The Pigeon Genetics Newsletter

Founded by Dr. Willard. F. Hollander

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Edited by Ash Hammett

Hello everyone!

I hope everybody is doing well.

So this month's newsletter is once again mostly full of stuff that I am personally curious about and the reiteration of basic stuff regarding how mutations *actually function* and the *results* of those functions we see expressed in the anatomy and plumage of domestic pigeons.

I'd like to thank Layne Gardner and Gary Young for their contributions to the newsletter this month.

-Ash Hammett

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The Arabian Trumpeter

by Gary Young

The Arabian Trumpeter is known for its unusual "drumming" voice. Both cocks and hens produce this unique sound. Sex is best determined in Arabian Trumpeters as it is in other breeds of pigeons, by the bowing and strutting that the cocks perform during courtship, along with spreading and dragging his tail toward the hen. Sex cannot be identified by drumming alone, as the hens will often drum as well as cocks.

My own breeding tests indicate that drumming is an autosomal recessive trait.

In outcrossing Arabian Trumpeters with other breeds, the offspring do not drum at all and back-crossing is required to get the drumming voice back.

Arabian Trumpeter pigeons are often confused with Laugher pigeons (also called Kumru or Kwock Knock). But the Laugher voice sounds like a plastic squeeze toy, accompanied by a type of warbling that can be considered laughing. The Arabian Trumpeter on the other hand makes a drumming sound similar to a gasoline lawn mower trying to start up. The two voices are very different. It is important to understand that Arabian Trumpeters are not Laughers and Laughers are not Arabian Trumpeters. They are two distinct breeds and should never be crossed together if voice quality is to be maintained.

An additional key identifier of Arabian Trumpeters, besides their unique voice, are their dark eyes. Black or "bull" eyes in most pigeon breeds are caused by the color pigment of the iris being switched off by white feathers. However in Arabian Trumpeters, the genetic mechanism is different. It is another form of dark eye that results from a mutation known as ***Dunkles Auge***, which is German for "dark eye" and given the symbol of (da). This recessive autosomal mutation is epistatic to other eye colors. In other words even though a bird is genetically orange or pearl eyed, its true genetic eye color is masked by the ***da*** gene in the homozygous condition (da//da) and we see a very dark eye similar to a bull eye. The Dark Eye gene is not very common outside of the Arabian Trumpeter breed but it can be bred for if one has a bird that carries the mutation.

Arabian Trumpeter Photo by Gary Young

It was assumed these "yellow" embers were dilutes. Breeding tests indicate they are actually Brown. This is a good example of how the base color affects the expression of a mutation.

Another pigeon breed with a similar drumming voice to Arabian Trumpeters is the Altenburg Trumpeter. However, Altenburgs do not have dark eyes. The two breeds are sometimes bred together to refresh the gene pool, but the first cross offspring are heterozygous for Dunkles Auge (+//da) and do not have dark eyes. These F1 offspring are excellent drummers but have orange or pearl eyes so they must be mated back to purebred Arabian Trumpeters in order to retrieve the dark eyes.

A common feather color factor in Arabian Trumpeters is "Ember". **Ember (e^E)** is an allele to recessive red and similar in color while in juvenile plumage, however the body feathers turn blue (or whatever of the three base colors would otherwise be expressed) during the adult molt leaving a reddish neck and sometimes ember flights and bar or check pattern.

Dirty or smoky factors will darken the body color, resulting in a less dramatic change from red to the base color.

Juvenile Smoky Ember Arabian Trumpeters. Note the pattern showing on the shields and tail as well as the blue base color showing through the bird on the right.

Also, you can see there is no albescent stripe on either bird's outer tail feathers, the hallmark of "smoky".

Juvenile Smoky Blue based Ember Arabian Trumpeter. Note the tail bar.

Photos from Gary Young

From Layne Gardner:

"Here are a few photos of milky Old Dutch Capuchines I shot in Germany. It just popped up out of some regular show stock and for many of the fanciers is considered undesirable. The milky colorations in Capuchines have taken off in Poland and there are a number of breeders working with it.

I have not tested these milkies and am assuming that it is the same as milky found in other breeds, but if I remember correctly, Axel Sell tested a milky look-a-like that was a differing gene. I don't recall if it was an allele to milky. Milky also cropped up in Old Dutch Capuchines in the U.K. years ago. David Darbyshire reported that he had milky in his ODC stud without outcrossing. It is still present in good numbers."

Normal Blue Barred Capuchine

Milky barred Old Dutch Capuchines
photos by Layne Gardner

Eumelanin and Phaeomelanin

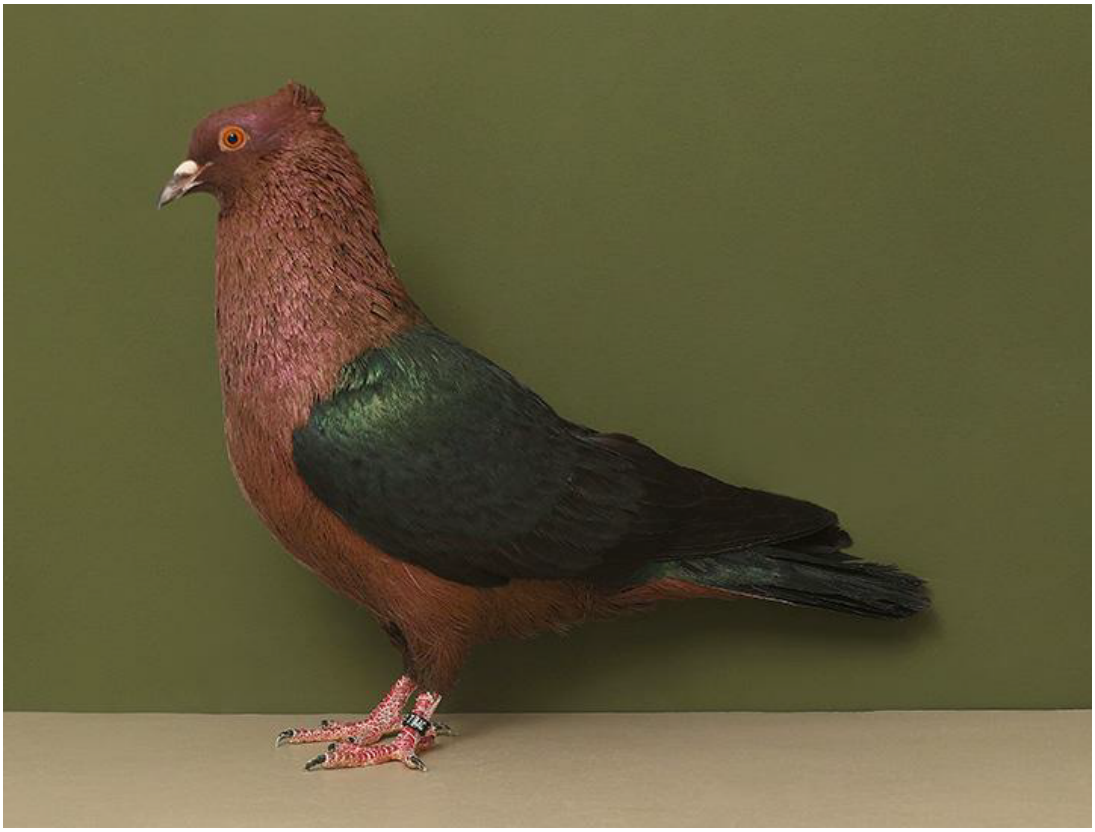
In a bird's plumage, ***pigments*** and ***structures*** are the two factors that create "color".

Pigments create color as a result of chemical molecules that ***absorb*** specific wavelengths of light. Domestic pigeons are capable of producing ***Eumelanin (black pigment)*** and ***Phaeomelanin ("red" pigment)*** in their plumage.

Melanin not only acts as an absorbing material of broadband visible light wavelengths for coloration, in addition, melanin granules also produce iridescent ***structural*** colors when they are arranged with high crystallinity. Highly "crystalline" melanosomes produce constructively scattered light. The wavelengths depend on structural parameters of melanosome arrangements.

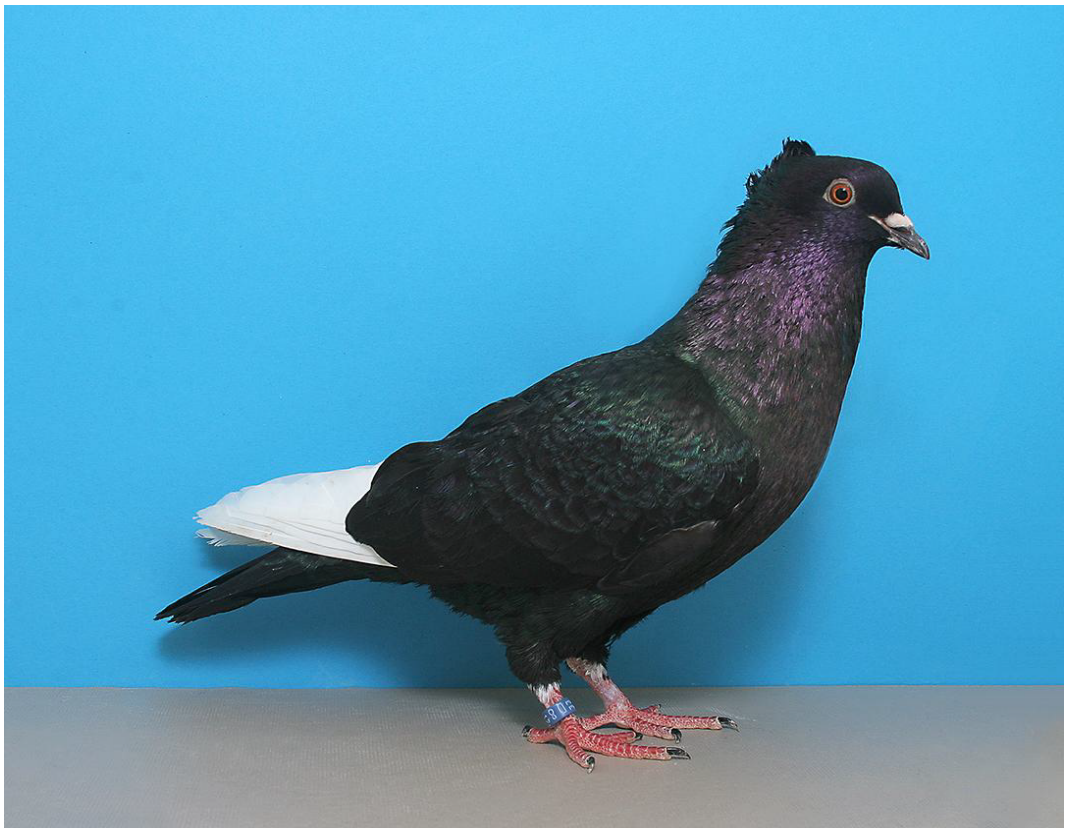
Unlike pigment-based "colors", **structure** creates color by ***reflecting*** light of certain wavelengths from ***nanostructures*** resulting from the shape and arrangement of pigment rods and platelets in the barbules that make up the feathers. This structure is what causes **iridescence** in the plumage. It is not a "pigment".

The striking, highly saturated blue t-pattern phenotype of Gimpel Bronze that Archangels are famous for is a good example of the two melanins at full expression and the nanostructures that create iridescence.



Intense blue, t-pattern, gimpel bronze Archangel ***photo by Layne Gardner***

Intense blue, barless, gimpel bronze Archangel ***photo by Layne Gardner***



Glanztaube ***photo by Layne Gardner***

The "black Gimpel" is a Glanztaube (iridescent or shiny pigeon) from Germany. It's a bit heavier bodied than a Gimpel and is recognized as a separate breed.

Color modifiers ***block*** the production of pigments to various degrees, and in different ways. Color modifying mutations can produce similar effects even though they are not chromosomally related. With the exception of Recessive Red and Recessive White, the ***base color*** (Blue, Ash red, or Brown) is almost always the defining factor of how a mutation is expressed in the plumage.

The only way to accurately test a single genetic mutation's properties and function accurately is to test-mate it to the ***wild-type*** genotype.

Pattern modifiers dictate ***pattern.*** All domestic pigeons carry two pattern genes, regardless of whether those genes are visibly expressed. The hierarchy of pattern dominance is one of the few factors that turns out to be self evident. T-pattern is the dominant pattern, then check, then barred, with barless always recessive to all patterns. These genes are located at the same ***chromosomal locus.*** No pigeon can carry more than two pattern genes. If two different genes are present, the dominant gene is the one expressed in the phenotype.

Spread is not related to pattern. Spread functions ***independently*** of the pattern gene.

The challenge with some of the phenotypes we discuss is that our only resevoir for the ***single mutant gene*** resides in breeds that contain multiple mutant color ***modifiers*** and it can be very tough to disassemble the genotype and extract the single mutation we want to study.

When numerous color mutations are expressed in combination with each other on the same pigeon, they create all kinds of effects to the plumage because of the interactions of various pigment blocking mechanisms. It becomes difficult to figure out which mutation is doing what.

Many "color" ***phenotypes*** are actually the result of several gene mutations, not just a single mutation, and many phenotypes appeared and were selectively bred long before keepers knew what a "gene" even was, much less a "mutation". And of course the traditional names given to these "colors" muddies the waters even more.

Throw in the pied designs and grizzles, and it gets even murkier.

Worst of all, the same genetic mutation will be named one thing in one breed, and called something else in another breed, even though it's the same genetic mutation or group of mutants.

Argent Modena ***Photo by Layne Gardner***

So in reviewing our Mutations Index, I noticed a mutation listed for "Mahogany"? Aka "Modena Bronze"? In following up my own curiosity, I dug around a bit and learned that Quinn listed eight "bronzes". He considered Mahogany and Modena Bronze being the same. Hollander called the factor ***Mahogany*** in 1983. Gibson believed that this bronze was indeed part of the Toy Stencil Complex of three separate genes. More expressions beyond what Quinn had listed have been discussed. Cryberg claimed it took three seperate genes to create this phenotype. Axel Sell's book refers to a "Stencil Bronze"?

So what is the deal?

The Cauchois below are beautiful examples of the Toy Stencil and Mahogany "Stencil Bronze" phenotypes found in many old European breeds, including Modenas. I'm still skeptical about this "Mahogany" single mutant. I'd like to hear from anybody who has experience with breeding this group of mutations.

Toy Stencil

Toy Stencil

Intense "mahogany". Look closely at the primary flights.

Dilute "mahogany".

Cauchois photos courtesy of Layne Gardner.

The Mutants Index:

Since the last newsletter, I have continued to review our "Index of Mutations".
I'm currently studying Axel Sell's materials as a reference tool to use in some revisions.

Any insight, fact-checking, corrections, and adjustments that the group points out to me are much appreciated and actively encouraged. Please feel free to send me comments that might help us create a more accurate and comprehensive index.

In researching, I have come across a number of "named" mutants, symbols and all, that I personally am a bit skeptical of their validity. I have not included those as of yet.

In a few cases, I have discovered differing symbols for what seems to be the same mutation.

This is confusing, and typical of the many discrepencies in our hobby.

Also, traditional names used in different breeds that are in fact the same genetic mutation(s) is very misleading.

We should be using the same description for any genetically confirmed color phenotype regardless of what breed it appears on.

There should be ***one universal symbol*** for a confirmed mutation. Of those mutants of which I've discovered more than one symbol for, I've either just picked one and used that symbol based on the credibilty of the source, or left that "mutant" out of the index altogether, because I am wary of the mutation's validity and I intend to look into the matter.

Also, what about the enlarged crops and "blowing" in Pouters and Croppers?
No mutant(s) listed?
What are we missing there? Anything?
All doves and pigeons are capable of inflating their crops. Is the extreme trait in the Cropper breeds just selection, or is it a mutation in itself?

What about really long legs such as those seen in English and Pygmy Pouters?
Selection or Mutation?

What about the extreme feather length in Jacobins and Old German Croppers?
No mutant(s) listed.

We don't even have a mutant gene or genes listed for multiple tail feathers? The fantails are one of the oldest breeds to exist, and nothing in our list mentions that trait? Fantails can have up to 40 tail feathers. The Utah study claims "a small number" of mutations are responsible for the trait. But there is not even ***one*** mutant listed in our index in connection to why Standard and Indian Fantails exhibit such an extreme physical trait?

Definitely a couple of mutations missing from our list in that regard.

I will continue to research and update the index and keep revising the information there, so please make me aware of stuff I've overlooked.

The Spiral Notebook

ac - achondroplasia (lethal)
al - albino
am - amputated
at - ataxic
b - brown
B^A - ash-red
Bh - baldhead pied
c - barless
C^L - light checker
C - checker
C^D - dark checker
C^T - T-patterm
ca - cataract
cl - clumsy
cr - crest
cy - crazy
d - dilute
d^{ex} - extreme dilute
d^p - pale
da - Dunkles Auge (dark eyes)
dr - drumming
Drz - drizzle
ds - Davis syndrome
dsc - deutsch scraggly
e - recessive red
e^E - ember
er - erratic
F - frayed
fb - feed-blind (lining blindness)

breed (definition): animals ***within a species*** having a distinctive appearance or behavior developed by deliberate (***artificial***) selection.

fg - fringe
fr - frillneck
fs - Frill stencil
fz - frizzy
G - grizzle
G^T - tiger-grizzle
G^W - white grizzle
Gp - gimpel pattern ---------->
gr - grouse
H - hosen or grouse legged
ic - ice
In - indigo
K - kite bronze
Ku - short beak
L - silky
ma - mahogany
mi - microphthalmia
my - milky
Nn - Naked neck
na - Naked
n - no oil gland
ofr - Chinese Owl frill
o - recessive opal
o^{ch} - cherry
Od - dominant opal (99.9% lethal as homozygote)
p - porcupine
pd - pink-eyed-dilute
py - polydactyly
ro - rolling, tumbling
r - reduced
r^{Ru} - rubella

Gimpel - or Archangelbronze 1 (Quinn's Kite Archangel)

Ka1 - dominant
Bronze or copper mainly restricted to the body, usually the expression of copper on the head is minimal or nil.

Gimpel - or Archangelbronze 2

ka2 - recessive
Spreading of copper or bronze over the head

Testing seems to confirm Sell's two gene combination of Archangel quality Gimpel Bronze.
So why keep the "Gp" symbol for Gimpel Pattern at all?

ros - rose, beak crest
S - spread
Sb - sideburns
sc - scraggly
skpy - Show-King polydactyly
sl - slipper
so - sooty
St - stipple ---------->
St^{F} - faded
St^{Q} - qualmond
St^{Sa} - sandy
St^{H} - hickory
St^{f} - frosty
sm - smoky
t - extra outer toes
t^{H} - Hasz' lethal
tr - pearl iris
Ts - Toy stencil ---------->
U^{G} - under grizzle
V - dirty
w - outer-toe web
Wr - warbling
wo - wobbly
wl - web-lethal
z^{wh} - recessive white
z - gazzi
z^{Pc} - penciled

Stipple is the proper name given to the prime mutant at the locus where this group of mutations occurs.
The ***St*** locus resides on the sex (Z) chromosome(s).

Any of the alelles are properly generalized as "Stippers". Any combination of **Stipple** with any other mutation(s) can be properly considered as a "Stipper", including Almond.

Toy Stencil
(Toy Stencil complex) Ts partial dominant
Responsible for white pattern.
Probably the result
of three traits acting together **(Ts1, Ts2, ts3)**
-Axel Sell

So, it's pretty clear that Sell is correct about this, too. So why is there only one mutation on this list for "Toy Stencil"?