW: Recessive red is an autosomal recessive gene which masks the underlying basic color (blue-black, ash-red, or brown) and pattern. It causes the pigeon to take on a fairly uniform rust or red-brown coloration. Ideal recessive red coloration is uniform throughout, with the flight feathers and tail the same shade as the rest of the bird. (A good example is the red Carneau or the red schietti Modena.) However, such ideal coloration requires some additional modifying genes, not all of which have been positively identified. It is claimed by many fanciers that indigo quite noticeably improves the color, and the spread factor does likewise. (The best colored recessive red Racing Homer I ever owned was also spread and indigo.) Many recessive reds possess a smuttiness that dulls the color, and the tail is more brown than red. This is particularly true in recessive red Racing Homers,

where the emphasis is on performance rather than on color. Recessive yellow is the combination of the recessive red gene with the gene for dilution, which is also recessive (see above). Recessive yellows are not really yellow, but more of a rich tan similar to the "buff" found in chickens. Many recessive reds and yellows, particularly among Racing Homers, exhibit a white mottling or "splash" effect on the wingshields and head, and the cause of such mottling has not been firmly established.Click here to access an article I wrote concerning the inheritance of the mottling effect seen in many recessive red homers. Back to top of page

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WHITE: White is a complicated subject for the simple reason that a white pigeon may be the result of several genetic factors. For example, homozygous grizzle causes a blue pigeon to be stork-marked (white body with some coloring on the flights and tail feathers), but a homozygous grizzle ash red is almost pure white, with perhaps a few very light red feathers visible upon close inspection. Such whites can usually be distinguished from other genetic combinations because they will have orange eyes rather than the "bull" eyes of many whites. Other whites are the result of one or more of the genes that cause a bird to be pied, and the particulars of some of these genes have not yet been worked out. Examples would be the saddle, whiteside, baldhead, Lahore, and other patterns.

It has been established, however, that many whites are the result of a specific gene for "recessive white". Such a gene has been identified in the various "homer" breeds: Racing Homers, American Giant Homers, German Beauty Homers, Dragoons, etc. Recessive white is believed by some to be at the same locus as the gene for the gazzi pattern, which has been shown to be a simple recessive, and recessive white is epistatic (see "epistasis" below) to all other colors and patterns, a possible exception being recessive red. (I am unaware of any research concerning the combination of those two genes.) The action of recessive white is identical to that of recessive red in that if a pair of recessive whites are mated together, all young are recessive white. If a recessive white is mated to a self-colored bird that does not carry the recessive white gene, all young are colored. If two colored birds carrying the recessive white gene are mated, the offspsring exhibit the classic 1:2:1 Mendelian ratio, which is: 1 white, 2 colored birds carrying white, and 1 colored bird that does not carry white. Most, if not all, recessive whites have dark or "bull" eyes. Back to top of page

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"SEX-LINKED" MATINGS: A sex-linked mating is a mating of two pigeons whose sex-linked color characteristics (dilution, reduced, almond, faded, Quinn-mutant, along with the three "basic" colors of blue-black, brown, and ash-red) are such that the gene for the hen's particular sex-linked characteristic is dominant to the cock's corresponding gene for that characteristic. When this happens, all youngsters having the mother's color will be cocks and all young having the sire's color will be hens. In other words, in a sex-linked mating the young are just the opposite color of the parents. The reason for this is that the cock has two active sex chromosomes (one from each parent) and the hen has only one that is active. She receives her sex chromosome from her sire only; hence her color must be inherited strictly from him. Since the young cock receives one chromosome from each parent, and since in a sex-linked mating the mother's color is the dominant one, the son must appear the color of his mother. (He will carry the sire's color on the other chromosome and is capable of passing it on to later generations.) Examples of sex-linked matings in which the young have just the opposite colors of their parents include, but are not limited to: Blue cock x ash-red hen; Brown cock x ash-red or blue hen; Non-almond cock x almond hen; dilute cock (dun, yellow, "true" silver or silver-dun-bar, cream, etc.) x intense (blue-black, ash-red, brown) hen. Indigo, dominant and recessive opal, toy stencil, etc. are not sex-linked characteristics and therefore these

principles don't apply to them.Click here for a more detailed discussion of sex linkage. Back to top of page

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THE PATTERN SERIES: The pattern series consists of T-pattern (sometimes called "velvet"), checker, bar, and barless, in descending order of dominance. That is, anything later in this list is recessive to anything listed ahead of it. Pattern is an autosomal characteristic and therefore is controlled by 2 genes, one from each parent. A bird that appears to be a T-pattern can carry any of the four pattern genes (T-pattern, checker, bar or barless) on the second chromosome but it appears T-pattern because T-pattern is dominant to all the rest. A bird that is checker can carry checker, bar or barless on the other chromosome, but it appears checker because checker is dominant to bar and barless. It cannot carry T-pattern because if it did it would appear T-pattern rather than checker. Likewise a bar can carry bar or barless on the other chromosome, but it cannot carry T-pattern or checker because if it did it would not be a bar; it would be T-pattern or checker, due to the dominance of the latter. A barless must be barless on both chromosomes because the gene for barless is recessive to all the other pattern genes.

If a bird has the same pattern gene on both chromosomes we say the bird is "homozygous" for that pattern. If a bird is homozygous for a given pattern and is mated to a bird of another pattern that is recessive to it, all the young will have the same pattern as the dominant parent, but will carry the gene for the pattern of the recessive parent. Such youngsters are said to be "heterozgous" for each pattern. If two heterozygotes are mated together we get the classical 1:2:1 Mendelian pattern, which means 25% of those young will be homozygous for the dominant gene, 50% heterozygous, and 25% homozygous for the recessive gene. In appearance they will be 3:1, since only the one that is homozygous for the recessive gene will show it.

Caution! The gene for spread, which makes a blue pigeon black, is NOT part of the pattern series. Back to top of page

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EPISTASIS: Sometimes you hear a statement such as "Recessive red is epistatic to all other colors and to the pattern series." This simply means that recessive red covers or hides all other colors or patterns. For example, a recessive red may be genetically a bar or a checker, but one cannot tell by looking at the bird because the pattern is hidden by the recessive red gene. Recessive red also hides ("is epistatic to") the underlying sex-linked color of blue-black, ash-red, or brown. The spread factor is epistatic to the pattern on an otherwise blue pigeon, making it appear solid black. The combination of both recessive red and spread often makes for a much richer and more even shade of red. Back to top of page

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"SILVER": I have placed the word "Silver" in quotes because within the pigeon fancy it has two separate meanings.

To a geneticist and to breeders of most fancy breeds, it means the same as dilute blue bar. This is an ordinary "wild type" blue bar pigeon with the single recessive sex-linked gene for dilute (homozygous, or two copies of the gene, in cocks; one copy of the gene in hens). Such a bird has a light silvery ground color with bars that are almost black. Racing Homer breeders often refer to this as a "dun bar" or "silver dun bar". (See notes on "dilute", above.) Sometimes a brown bar is called silver, but the bars of a brown are more chocolate colored.

Also, a brown will fade considerably with continued exposure to sunlight, and usually will have "false pearl" or pinkish tinted eyes. A true silver (dilute blue) will fade with heavy exposure to sunlight, but not nearly as much as a brown.

The term "silver", when used by Racing Homer breeders in the United States, or breeders of many of the show strains of the Racing Homer or the American Show Racer, means the same as "silver red bar", which is simply an ash red bar pigeon with clear ash wingshields and often with a "frosty" or silvery sheen to the feathers on the neck. Note that in this case we are dealing with a sex-linked dominant. If such a bird shows any smuttiness or dirtiness in the wingshield area, it is usually referred to as a "mealy". Back to top of page

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ALMOND: "Classical" almond coloration is the color combination most often seen in the English Shortface Tumbler: golden ground color with haphazard flecking of black and lighter grey throughout. The color got its name from the fact that the ground color is supposed to be the same color as that of the inside of the shell of the almond nut. Unfortunately that classical color is actually the result of several genes: the almond gene plus T-pattern, kite bronze, and recessive red. The almond gene alone, which is sex-linked, simply is a "lightening" gene that cancels the effects of most pigments, making an otherwise blue pigeon look like a dirty white with a few dark flecks. Such birds are often mistaken for homozygous grizzle or some other mutation. For a much more thorough treatment of the almond complex, see the link to Frank Mosca's website below. Back to top of page

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CREST: Crest is another autosomal recessive gene that causes the feathers on the back of the head to be reversed. One gene appears to be responsible for the reversal of feathers, while additional "modifier" genes determine whether the reversal appears as a "peak" crest as in Oriental Frills and Archangels, or a "shell" crest as seen in Helmets, Nuns and English Trumpeters. UPDATE: Recent studies would indicate that there may be more than one gene for crest, and that peak and shell crest may not be the same gene, so the reference to "modifier" genes above may be an oversimplification. For the beginning fancier, however, it will suffice to think of crest as a recessive gene. Back to top of page

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WILD TYPE: The phrase "wild type", when used in genetics, simply means the total gene package of an individual which has no mutations. It is a reference point from which geneticists work. In the case of the pigeon, it represents a blue bar bird of normal size, with clean legs, no crest or frill, orange eyes, etc. In other words, it represents a bird resembling the "wild type" rock dove, columba livia. "Wild type" in reference to the pattern series means barred; "wild type" in reference to foot feathering means clean legged; "wild type" in reference to basic color means blue; etc. In discussing "wild type", many pigeon geneticists envision a blue bar racing homer, although the racing homer is admittedly not "wild type" when the homing instinct is considered. Back to top of page

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Neck Frill: Neck frill (sometime called "cravat" or "zipper") is a simple autosomal recessive. It is a staple of certain owl breeds, as well as the Oriental Frill and the Turbit. Back to top of page

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BROWN: Brown is a sex-linked recessive, which causes the black areas on a "wild type" pigeon to become a chocolate brown. It is often confused with the dilute of blue, or what many refer to as "silver dun bar" or "true silver". However, brown is intense, and brown youngsters will have normal down when in the nest, unlike the short down of a true silver. The dilute of brown is Khaki. Khaki is often confused with cream, or ash yellow, which is the dilute of ash red. Cream, however, does not show a tail bar, and khaki always does. Both brown and khaki are extremely susceptible to bleaching by sunlight, whereas true silver and cream may show some bleaching but nothing near the effect on brown. (See notes above, under "dilute" and "silver".) Back to top of page

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DRIZZLE: Drizzle is apparently an autosomal dominant discovered in the early 2000's by the late Larry Long of Iowa. It causes a blue pigeon to be more grayish than ordinary and the bars and checks are more charcoal gray than the black of a normal blue. A spread blue is more of a solid charcoal than a black as well. Drizzle on ash red washes out the red pigment extensively. The trait showed up again in 2007 in the loft of Tom Barnhart of Ohio. Upon checking pedigrees, it was found that the Barnhart source as well as the original bird discovered by Larry Long both traced back to the same source loft of Pete Hogan in Buffalo, NY. Long gave the trait the name "drizzle" because he thought it looked as if the bird was being viewed through a drizzle or mist. James Gratz is currently (2010) doing breeding tests on this gene to see if there is any significant difference in the phenotypes of the heterozygous and homozygous forms. Back to top of page

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Link to Texan Pioneer and a short note on autosexing
Link to Kevin Stalder's tribute to Dr. Williard F. Hollander
List of genetics symbols at Bob Mangile's genetics site
Link to Frank Mosca's genetics site
Link to Ron Huntley's rare color site

http://www.barnhartlofts.com/genetics.htm