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Histone Spools change your chickens!

NEW MOTTLED ALLELE

Hind wings

SULMTALERS, FAVEROLLES and the 'CONDITION'

RED WHEATEN

POULTRY BOOKS

• BY SIGRID VAN DORT •

State of the Art poultry books written by a breeder, illustrated (photos and drawings) by her friends and herself. These books contain knowledge you find nowhere else. Books stay, online info vaporises. You want a solid base of knowledge to avoid disappointments? These books are based on research, like the articles in this Chickencolours e-zine.
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Histone Spools change your chickens!

Text: Sigrid van Dort, April 8 2015- REV. 2018

Classic epigenetic inheritance, DNA methylation:
This picture shows a DNA molecule which is methylised on two locations. DNA methylation plays and important role in epigenetic gene expression (e.g. in the development of cancer). Picture: Christoph Bock, Max Planck Institute for Informatics.

A lot of expressions can be traced back to sex hormones, think of the darker pencilling/pattern on the saddle/cushion of hens compared to the pattern on a rooster of the same colour.
Or when she is laying during moult by which her pattern becomes less distinct and even blurred and smutty. Or a parasite infestation which affects feather structure and therefore colour depth and distinction.
Or stress, causing the chicken to drop behind in growth and volume, or an IB infection or vaccination of the hen by which she can not deposit enough nutrients in the breeding egg or the shell doesn't function very well anymore by which exchange of gasses is not optimal and the chick will lack things causing it will never be as strong as other chicks from the same parents, although it looks the same and well.
There are a lot of influences from the environment (in contrast to inherited ones), which have influence on phenotype and the way the chicken thrives, even in the smallest details.

A lot of external influences are no surprise to us, this becomes less when we think we can control them all and even more less when it is about the processes which take place inside the chicken with all visible consequences.
Not only the way the chicken looks but also behaviour and health condition of the birds. To make the breeding process even more confusing to breeders and less controllable, here a few research results with regard to inheritance and the components which have influence on phenotype and functioning of chickens.

It is known for some considerable time, inheritance is not only a DNA thing. We can try as much as we can to find the right genes, there will always be variations in phenotype even if genotype pure and identical to the other birds.

What causes the difference between two duckwing (e+) sisters from the same parents? One has a red breast according to the standard description and on the other red is expanded till over the shoulders and in the cape. How is this possible? It is called gene expression. For instance autosomal red can be enhanced and it will expand, or it can be inhibited and express way less, in both shade and place on the bird.

Although breeding is difficult enough, in this article is shown you just can not control everything, or can you? By giving the animals an even better life to bring out the best in them?

Another particle which joins the genetics party!

Traits are not only inherited to the next generation via DNA, this can happen also in another way, by stuff which is in cells. Researchers from the University of Edinburgh (Scotland, yes the ones from the half hen half rooster Sam and sheep Dolly) recently discovered (last year, this year published) that packaging cells (histones) which function as spools around which DNA strands are wrapped, ánd which are nót part of the genetic code can miraculously control genes switching on and off.

The fact histones play a role whether or not genetical information will be passed on to the next generation was found previously by researchers of the Max Planck Institute for Biophysical Chemistry in Göttingen (Germany) in 2010. They developed an experimental system to test these chemical changes on fruit flies.

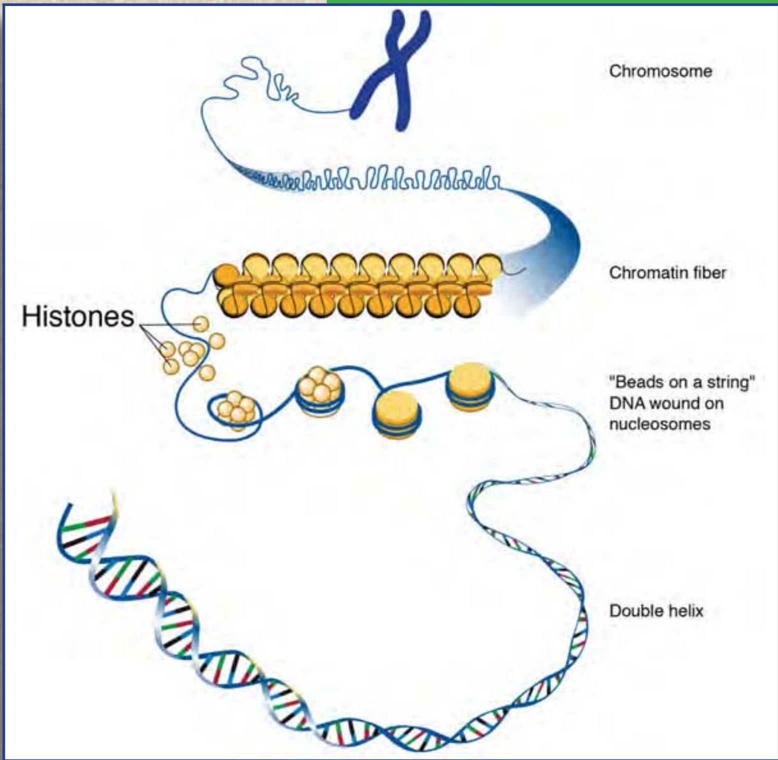
The Scottish researchers found naturally occurring changes in the histone proteins and how they controlled genes in a way it can be passed on to the next generation and therefore (also) determine hów these traits are passed on.

The word that might pop up to you is ‘epigenetics’ when your read about acquired traits bypass DNA, and its mentioned in my 2nd genetics book Genetics of Chicken Extremes, written 2010-2011. At that time epigenetics was already a hot item. Switching genes on and off is called gene methylation, or in our language gene expression.

“We have shown without doubt that changes in the histone spools that make up chromosomes can be copied and passed through generations. Our finding settles the idea that inherited traits can be epigenetic, meaning that they are not solely down to changes in a gene’s DNA”, says Prof. Robin Allshire, School of Biological Sciences.

This is the first time that actually is demonstrated DNA is not solely responsible for inherited traits. This conclusion paves the road to research on how and when this way of inheritance occurs but also if it is linked to certain traits or for instance a health condition. Also research on how and if changes in histone proteins are caused by environmental influences like stress or diet and which influence they have on genes which are passed on to future generations. Well, that’s quite a lot especially because genes which are switched on and off are associated with cancer.

For some time researchers suspect that genes are influenced by other mechanism(s) next to only DNA in successive generations. However, it should be determined whether this is a natural occurring common process or not. The new theory is tested on yeast which has a similar gene control mechanism as human cells.
Scottish researchers made changes in histone protein, mimicking a natural situation, the result was that the histone protein switched off nearby genes.



Histone proteins a new variant of epigenetic inheritance:
An histone protein gives structure and support to the chromosome. To stuff a very long strand of DNA into a cell nucleus, the strand is wrapped about histone proteins, resulting in the compact shape of a chromosome.
Some sorts of histones are associated with the regulation of gene expression.
Illustration: Darryl Leja, NHGRI

What preceded...

How can you put a two meter long DNA strand into a cell nucleus? Answer: wind it to a ball. DNA is winded around proteins which are called histones. The result is DNA will be 50.000x shorter. What happens next is that other proteins gather around the chromatin (= DNA and proteins in cell nucleus) and finally this mess becomes a chromosome. These are the product of an ingenious packaging trick. The five types of histones (H1, H2A, H2B, H3 and H4) have more tasks which make them so interesting. Histones have small chemical attachments on varying places, like acetyl, methyl and phosphate groups.

These cause the chromatin to open so the information can be read. Conversely, are some areas on the DNA molecule deactivated or in another way made unreadable by changers (modifications) like binding of proteins. This is called 'gene silencing', the gene is unable to communicate. The changes in histones can intervene in controlling gene activities resulting in something is added or inhibited (function or non-function) to the genetic code of DNA.

Every time a cell divides itself, this modified pattern of the histones is inherited by the daughter cells. Researchers assume this epigenetic inheritance is controlled by a cell-specific or organ-specific 'histone code'. This code determines whether the cell machinery has access to by DNA coded genes or the access is denied.

Previous research in Germany

German researches wanted to break the histone code in 2010, which was done by the Scottish recently. There are hundreds of gene copies necessary for the production of histones, which are stored in the genome of higher organisms.

Till 2010 it seemed impossible to switch off these gene copies and to replace them by genetically modified histone variants.

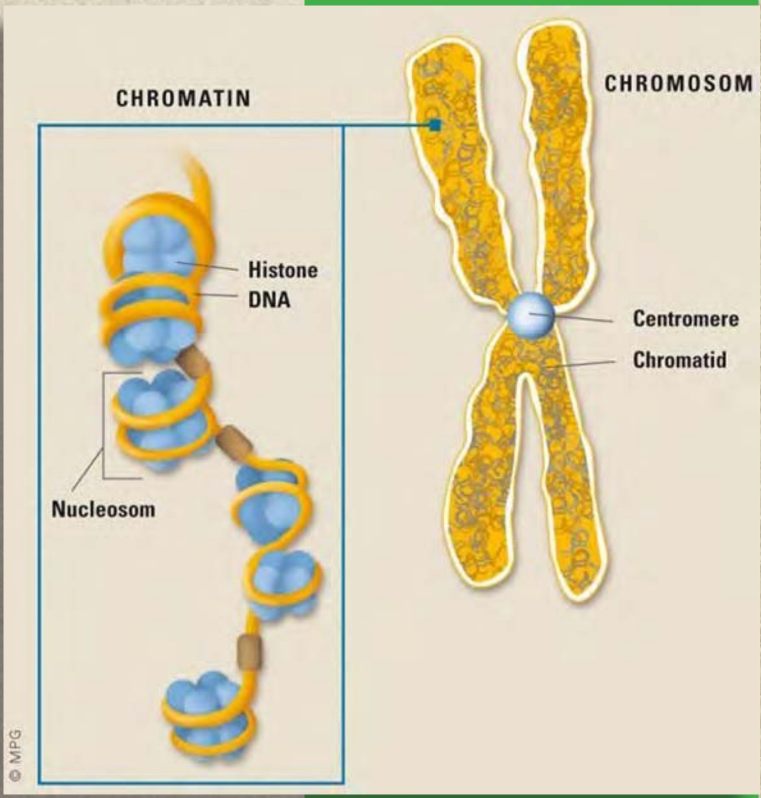
The researchers could only make a test system to do this: when these genetically modified histone variants miss a docking station (where chemicals can bind), certain changes in these histones can't take place and this can be investigated regarding the consequences, for example if defects in the organism occur. Put differently: sabotage the histones and see what goes awry (walks into the soup, dutch said).

Researchers from Max Planck succeeded in 2010 to jeopardize a fruit fly. They developed a method to research all histone modifications. The cell biologists removed all histone genes from the genome of a fruit fly. The result: cells were unable to divide while all DNA was present and already copied.

Business as usual in normal cell division, the genome is doubled by DNA synthesis but the cell won't develop further and the organism dies. The situation normalises progressively when the amount of copies of the four histone genes increases.

"Fruit flies with twelve copies of a histone gene cluster managed to survive and were also capable to reproduce", explained a German researcher at that time.

Restricted epigenetic inheritance of H3K9 Methylation, Science, 2015 DOI: 10.1126/science.1260638



Condensation from DNA happens by the restructuring of the two meter long strand of DNA till its a chromosome with a diameter of 1.5 micrometer. DNA is wrapped around proteins which are called histones.
Illustration: Max Planck Society

A genetic system to assess in vivo the functions of histones and histone modifications in higher eukaryotes. EMBO reports, 2010; 11 (10): 772 DOI: 10.1038/embor.2010.124

It was known already multicellular organisms need an amount of copies from histone genes, in order to survive. However, the results of the German scientists also indicated that the cell realises histones are missing during cell division and therefore the cell stopped although DNA was already duplicated, as is usual in cell division processes.

It is obvious and clear there is communication going on between the histone production process and the cell division machinery. The German test system on fruit flies in 2010 was the onset to break the histone code, which the Scottish scientists managed to do in yeast cells end 2014.

Anyway, you as breeder, will never have total control of how your chickens look like or act. Maybe this story helps a bit if you're a control freak and you learn it is not you who determines alone how your chooks are doing and these histone thingies have something to say as well, just to mention something...

Japanese scientists find

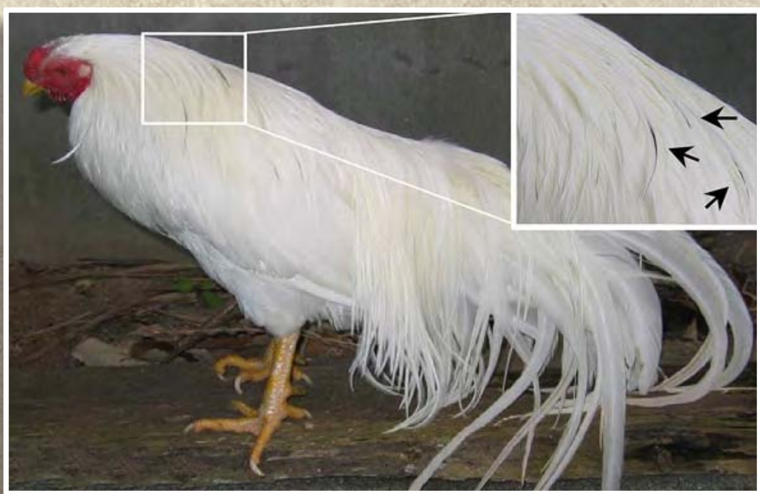
NEW MOTTLED ALLELE

Text: Sigrid van Dort
March 2014 - REV 2018

Mottled and hysterical mottled are known, just like exchequer, which these are not.

A new white with leakage: Minohiki-white or...

In Minohiki there is found a white mutation which looks the same as white we know with the exception of some leakage (see photo). This Minohiki-white inherits autosomal (on both sexes the same) recessive, same as recessive white. There is something going on with this Minohiki-white which became clear when it was crossed to mottled (mo/mo). All chicks from the cross Minohiki x mottled (black) Pekin/Cochin bantam were... mottled! What does that mean? That Minohiki-white is an allele of mottled, which gives a white chicken with some leakage when pure. Mottled is recessive and hardly visible in impure birds (mo/Mo+), only chick down and sometimes also youth feathers will tell (white feather tips which moult away). Some breeds show impure mottled, like Serama which have a few white feathers on the head, white thumb feathers and an occasional mottle on the abdomen and secondaries. Homozygous a Minohiki-white is white, crossed to mottled it gives hysterical mottled as we know from Serama and some Pekins (Calico, hysterical mottled mille fleur).



It is surprising how much there is still found in chicken colours.
Above F1 birds (mottled black Pekin x white Minohiki) show similarities with hysterical mottled as I call this pattern.
Carefoot wrote that exchequer is as mottled after which the logical thought follows - since Serama are part of the lives of many fanciers, - that Serama are hysterical mottled due to some kind of mo enhancer...
It appears there is more possible and Japanese scientists found one of the possible clues...

Because Minohiki-white x mottled, gives hysterical mottled it means that this white is a new allele of mottled. The name Japanese scientists assigned to it is mo^w (w from white) because its recessive small caps in a cross to a coloured Mo+ chicken.

About the white test-Minohikis

Minohiki is a longtail breed which is created in 1940 in Japan as national treasure-breed. The test-Minohikis are kept in a closed flock at the Nagoya University since 1988. Most common colour is wheaten with or without columbian (classical pattern). From these columbians there are born occasionally whites with a few partial coloured feathers in hackle, shoulder and tail. The chicks of these whites are yellowish white with a small brown head dot (Co dot? SvD). In the first test they crossed the white Minohiki to Japanese Silkie (Ukokkei, see my Silkies and Silkie bantams, SvD) which were homozygous recessive white. All F1 were coloured and normally pigmented, conclusion: the white Minohikis were not recessive white, and they knew it was not a new allele

A and B, Minohiki, top wheaten coloured, below B Minohiki-white hen, rooster is on the title page. C. hackle feathers of wild colour rooster (Mo+) and two from mo^w/mo^w roosters. Third row: white Minohiki chicks, D is Mo+, E and F are mo^w/mo^w, with and without head spot.

on the c-locus of recessive white (TYR). In another test cross they found out it wasn't dominant white either (see paper, too long and technical to tell here).

About mottled in this research (mo)

Mottled (mo) is common in lots of chicken colours all over the world. The researchers suggest chick down of mottled chickens looks the same as from Minohiki-whites. I suppose this applies to the chickens they used, because there are numerous mo chick downs depending on the genes which are in them. Lets continue the suggestion in the paper that chick down of mo/mo looks the same as from Minohiki-white chicks.

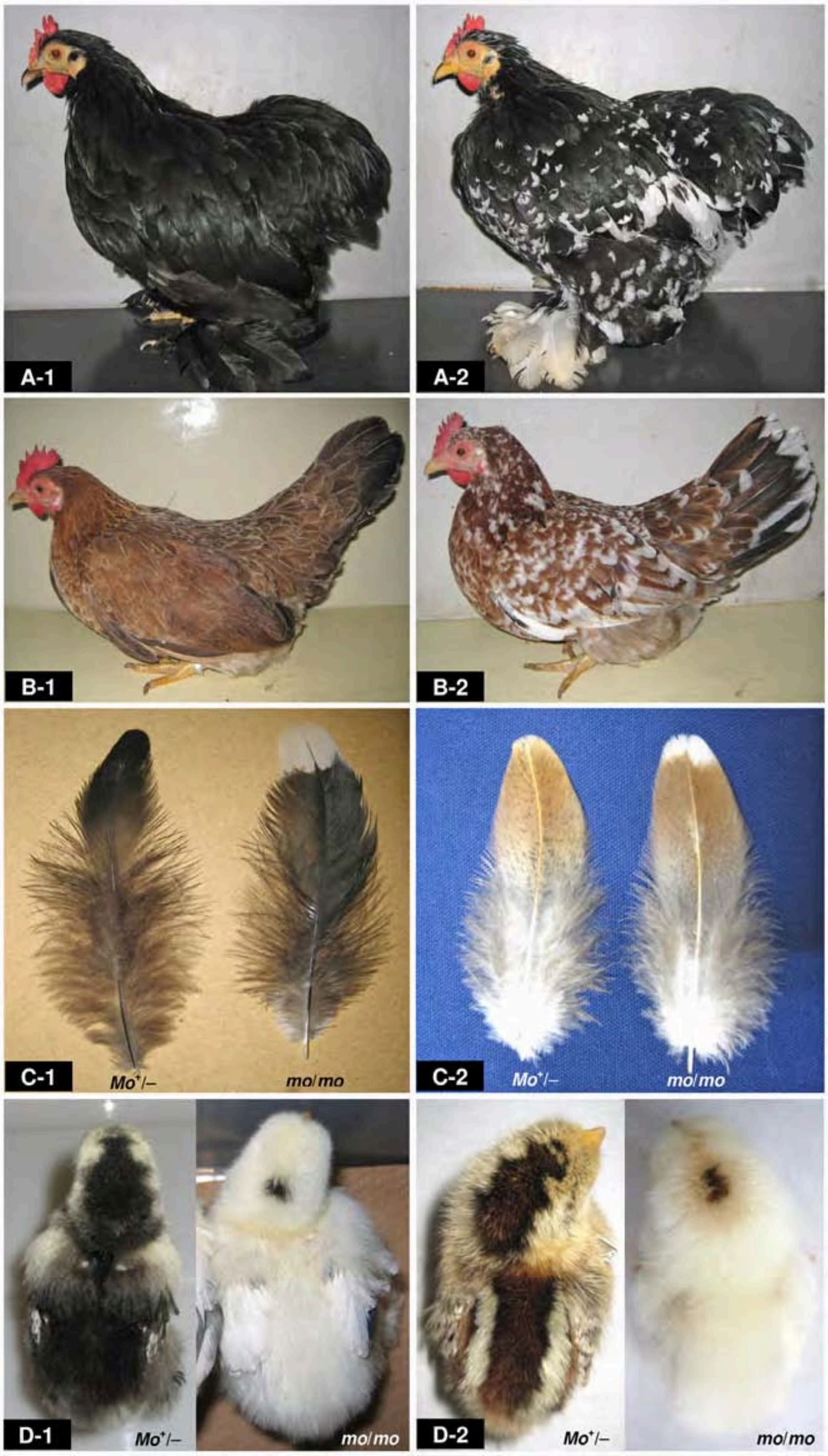
Specifically mentioned in the paper: Exchequer feather pattern is the same as mottled, only difference is that next to white feather tips also whole feathers are white or pigmented. Carefoot suggested exchequer is a variety from mottled, this still counts and the contrary is not proven yet.

Cross Minohiki-white x Pekin and Ehime-jidori

To check what Minohiki-white exactly is, because its not recessive white nor dominant white and it combines positively with mottled, there was made a cross between a white Minohiki hen and a black mottled Pekin and a duckwing mottled Ehime-jidori rooster.

F1 mottled Pekin x white Minohiki had mottled-like feathers which were intermediary between mottled and white (see the birds on the title page). Also F1 from mottled Ehime-jidori x white Minohiki was intermediary between mottled and white, see photo A3 on the next page.

Four F1 chicks of the cross with mottled Pekin had yellowish white down and one or two head spots and the mottled phenotype (photo A3B on the next page). The feathers of F1 were pure white and blacks with white tips (photo C, next page). Nine F1 chicks from the cross to mottled Ehime-jidori had also yellowish white down and one or two brown black head spots.

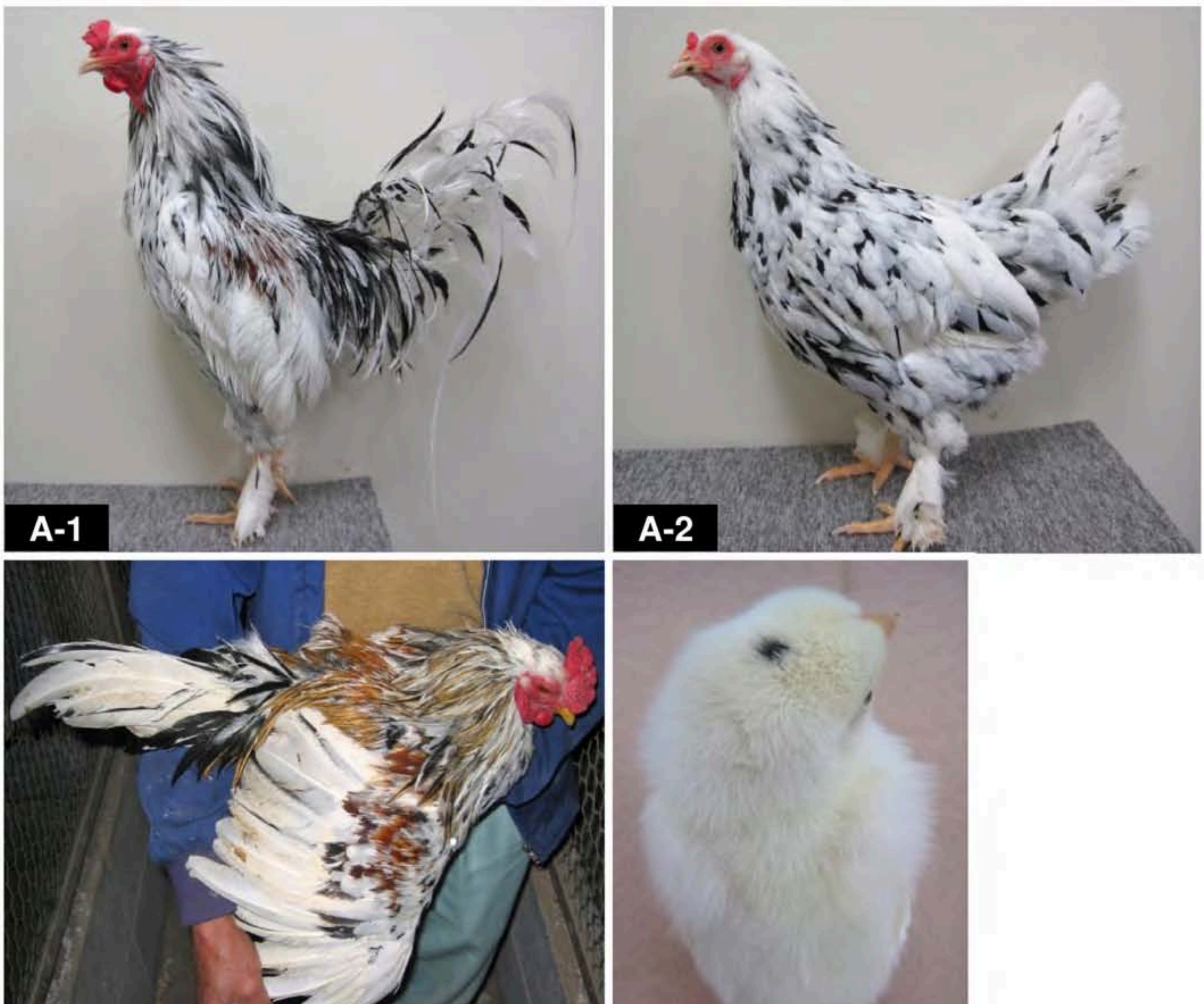


Coloured and mottled coloured on two different 'E' backgrounds in Chochin bantam/Pekin (E) and Ehime-jidori (e+).
A1 Cochin bantam black (Mo+), A2 Cochin bantam black mottled (mo), both hens.
B1 e+ Ehime-jidori, B2 e+ mottled Ehime-jidori (hens).
C1 and C2 feathers from both wild type and mottled of the birds above.
D1 chick down black and mottled black Cochin bantam.
D2, chick down Ehime-jidori e+ duckwing and mottled e+ duckwing.

Two F1 hens from the cross to mottled Peking were crossed back to their white Minohiki father of which 40 offspring resulted of which respectively 18 and 22 where Minohiki-white and hysterical mottled. This equals the 1:1 ratio. These crosses showed that Minohiki-white is an allele of mottled and therefore on the same locus mo, therefore Minohiki-white is mo^w, which gives white chickens when its pure, with or without some leakage on the dorsal side (neck, back, tail).

Allelism test between white chickens and panda mutation Japanese quail

The panda mutation (s/s) in Japanese quail has white feathers and coloured spots (see photo second next page). Panda in quail is caused by a rather massive mutation (non-synonymous) in the EDNRB-2 gene. The Japanese scientists from mo^w thought it would be interesting to make a F1 hybrid between mo^w/mo^w Minohiki and a panda (s/s) quail. This can't be done by putting those two together because they don't like each other, so artificial insemination was used. When the chick was born, it had a similar head spot as the mo^w Minohikis. When the quaicken was 8 weeks old it got some coloured small dots on the shoulder/wing. These dots showed it was the same gene in different but related



Minohiki-white is an allele of mottled (mo). A2 and A2 mature F1 cross white Minohiki x mottled black Cochin bantam/Pekin (rooster). A3, mature F1 white Minohiki x mottled e+ Ehime-jidori (rooster). All F1 showed hysterical mottled phenotype; intermediary between mottled and Minohiki-white. B, F1 chick from mottled black Cochin bantam/Pekin x white Minohiki. C. feathers from the saddle of the F1 hen (A2, F1 mottled black Cochin bantam/Pekin x white Minohiki), both white and black with white tip feathers.

Left: wild colour quails (male left), photo right is panda mutation which is autosomal recessive and allows both red and black (in contrary to paint Silkies!).
Chicks with the panda mutation have more spots on head, back and tail. When they grow up the spots stay on the same place and become normal ground wild colour, as if there is a sheet with holes covers them, there is no sex plumage in panda. Recessive white (quail version) and dotted white look like panda and they are all alleles of the quail s-locus. Recessive quail white (s) and dotted white (s^dw) can be distinguished from panda by the location and size of the spots and dots. Cause of panda is: endothelin receptor B subtype 2 (EDNRB-2). This receptor is also responsible for white spots in rats, mice and horses (paint).

Photos: Mapping of panda plumage color locus on the microsatellite linkage map of Japanese Quail. Gifu university Japan. BMC Genetics 2006, 7:2, doi: 10.1186/1471-2156-7-2

Open Access (free to read article) on: www.biomedcentral.com/ 1471-2156/7/2

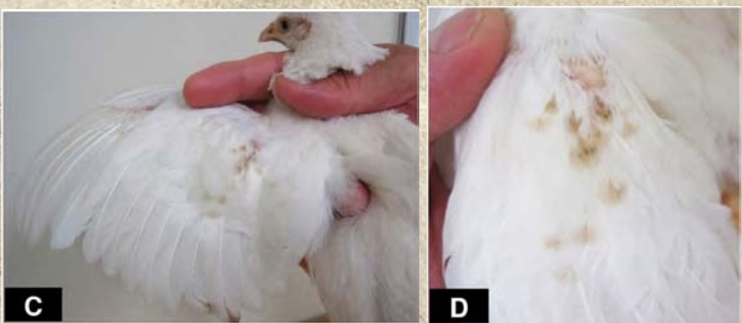
A hybrid:
panda quail x mo^w Minohiki.

species: EDNRB-2. The hybrid quaicken had the 'dotted white' feather pattern from quail, equivalent of pure mo^w.

About white in chicken feathers

In my previous article this month (march 2014) it was about what causes dominant white (PMEL17). There is always a causative gene, which directs a to us in the fancy known gene which we can see (phenotype). The gene I (dominant white and its alleles dun colour, smoky and wildtype i+) expresses due to the action of PMEL17, which codes a matrix protein in the pre-melanosome. The gene which causes the known to us in the fancy: recessive white (and its alleles albino and red eyes plus wildtype C+) is also known and those are several alleles of the tyrosinase gene (TYR), which codes for a key enzyme which is necessary to make melanin.
White feathers in chickens are mostly caused by these genes (TYR, PMEL17), plus silver (S).

The hybrid quaicken, 8 weeks old. Watch the spots on the wing.



Spots on the hybrid quaicken.

Top: panda, left dotted white (ignore the feather tuft). Photos: Animal Genetic resources knowledge bank in Taiwan.

White spots in other animals

Varieties of mottled in Serama growers. The one in front is mottled too, see side of the tail near body. Photo has bad light conditions, chick in the front is white.

The molecular basis of white spots in mammal hair and skin, by which cells in specific parts of the skin don't make pigment causing pink spots in the skin and white fur, has been extensively researched in rats and mice.
This pattern is caused by abnormalities in the differentiation (task), survival and migration (from embryo-time on) of pigment cells which come from the neural crest (early fold in the embryo where cells develop which make pigment, bone, skin, smooth muscles etc). Known causes from the spotted pattern are endothelins (EDNs), of which exist several forms. Endothelins were first known from their contracting peptides which had influence on (blood) vessels, meanwhile its known they have an important role in the growth of pigment cells. Endothelins have influence on the development of pigment cells which emerged from the neural crest, in a dose dependent way in mice and quail embryos.
Both in humans and mice, endothelins have influence on pigment cells. Mutations can occur in different types of endothelins (EDNs) which leads to lethal spotting (ls) and piebald lethal (s^l) in mice. These lethal genes cause hypo(under) pigmentation and other troubles by which those animals won't survive. Also birds have EDN-genes which are paralog (a gene which ended also into another species) to the ones in mammals.

By which is mo^w caused?

The causative gene of mo was not known yet, we fanciers know its a time-limited colour stop when the feather starts to grow and depending on how long the colour stop is active, the feather tip is more or less white.
The longer a mottled chicken lives, the more white s/he will become. This doesn't happen with all mottleds, there are individuals which stay the same and don't become white by age. We know there is an heritable factor in this yes or no whitening by age in mottleds and that's it.
To find out which gene is responsible for Minohiki-white, the scientists looked around to see if there were more birds with similar phenotype. This was found in Japanese quail in the panda and dotted white mutation: the latter looked similar to Minohiki-white: a white birds with some coloured feathers in the neck (check your white chickens!) and/or the cheeks, back, tail and wings. The dotted white mutation in Japanese quail has a much larger region of white feathers compared to the panda mutation which has only a few large spots with coloured (wildtype) feathers on the back and some are totally white. These quail feather colours can be compared to mottled in chickens and Minohiki-white, as tested. The cause of mottled in chickens was therefore discovered and lies in a mutation of the EDNRB-2 gene.

You don't have to read this:

Three mutations on EDNRB-2 and questions for the future

The Japanese scientists discovered something strange during sequencing. First they looked to EDNRB-2 as it occurs on a normal coloured chicken. They found in Japanese bantam (Chabo), Cochin/Pekin bantam and Koshamo three mutations on the gene, which can be considered as mottled related (Thr8Ile, Thr15Ala and Arg332His). These mutations (substitutions) were found in all mottled chickens. Arg332His, is stronly conserved in

Table S2. Distribution of the G1008T nucleotide substitution leading to Cys244Phe in *EDNRB2* in 22 chicken breeds including Red jungle fowl.

Breed	**Origin**[a]	**Plumage phenotype**	**Number of individuals**	**Nucleotide sequence at position 1008 (Amino acid at position 244)**		
				G/G (Cys/Cys)	G/T (Cys/Phe)	T/T (Phe/Phe)
Minohiki (MH)	Nagoya Univ.	White with a few pimented feathers	8			8
Minohiki	Fancier (Shizuoka)	White with a few pimented feathers	2			2
Onagadori	Fancier (Kanagawa)	White with a few pimented feathers	4			4
Ohiki	Fancier (Hiroshima)	White with a few pimented feathers	1			1
Shokoku	Fancier (Ehime)	White	2	2		
	Fancier (Mie)	White with a few pimented feathers	3			3
Uzurao	Fancier (Ehime)	White	4	3	1	
		White with a few pimented feathers	2			2
Chabo	Hirosima Univ. & Fancier (Fukui)	White	10	10		
Chan	Fancier (Okinawa)	White	5	5		
Koshamo	Fancier (Kagoshima)	White	4	4		
Japanese Silkie (SIL)	Nagoya Univ.	White	8	8		
Cochin bantam (CB)	Nagoya Univ.	White	3	3		
White leghorn (WL-G)	Nagoya Univ.	White	8	8		
Minohiki (MH)	Nagoya Univ.	Black breasted red or Buff columbian	18	12	6	
Onagadori	Fancier (Ehime)	Black breasted silver	6	6		
Shokoku	Fancier (Shizuoka & Ehime)	Black breasted silver	8	8		
Uzurao	Fancier (Ehime)	Black breasted red	6	4	2	
Totenko	Fancier (Kanagawa)	Black breasted red	8	8		
Koeyoshi	Fancier (Kanagawa)	Black breasted silver like	8	8		
Hinaidori	Fancier (Kanagawa)	Black breasted red	8	8		
Koshamo	Fancier (Ehime)	Solid black	8	8		
Shamo	Fancier (Fukushima)	Solid black or Blue	4	4		
Ehime-jidori (EJ)	Nagoya Univ.	Black, Black breasted red or silver	8	8		
Chabo	Hirosima Univ. & Fancier (Fukui)	Blue, Black, Barred and Buff columbian	8	8		
Chan	Fancier (Okinawa)	Black, Black breasted red or silver	10	10		
Cochin bantam (CB)	Nagoya Univ.	Solid black	8	8		
Brown Leghorn (BL-E)	Nagoya Univ.	Black breasted red	3	3		
Black Minorca (BM-C)	Nagoya Univ.	Solid black	3	3		
Fayoumi (GSP)	Nagoya Univ.	Autosomal barring	3	3		
Fayoumi (PNP/DO)	Nagoya Univ.	Columbian like	3	3		
Fayoumi (GSN/1)	Nagoya Univ.	Columbian like	3	3		
Fayoumi (YL)	Nagoya Univ.	Autosomal barring like	3	3		
Australorp (AL-NU)	Nagoya Univ.	Solid black	3	3		
Rhode Island Red (RIR-Y8/NU)	Nagoya Univ.	Dark brown columbian	3	3		
Red jungle fowl (RJF/NU)	Nagoya Univ.	Black breasted red	8	8		

[a] Districts where the samples were collected are shown in parentheses.

Genotyping 22 breeds

mo^w/mo^w

mo^w/Mo+

EDNRB and EDNRB-2 genes which are present in all vertebrates. Arg332His was also found in the panda quail, but both Thr's not. The strange thing is that Thr8Ile and Thr15Ala are also found in not-mottled chickens (Rhode Island Red, large Cochin and Sebright). This suggests that the Arg332His substitution in the mutation, is the cause of mottled feathers and that both Thr's are present as a mutation but without influence on feather colour. Both Thr's can cause the difference between Minohiki-white and the panda colour in quails although there is a similarity of 97,7% in EDNRB-2 in coloured chickens and coloured quails. Phenotype of mo^w looks as s^dw in quail (dotted white) which probably is caused by the regulation zone of the gene by which there is produced less EDNRB-2, therefore less pigment. Chickens pure for mo^w show way less colour compared to mo/

mo chickens. The expression level of mo^w in the liver was equal to the expression of coloured chickens. This suggests that the Cys244Phe mutation in the mo^w allele is not the reason for less EDNRB-2, but that it causes a decrease of EDNRB-2,due something going wrong in the functioning of EDNRB-2 by which differentiation, migration and increase/density of pigment cells goes wrong. To find out this idea, the scientists are right now (2014) testing gene expression in Mo+, mo and mo^w embryos.

As always, answers give rise to more questions

... because why do birds have EDNRB-2 next to EDNRB? Does -2 has different or other functions next to feather pigmentation?
Looking at the functions of EDN's in mammals, there are found mutations which can be compared to those of mottled, but the ones in mammal have disasterous consequences for the individual, they are lethal. Birds with mutations in EDN-EDNRB live happily and forever, the only 'problem' is feather pigmentation (not the eyes etc everything works fine).

Black skin in the Silkie Fm (fybromelanosis) is a mutation (duplication) in EDN3, which causes hyperpigmentation in skin and other tissues.
EDN3 is a ligand (connection spot on a protein) from the EDN-EDNRB system and plays a large role in increase/density of pigment cells. In black skin there is an excess of pigment cells. When scientists make chicken with Fm/Fm and mo^w/mo^w, they can perhaps find out based on phenotype, how the EDN-EDNRB system in birds functions. The gene mo^w is a so called loss-mutation, which surpresses pigmentation almost totally when pure.
Due to the discovery of mo^w, and in which gene the mutation is located, it is possible to find out, by crossing with all kinds of feather colours, to look how and where the mutation hits the bird. It is also interesting to find out why birds have EDNRB-2. The scientists assume that mo^w is only present in the breeds they sequenced: Japanese (Asian) longtail breeds.

For us as fanciers its interesting to give an extra eye to our white chickens with Asian roots and the hysterical mottleds...

1. check chick down for a brown black head spot in mottleds which are born WHITE;
2. whites from hysterical mottled check whether they are 'dirty' or display leakage on the top (dorsal) side as described in the paper;
3 test crosses and see if exchequer-like birds come from whites or leaking whites x mottleds.

Have fun!

And thanks to the Japanese scientists of Nagoya University who were to keen to see the leakage in Minohiki-whites.

This article is based on the following article (www.plosone.org):

Endothelin Receptor B2 (EDNRB2) is responsible for the Tyrosinase-independent Recessive White (mo^w) and Mottled (mo) plumage phenotypes in the chicken.
January 23 2014, DOI: 10.1371/journal.pone.0086361.

**PS. Did you notice the lovely Pti-1L feathered legs of the F1s Cochin bantam x Minohiki on the title page, quite a lot of expression although its classical. And how about those long tail feathers of the rooster? They are a mix, they look very nice in type and feathering.
Surprising long tail feathers when you consider the short tail of the Cochin bantam, enough to see next to the goal of their existence. Comb: P/p+, R/r+?**

Zonal hysterical mottled Serama hens, USA Jerry Schexnayder.

A few hysterical mottled Serama

These spots on the shoulder look like dotted white of the quail, it isn't poop because the colour is on individual feathers. Compare with photo D of the hybrid quaicken.

Old photos reviewed, I never got a clue of the mottled Serama, therefore I documented them a lot...

Hen which is not white on shoulder, hysterical mottled... can be red leakage as well? It is not dominant white because there is choc in main tail. Never seen classical dominant white (I) in Serama.

Buff exchequer, or hysterical mottled on a wheaten hen.

Hysterical mottled rooster (Lake City line) which never became more white and started like this as well.

Text/photos: Sigrid van Dort
Photos fossils: Science.org
14 May 2015 - REV 2018

Hind wings...

Imagine your'd never seen the whole variety of chicken breeds and you only know the iconic picture of a chicken as you can find everywhere, like on food products, during Easter etc. Imagine you see a Cochin or Brahma for the first time in your life, and you see no legs under the chicken. What you see is hind wings instead of legs! Can you imagine how strange this is?

Brahma leg feathers Pti-2... and vulture hocks.

Fossils have been found from dinosaurs (2003) on which you can see prints of feathers in the stone. Before the dead animal fossilised, the sediment was shaped after its contours and therefore we know that certain dinos had feathers.
These microraptors had just like Brahma also feathers on the legs. The evolution of the leg and arm feathers looks very much the same and over time the leg feathers disappeared and were replaced by scales depending on the environment of the animal (1).
The change from feathered to scaled legs is caused by genes in our chickens and it is likely this happened the same way in prehistoric times. (2)

So...Brahmas and Cochins are theropod (two legged) microraptors. Yes? No? Yes.
Why are there hard feathers, some as stiff as wing- and tail feathers on legs? This question has been answered a lot of times, depending on the latest insights in evolution of the birds,

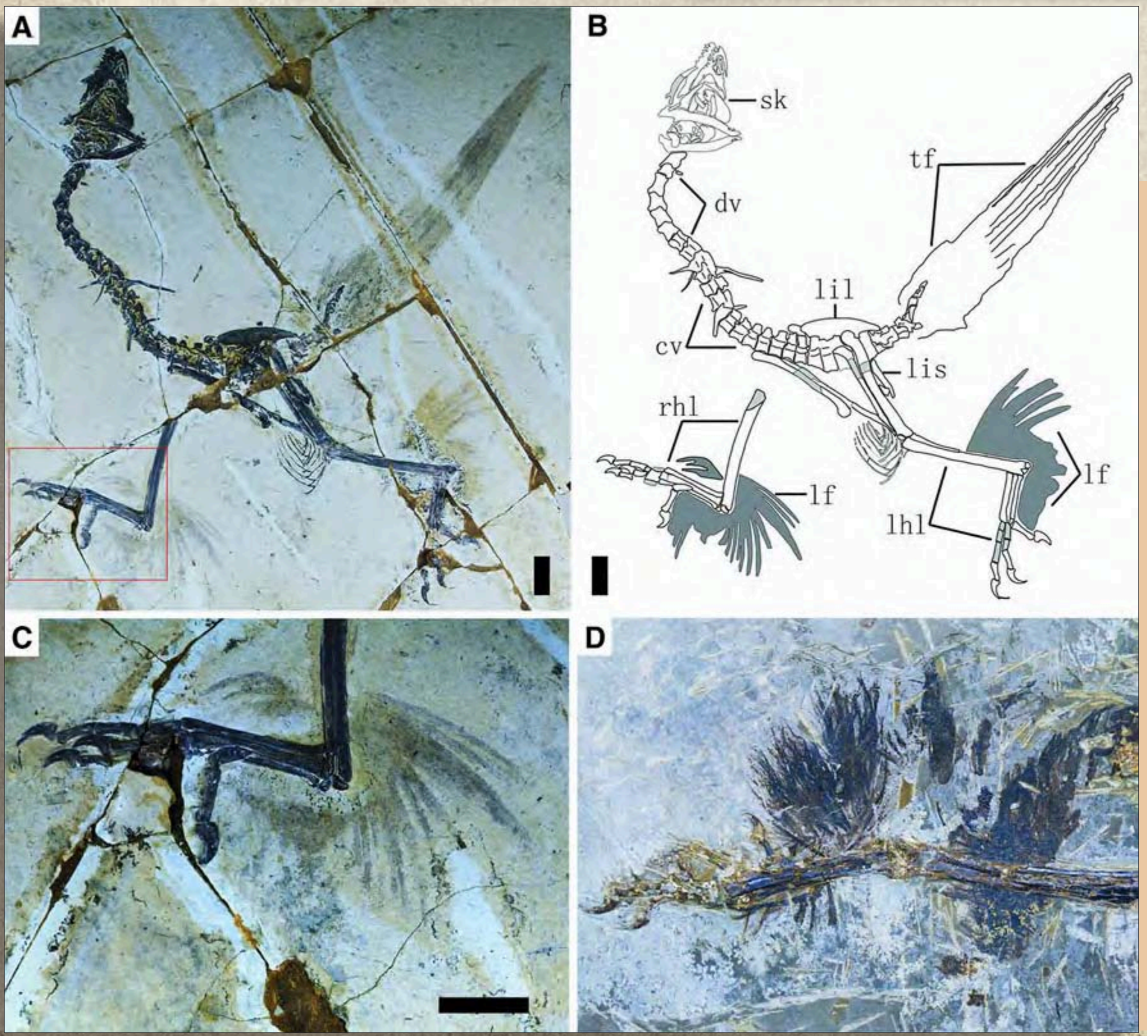


Fig. 1 Leg feathers in the basal avialan Sapeornis. Photograph (A) and drawing

(B) of STM16-18; and close-up photographs of leg feathers of STM16-18

(C) and STM16-19

(D). Abbreviations: cv, cervical vertebrae; dv, dorsal vertebrae; lf, leg feathers; lhl, left hindlimb; lil, left ilium; lis, left ischium; rhl, right hindlimb; sk, skull; tf, tail feathers.

starting with dinosaurs and new research by comparing the dinos and modern birds.
When the Brahmas were still dinosaurs, the feathers on front and hind legs were used for primitive flight or helping to jump and glide through the air between the tops of trees.
More emotional suggestions are like: foot feathers for modern birds are made for protection against a cold climate, like we wear boots or hot climate, as we protect ourselves against the sun. We can continue to question 'why' and find a lot of answers depending on the bird we ask about.
We can also ask a different question and that is: how?

How are wing feathers on the (hind) legs possible?
Evolutionary: the discovery of several dinosaur fossils in Germany and China and the research papers published later (2000-2013) gave rise to the conclusion: first there were feathers and later there were scales.
So: feathers are default and due to molecular signalling pathways during embryonal development, feathers change into scales or... not.
Beta-catenin is known for inhibiting feathers resulting in scales (of all sorts) and it prevents cells grouping together in the lower skin layer in order to form the proto-feather making cells. On the other hand, other molecules can inhibit the expression of beta-catenin by which cells start to group together and form early feather follicles and feathers will grow later. The same time another signalling molecule (SHH, sonic hedgehog) is playing a role in how and where the feathers will grow. This is the simple explanation. (A)

In the embryo the whole bird is programmed to have feathers allover. Considering the legs from breeds with foot feathers, the whole leg except the foot pads (soles) and the small strip of skin on the backside of the legs (consists of same skin type as the soles) are not affected by this feather-program (due to low and shortlived SHH expression) which starts to run on day 8.5 of the embryo. (3)

Chicken breeds which have foot feathers, lack the signal to turn feathers into scales and therefore they grow feathers on the legs on restricted places. Foot feathers are not a gene causing feathers on clean legs, foot feathers are caused by genes which inhibit the mechanisms to prevent feathers on legs.
Foot feathers are not the extra on a bird, clean legs with scales are the extra.

Cochin bantams have wings on their legs.

This means that breeds with foot feathers are more 'primitive' than the ones without from evolutionary perspective.

Research shows there are a mechanisms which change the epidermis in all kinds of shapes: scales which overlap, foot pads with hexagonal shaped skin parts, feathers. This all happens in the embryo and is programmed beforehand.

Now we know signalling molecules determin if the bird has naked legs or feathered legs, we can look for the different sorts of foot feathers because not all chickens have so many feathers on their legs as Brahma and Cochins. This is directed by the genes which determine the amount and location of foot feathers which we can find back in literature.

Literature on leg feathers not conclusive
Literature on leg feathers, also the more recent, is not conclusive about the genes and/or their alleles related to phenotype and their location on chromosome 13 (4). This is also for vulture hocks which are associated with leg feathers and found also on the same location as leg feathers Pti.
For vulture hocks it may be possible it is also located on another chromosome not sequenced in the latest research (2009) on leg feathers.
So, for both leg feathers and vulture hocks it is obviously not clear, as compared to other single gene traits like genes for

Langshan feathering on a cuckoo chocolate Silkie mix hen, the leg feather inhibitor from Orpington inherits also in F3 and further. Leg feathers is dominant, only not when you want it to be.

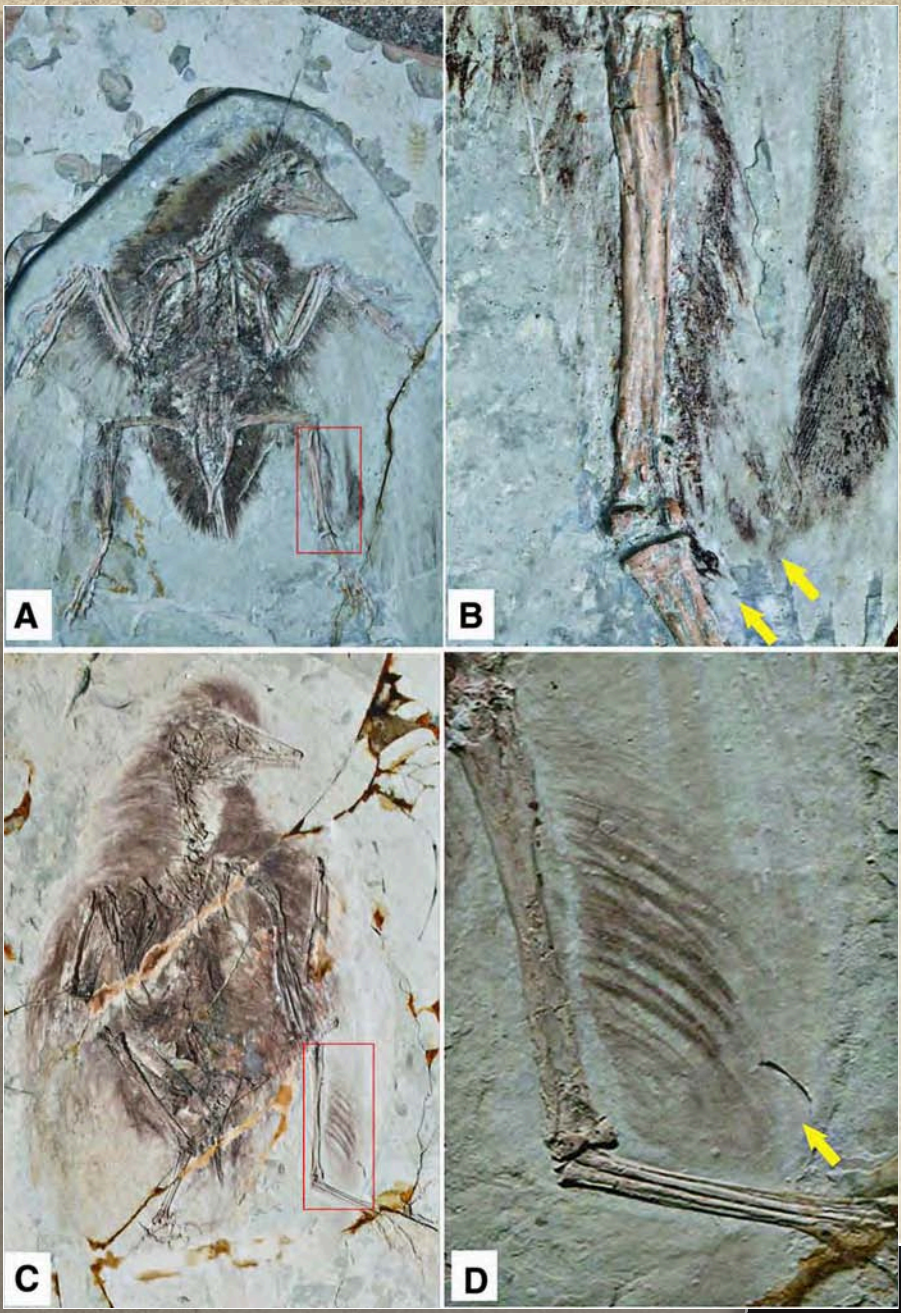


Fig. 2
Leg feathers in the basal avialan Confuciusornis and the enantiornithine Cathayornis.
(A) Confuciusornis, STM13-32.
(B) Close-up of leg feathers of STM13-32.
(C) Cathayornis, STM7-50.
(D) Close-up of leg feathers of STM7-50.
Yellow arrows indicate the distalmost preserved points on individual leg feathers.

Below:
Snowboots of an American Silkie. All toes are feathered, just an expression of the same genes.
Photo: Rachel Leigh.

comb shapes, on what region they are located and how they influence other genes.

The description of foot feather genes is rather confusing especially the Pti-1L and Pti-1B combined with Pti-2, as we read often. Lets try to figure it out.
Pti is the abbreviation for ptilopody and 1L and 1B refer to different alleles of the gene Pti (no foot feathers is pti+).
1L is chosen for Langshan and 1B for Brahma to refer to the phenotype.
Pti2 is meant for the heavy Brahma-like feathering.
1L and 1B don't refer to specific breeds but to the way the feathers look. Brahma are considered to have Pti-2.
Can you still follow this? Well, I'm lost here...

Pti-1L and -1B are supposed to be different alleles with different expression based on test crosses x clean legs.
When Pti-1 Langshan was crossed to clean legs still 6,7% of the offspring had clean legs although Pti is considered dominant.
And when a heavy feathered bird was crossed to a clean legged, offspring could have leg feathers ranging from

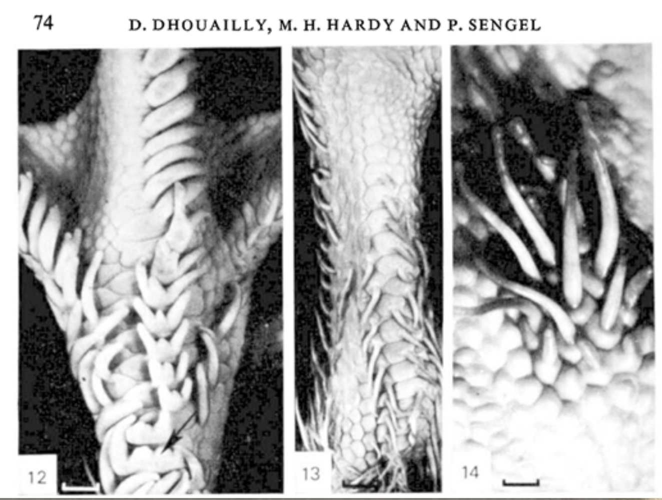
Langshan to heavy as Brahma. Mr. Somes Jr. did test crosses and wrote in 1991 that he thought (based on the phenotypes) the variation was caused by two alleles (1L and 1B) of the same gene, Pti. That is how -1Langshan and -1Brahma came into existense.
This does explain something, but not all because why are there Langshan feathers on crosses of Brahma x clean legged? Different alleles? Or different expression of the same gene? Or is the inhibitor of leg feathers too strong in some individuals? Anyway, the Brahma and large Cochin are considered to have Pti-2, lots of feathers.

Variation of expression or different alleles?
Expression of leg feathers is very variable which breeders noticed too when they crossed feather footed x clean legged breeds to use a gene which is present in the clean legged. Although Pti is dominant, it was in some cases very difficult to get the heavy feathering back.
These kinds of results gave rise to the thought of a leg feather inhibitor being present. And as we read above, this can be due to one of the molecules necessary to get leg feathers. It is not only the (considered) leg feathering gene which determines the amount of leg feathers, there is a whole army of signalling molecules at work of which one can make the difference to create a totally different image.

Vulture hocks and leg feathers
Vulture hocks are hard feathers on the outside of the thigh and as stiff as the feathers of the wings. The feathers are slightly bent inwards and only express when there are leg feathers.
In 2009 the leg feathers Pti-gene was found to be on chromosome 13 (Ben Dorshorst), on the SNP (part of a chromosome) where Pti was found also vulture hocks was sequenced. This can mean: vulture hocks is part of Pti or it was just there and the gene (being recessive in literature and also sometimes incomplete dominant) is located on another chromosome which was not investigated.

Vulture hocks and middle toe feathering are considered to be related, as is sometimes thought by breeders. Middle toe feathering is part of the expression of leg feathers and can express with or without vulture hocks. The same is for vulture hocks, they can express with any type of leg feathers as long as there are leg feathers.

Dinosaur legs on Pavlov chickens: pti-3
Leg feathers on most breeds are on the outside and front of the leg and can extend to all toes but the inner toe. This is a pattern which is followed and is directed by the cells in the embryo which can either make scales or get the signal at day 8,5 to grow feathers. The inside and the back (below hocks) of the legs don't have feathers, also not in heavy feathered breeds like Cochin and Brahma.
But, the Russian Pavlov is a chicken breed which has feathers on all toes and all over the legs but a small strip right down the hock which consists of the same skin as the foot pads (soles).
Contrary from Pti-1 and 2, pti-3 Pavlov leg feathers are recessive and much more soft and laying flat on the skin than the other leg feathers. Vulture hocks on Pavlov chickens are very tight too. When crossed pti-3 x clean legs, still approximately 40% of offspring has little feather stubs.


74 D. DHOUAILLY, M. H. HARDY AND P. SENGEL

Freak photo of artificialy induced feathers on chick embryo of 17 days by an injection with retinoic acid. Experiment from 1980 "Formation of feathers in chick foot scales: a stage dependent morphogenetic response to retinoic acid" .

Vulture hocks on Brahma.

The special leg feathering and all toes of Pavlov pti-3. Photo and bird: Mr. Komov, Russia

Let's see what leg feathers look like...

A scheme of how leg feather genes can look based on literature (for as far as understood) and practice (done) when crossing Pti-2 x clean legs in order to get Pti-2 back again in this case the cross was made to borrow a feather colour gene from a different breed with bold legs. Pti is dominant and clean legs is pti+. Pti-1B is dominant to Pti-1L. Although vulture hocks are a different gene (is it?), they are only visible in combination with leg feathers. Vulture hocks is supposed to be recessive therefore noted as small v, no vulture hocks is V+ then. When leg feathers are weak like in Langshan feathering, vulture hocks can be present but not seen.

pti+/pti+
V+/V+

Pti-1L/pti+
V+/V+

Pti-1L/Pti-1L
V+/v
v/v (not visible)

Pti-1B/pti+
Pti-1B/Pti-1L
V+/v (only visible in youth feathers, after moult they are gone)
v/v

Pti-1B/Pti-1L
Pti-1B/Pti-1B
v/v

Pti-2/Pti-2
Pti-1B/Pti-2
v/v

Illustration: Sigrid van Dort - Genetics of chicken Extremes

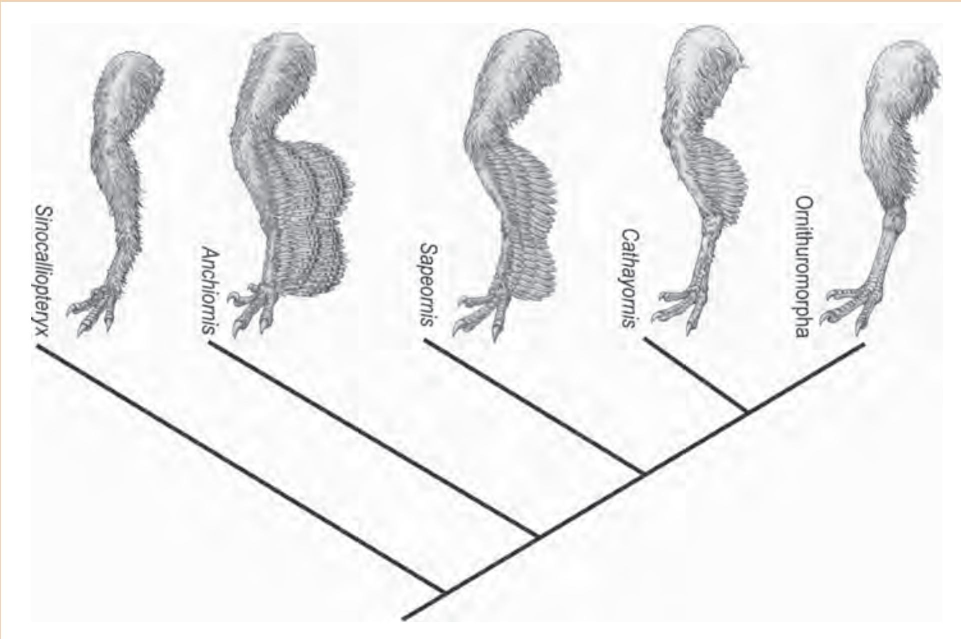


Fig. 3 Evolution of leg feathers in coelurosaurian dinosaurs. Four major stages in the evolution of integumentary structures on the hindlimb are represented by the compsognathid Sinocalliopteryx (short filamentous feathers covering legs, including feet); the basal deinonychosaurian Anchiornis and the basal avialan Sapeornis (large pennaceous feathers on legs, including feet, forming a winglike structure); the enantiornithine Cathayornis (large femoral and crural feathers forming a reduced winglike structure); and ornithuromorphs (small femoral and crural feathers.

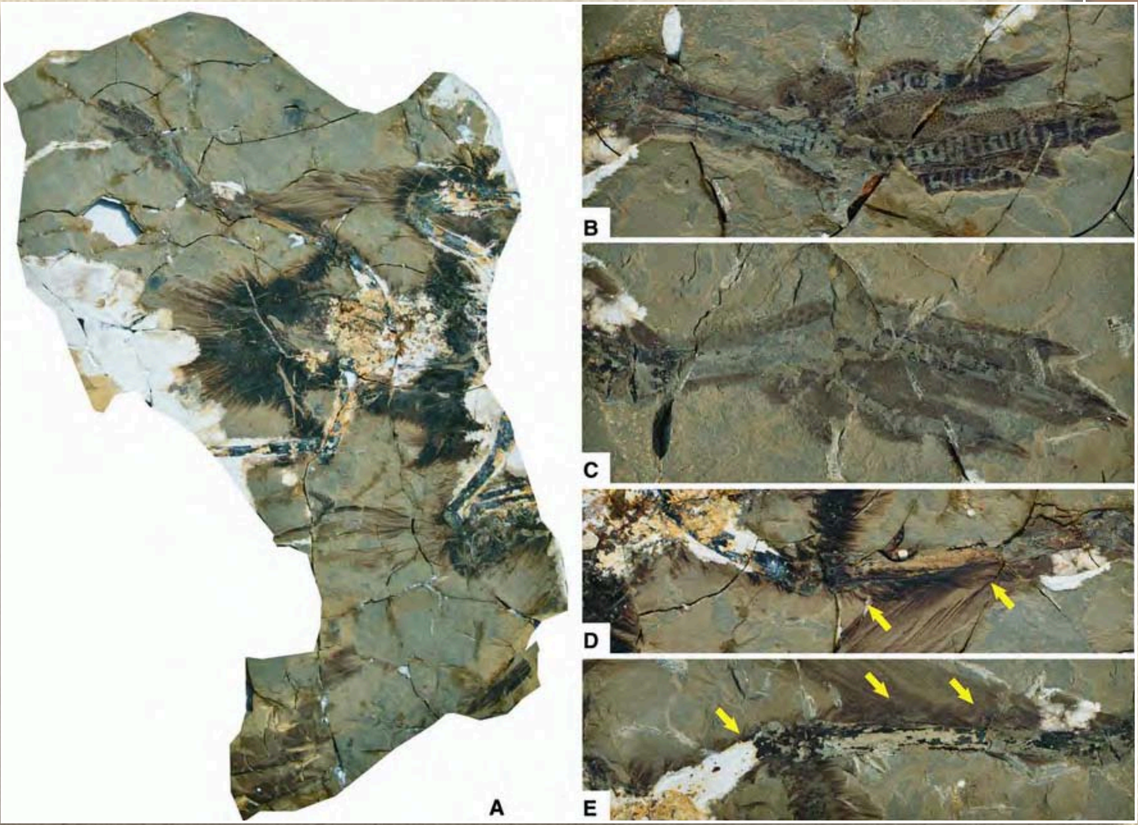
Short outer toe, brachydactyly (By)
Almost if not all breeds with leg feathers have a shorter outer toe on their feet. You can see it in Brahma, Cochin, Silkies, Sabelpoot and also in Marans, Faverolles, Langshan. A shorter outer toe has to do with leg feathering and not the amount of leg feathers. It is a gene and the gene is incomplete dominant which means it is visible even when its impure.
The outer toe should have 5 phalanges and brachydactyly causes to miss one or more phalanges. The most extreme version is only two phalanges left and in these cases most times also the nail is missing, these very short outer toes are more often seen on hens than on roosters although the By gene is not sex linked. Although there is no relationship between the amount of leg feathers and short outer toe (just as often seen on Marans as on Cochin), the amount of missing phalanges does have a relationship with the amount of feathers, the more feathers, the shorter the toe can become. Only a missing nail + one phalange can be seen frequently, also on only one foot, which can be a pitty when the bird is beautiful.

Short outer toe when leg feathers. Often also missing nail.

The Russian geneticist Serebrovsky did experiments on brachydactyly. He concluded, based on test breedings, there was always a short outer toe when there were a few feathers on only the outside of the leg and outer toes (Marans, Langshan feathering Pti-1L). He concluded that, whatever leg feather gene was present pure, the outer toe was shortened. Only birds which were impure for leg feathering (for example Pti-2/pti+) had normal length outer toes and they did not miss nails.
The length of the outer toe should be just as long or longer than the second toe (middle one seen from the front). Just compare the foot of a Cochin with the foot of any other same size bird with clean legs and you will notice.
Breeders of breeds with leg feathers are used to the short outer toe, just as judges, its part of leg feathers, just like vulture hocks are and don't exist without leg feathers.

Wyandotte salmon colour (from Faverolles), not enough feather inhibitor on the legs.

Fig 4. Integumentary features of the hindlimb in the basal ornithuromorph Yanornis.
(A) Photograph of STM9-5. Pedal integument of STM9-5 as seen in the slab
(B) and counter slab
(C). Femoral and crural feathers of STM9-5 as seen in the slab
(D) and counter slab
(E). Yellow arrows indicate the distalmost preserved points on individual leg feathers.



Web foot, syndactyly, fleece between the toes
Even seen on shows sometimes. Just like brachydactyly no problem for the bird only for the judge.
The web mostly happens between the 3rd and 4th toe in birds with leg feathers and it's seen on one or both, no rule. Just like brachydactyly needs syndactyly leg feathers to express.
How about the inheritance of web foot? Well, it seems that science and practice have more than one version on this about its dominance, as its supposed to be but, there is always a but, it is possible web foot is a complex of genes and not just one thing, to cause it. Therefore it can happen that two perfectly foots make a web foot baby and the other way around too. But we don't breed with birds with a web foot if we have the same quality without. For us, breeders, web foot is recessive since we see it sometimes and not all the time. It is something to pay attention to, just like missing nails on outer toes. Even if its caused by more than one gene, the ingredients of these flaws are present in our birds if they pop up.

From evolutionary perspective the default is not clean legged but feather legged

(1) Read after free subscription latest research on leg feathers: 15 March 2013: vol. 339 no. 6125 pp. 1309-1312 DOI: 10.1126/science.1228753 **Hind Wings in Basal Birds and the Evolution of Leg Feathers**

(2) Citation: "The evolution of leg feathers parallels that of arm feathers in prehistoric ancestors of our today's birds, which is not surprising given that forelimbs and hindlimbs share fundamental similarities both in development as the way they look. However, leg feathers were gradually reduced from toe to body in the avialan evolution, with eventual loss of the leg feathers and the appearance of scales on the legs. The interpretation that the scales of early prehistoric birds came after the feathers is consistent with the fact that scale formation in modern birds requires inhibition of feather growth that would otherwise occur. This is seen in research of the feathered feet of the scaleless and Silkie strains. In the development of the modern birds, feathered feet can be changed into scaled feet or vice versa by changing the expression pattern of either one gene or a set of genes. A similar genetic change might have occurred early in the evolution of birds in prehistoric times".
(M. P.Harris, B. L.Linkhart, J. F.Fallon, Bmp7 mediates early signaling events during induction of chick epidermal organs. Dev. Dyn.231, 22(2004). doi:10.1002/dvdy.20096 Medline)

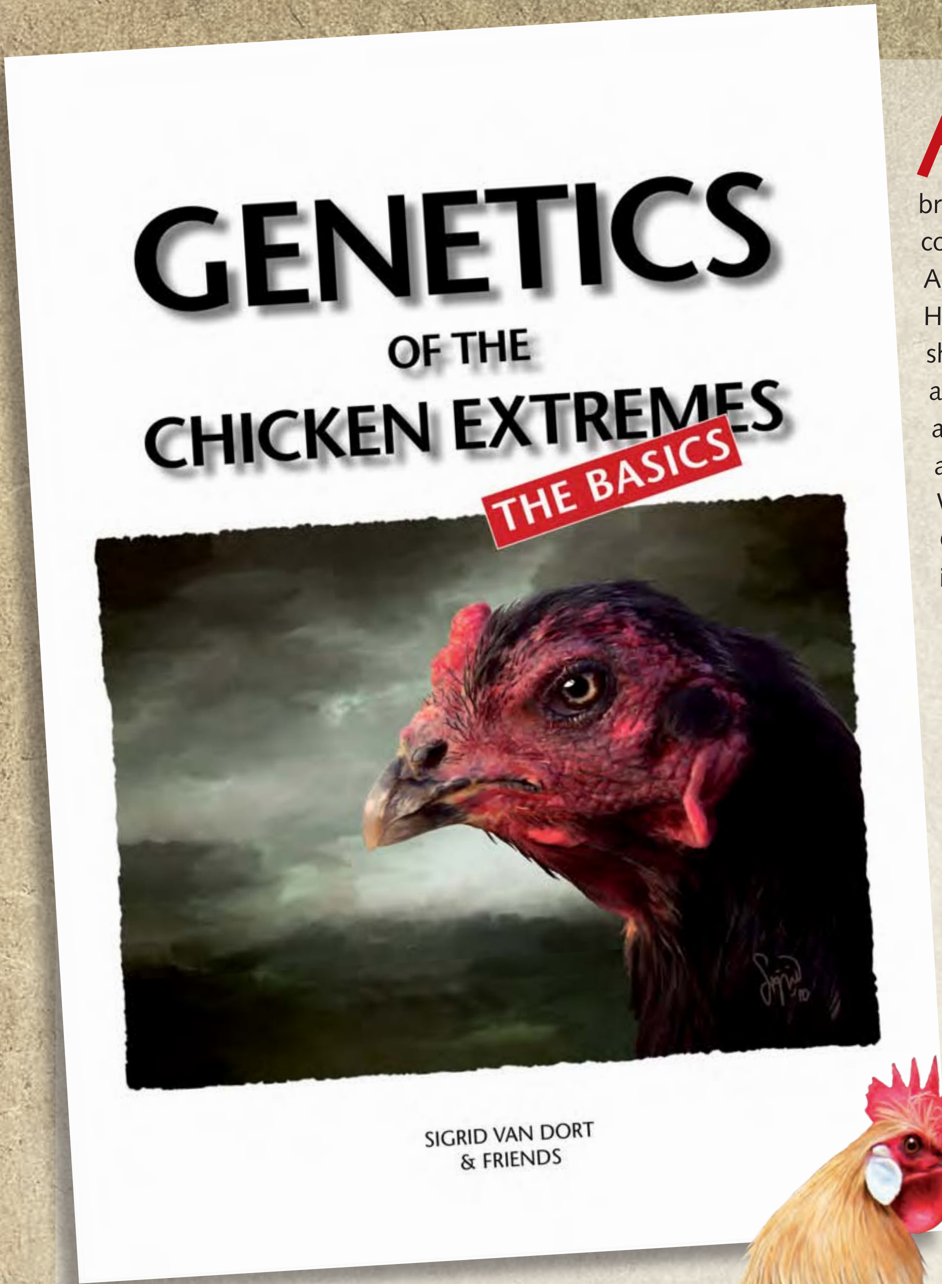
(A) F. Prin, D. Dhouailly, How and when the regional competence of chick epidermis is established: Feathers vs. scutate and reticulate scales, a problem en route to a solution. Int. J. Dev. Biol.48, 137(2004). doi:10.1387/ijdb.15272378Medline

R. B.Widelitz, T.-X.Jiang, J.-F.Lu, C. M.Chuong, Beta-catenin in epithelial morphogenesis: Conversion of part of avian foot scales into feather buds with a mutated beta-catenin. Dev. Biol.219, 98(2000). doi:10.1006/dbio.1999.9580
Medline

(3) Int. J. Dev. Biol. 48: 137-148 (2004) How and when the regional competence of chick epidermis is established: feathers vs. scutate and reticulate scales, a problem en route to a solution
FABRICE PRIN# and DANIELLE DHOUAILLY* Equipe Biologie de la Différenciation Epithéliale, UMR CNRS 5538, Institut Albert Bonniot, Université Joseph Fourier, Grenoble, France)

(4) Genomic Regions Associated with Dermal Hyperpigmentation, Polydactyly and Other Morphological Traits in the Silkie Chicken.

Web foot, also something which happens more in breeds with leg feathers.



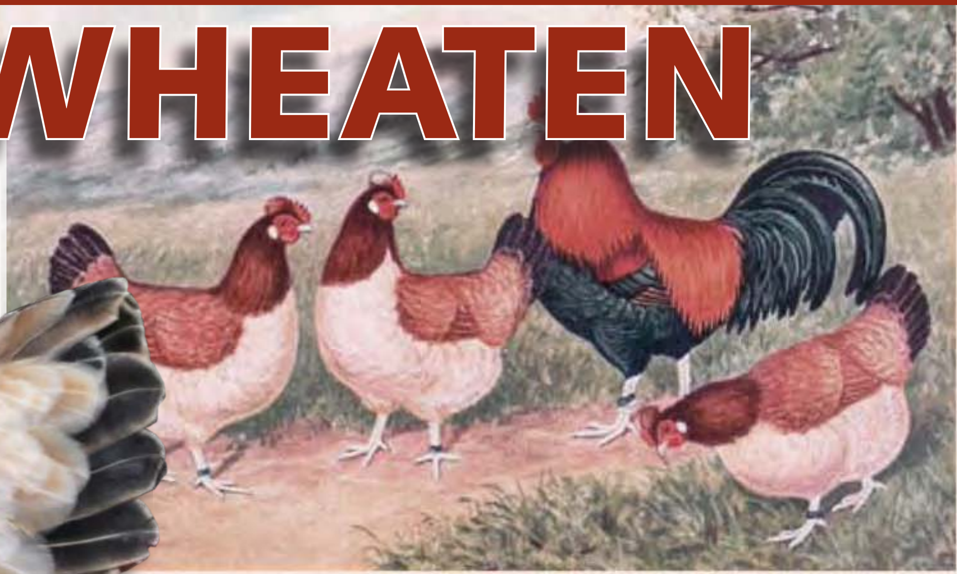
After the book Genetics of Chicken Colours, which added a new dimension to the fancy because breeders saw genetics isn't scary nor complicated, this book had to be written.
A chicken is more than feather colour only. How about the eye and leg colour? Comb shape, feather quality and structure, crest and tassel. If you make a new colour on an existing breed by borrowing a gene of another breed, how to fix it all?
With the addition of this book to the Colour book, phenotype of the chicken is fully discussed. After an outcross it is possible to return to your original breed including the new feature.
This book is written with your basic knowledge of inheritance in mind, which is described in Genetics of Chicken Colour - the basics. Added are over 800 photos to illustrate the text or the other way around. Experiences from practice are mentioned and showed in photos, because literature is not focussed on our ornamental breeds.
Genetics itself is right now going through major changes, new developments are discussed since we 'know' a lot from decades of experiences which are passed on from generations of breeders.
Science wants proof, and the scientists managed to prove things like 'selection'. What is selection in a pure bred bird? We know how to do it, here you can read why. Next to the single gene traits which can cause an extreme (compared to wildtype) also more complicated traits which are actually interactions of more genes are discussed.
The classic extremes, deviations from wildtype (+) are discussed including the many phenotypes of it. A chapter on the chicken embryo is added as well and some chicken biology. This book is just like Genetics of Chicken Colours a read and picture book, full of knowledge and interesting facts.

Get your copy at www.chickencolours.com
It is €75 ex postage, see for your country on the website.
Many successful creative breeders have bought this book and it saved them generations of breeding to get the results they aimed for.

SULMTALERS, FAVEROLLES and the 'CONDITION'

Text:
Sigrid van Dort
November 2012
REV 2018

RED WHEATEN



Dutch Sulmtaler

And yes, again cynicism exudes from the lines. And this cynicism fluctuates depending on the level of research and substantiation when its about... uh, Technical Chicken Stories.
I feel a fierce vicarious embarrassment coming up, when the level drops to the level 'apple = pear', which wouldn't surprise you anyway.

In the land of the blind, one-eyed man is king

Your credibility is depending on your position (self-crowned, nepotism or democratically chosen) plus your sense of your birthright, which refers to the degree of humbleness you exercise which translates itself in your ability to reflect. Time and time again I'm surprized what is published in specialist literature and explained to the rabble (us), which will never be 'chosen ones' neither do most of us reflect our birthright. Yes indeed, an apple is a pear. Or: I like the face, the other is not okay, why? Therefore.

What I'm trying to tell you is there seems to be no demand for authors and what they publish as long as they belong to 'right group'. Authority seems not to be based on anything more but the group. Therefore some of the Dutch Chicken Authorities see me as a louse in her feathers. Or is it the other way around? That I feel itchy when reading articles from chicken authority figures?

Because of my webright (not to be mixed up with my birthright) I think that the rabble (you -perhaps?- and me too) should be allowed to take cognizance of a different 'noise' than 'I am right, because I say so', therefore a few lines to spend: An article in the Dutch poultry club magazine Kleindiermagazine (October 2012) on Sulmtalers in large and bantam, gave me rise to write this. Sulmtalers are an Austrian regional 'valley' breed which is made to scratch on the fields after harvest, ending up as a good drumstick, totally innocuous and normal. Who has internet and elementary knowledge of the German language, can find a wealth of information about the history of the Steierer, Cillier, Altsteirer, Stoahendl and Sulmtaler which all have a common origin.

History of the colours

After 1850 and the mixing with a variety of other breeds of the existing population of chickens, the colours were spread over the following (related) breeds:
The lighter Altsteirer or Stoahendl in Obersteiermark, the Cillier in the direction of Slovenia (today the village Celje), Altsteirer: which came from Stoahendl and Cillier about 1902, Sulmtaler made by Armin Arbeiter included Cillier. The Cillier was first duckwing-like, wheaten (eWh), cuckoo and white. The whites and cuckoos maintained. The Altsteirer was, after WW2, present in wheaten, black, wildtype colour brown which is a darker and bit more red version of duckwing.

By the fancy, all colours of the Altsteirer were dismissed but white and dark red duckwing (not wildfarbe which is melanized duckwing).
At first the Sulmtaler existed in red (!) and wheaten. The white Sulmtalers were an invention of the fancy in the former DDR (East Germany). The white Sulmtalers came that way in the Standard of perfection, but have no original historical background.

Sulmtaler colour

Now there is a hint in the history of the Sulmtaler: they were red and wheaten, can be concluded why there are found red-wheaten Sulmtalers and wheaten (ordinary gold wheaten) in other areas. The Dutch Standard tells about the wheaten colour of the Sulmtaler: Colour description as #28 of the Standard with this difference: the cock has red brown hackle and saddle feathers. Some brown feathers in the breast are allowed (still the cock). The tassel is redbrown. Hen: in the redbrown neck some dull black pencilling is allowed, as well as an overall bit darker shade. The tassel is light wheaten.
The description above is not the one of gold wheaten. Question: in which Standard of perfection in the world can you find an answer to your question about colour? The Standard doesn't give hold how the chicken should look in colour. In the Dutch standard there are black and white drawings and further a description of red-duckwing if you try to find an answer about the colour shade and compare the descriptions with what you know because you've seen it. For red-duckwing: goldbrown hackle of the rooster, while red is still the same mahogany gene as in red birchen, just to mention something. In short, the Standard is about nothing when

Chabo hen, gold-wheaten.

Dutch Sulmtaler

FIND THE DIFFERENCES

Real Sulmtaler from Wolfgang Reiterer from Schwanberg.
reiterer.wolfi@aon.at
More photos on:
www.sulmtalerhendl.at

FIND THE DIFFERENCES

Tarwekleurige krielhen met veel goede eigenschappen, maar staat wat gedrukt.

Een latere tekening van Witzmann. Het type van de haan is hier ook, zoals we ze nu willen zien met vlakke rug en ook de tekening van de hennen komt hier beter tot zijn recht.

Left and above pictures from the article in a Dutch poultry mag about the Sulmtaler. A child can see the hens on the historical painting are totally different from the hen on the photo, chosen for the article. What's the purpose or explanation? Why isn't a single word spent on the differences? The one-eyed man?

FIND THE SIMILARITIES

ANSWER BELOW THE PHOTO IN MIRROR

Photo left: these are Faverolles hens, photo right is a Sulmtaler hen.

you search for info regarding how a colour is meant to look, or in the case of the Sulmtaler: finding out why there are so many differences between females and males amongst each other and why this is.
There is no redbrown hackle and saddle colour in the first rooster on the photo in the magazine, on the second photo this does show. Compare it with the rooster on the show, lower photo with 96 points. This means there are wheaten Sulmtalers and red-wheaten Sulmtalers.
Where is the so characteristic darker ‘camouflage’ colour on the back of the hens on the photos in the article and also on the show where I accidently was and took some pictures? Or aren’t breeders aware they are dealing with red-wheaten? Or don’t the breeders know how the Sulmtaler should look? Or is it the judges who don’t know the colour of the Sulmtaler?
Isn’t there anybody who recognizes the similarities between red-gold-wheaten Sulmtaler colour and the red-silver-wheaten Faverolles colour in the hens?
Why isn’t there a clue written that Sulmtalers can be ‘ordinary’ (gold)wheaten and also red(gold)wheaten? So they should be accepted in two colours? Because those two colours are the ones which are judged anyway, although nobody seems to notice this, only ‘the differ’.
Also in Austria and Germany they don’t seem to know what they see in the show cage. Anyway: this is a chicken of which colour is less important than type, just like in game and the chicken is accepted in two colours: wheaten and red-wheaten. If you look at it that way, there’s nothing going on.

Gold-wheaten cock with not enough mahogany from the 1st page of the article discussed.

Red gold-wheaten cock with enough mahogany a bit further in the article. What misses is a substantiation why these birds are so much differing from eachother. Below a good red gold-wheaten Sulmtaler cock.

The ‘condition’ wheaten

The most famous geneticist from the Dutch clay who published lots of ‘scientific’ articles for the fancy Mr. J. Ringnalda wrote once: “Wheaten isn’t a colour, its a condition”.
This only reflects the many guises of the hobby-name wheaten and that this colour is not understood because it is a colour.
In the chicken world they mean with wheaten -> gold-wheaten (eWh, s+).
Wheaten is also an e-allele, just like duckwing (e+), partridge (eb), birchen (ER) and extended black (E).
The hobby-name wheaten is eWh based on gold (s+) without any other additives.
When there is silver (S) present instead of gold, we talk about silver wheaten.
If you add mahogany (Mh) red enhancer to silver wheaten (eWh, S, Mh) you get salmon colour (hobby-name because its not a fish).
Add mahogany (Mh) to (gold)wheaten, then you get... uh... Sulmtaler colour?
When you add a gold and red diluter, you get yellow wheaten, add Db (columbian action gene) you get a ‘black tailed’. Wheaten is a nice broth to make different tastes and patterns. Indian game in double laced is gold-wheaten with melanotic (Ml) and pattern gene (eWh, s+, Pg, Ml) and some even have mahogany added to make the ground colour more red.
Wheaten with only the pattern gene (Pg) gives a kind of partridge effect (multiple lacings) but more coarse than partridge based on eb. The origin of wheaten is in Asia, its the basis of a lot of game colours, also the Serama has a numerous amount of colour variations based on wheaten.

The wheaten colour on the hen is compared to the salmon coloured breast of the duckwing hen, the wheaten hen is full of this stuff.
This explains that its difficult to make patterns on wheaten without helping genes which make black stick to the rather red ground colour, so there are enhancers necessary.
You can say that wheaten chickens are very reddish chickens and when its silver, its much of a silver bird in which black plays a minor role compared to the other e-alleles.
Wheaten is considered as the least dominant or most recessive allele.
But, when black is added it behaves phenotypically just as dominant as birchen (2nd most dominant) if the bird is homozygous. Explanation: suppose you make a cross between wheaten and partridge, black from partridge will make wheaten stronger which results in a chicken looking more wheaten (chick down also) than partridge although its wheaten with more black.
Returning to the ‘condition’ which wheaten seems to be, this has its origin probably in the difficulties directing ‘red’. A reason can be the

Sulmtalers getekend door Witzmann. De hennen zijn fraai van type, maar de ruglijn van de haan loopt wat sterk af. Let op de te donkere tint op hals, rug en zadel.

WHAT COLOUR SHOULD IT BE?

Tarwekleurige hen met een F type en ZG kuif. De staartopbouw moet veel beter en kleur egaler.

shape of pheomelanine, the pigment granule itself. There isn't much black present in wheaten, although you might think different when it concerns the male because of his wildtype outfit, this outfit has nothing to do with the amount of black determined by the e-allele, it is sex-black. The colour which dominates the image most, is always most difficult to direct and red (pheomelanine) is a rather difficult pigment to handle because it seems it doesn't respect the breeder's wishes and its as if there's almost too much where you don't want it and too little where you need it or it looks blotchy and so on. That's the character of red pigment...
So, now some substantial remarks on the article in this pretending professional chicken magazine where no critical soul seems to take notice of anything.

The one-eyed man and being king

To start with page seven about the accepted colours... there's stated that the rooster has a totally different colour compared to the hen and that the rooster can be broadly seen as partridge colour although he differs in parts from the 'normal' partridge colour as on Leghorn. What is the purpose of this 'explanation' of the author who is a much appreciated knowledgeable judge and member of the Dutch standard committee? Pears are broadly seen as apples? The writer does have the notion about the existence of wildtype colour, that a rooster and hen from duckwing (e+), partridge (eb) and wheaten (eWh) have wildtype colours when there are not extra additions except Pg which has no influence on the 'system' of wildtype colour itself.
The wheaten rooster is always different from the hen in colour, this is in any wheaten (without additions) and has nothing to do with the Sulmtaler. He is wildtype colour, like any wheaten rooster is and not like partridge wildtype colour, because in the wheaten wildtype coloured roosters the black shaft stripe in hackle and saddle is missing for the largest part or totally.
The wildtype coloured Leghorn rooster is e+ duckwing, not wheaten.
The Sulmtaler is eWh wheaten. A pear has a different shape compared to an apple, although they are both fruit. Therefore they both have a.... peduncle!
Comparing a wheaten (eWh) rooster to a duckwing (e+) rooster is of no use for the interested lay(wo)man; why is apple pie called apple pie and not pear pie? When apples and pears are cut into small parts, they are hardly to recognize when the pie is ready. In other words: comparing is of no use because its about two different colours, alleles, etc. It's about creating page-text?
In the article is pointed out there is a difference between the Sulmtaler rooster and the Leghorn rooster in duckwing in hackle and saddle feathers. The ground colour of the Sulmtaler rooster is redbrown and the black stripe of the shaft is missing. The hackle and saddle colour of a duckwing rooster is not redbrown but orange to orange-yellow. There are also 'brown' duckwing Leghorns, are perhaps these the ones the author refers to?
The colour of hackle and saddle of a brown duckwing Leghorn rooster is dark orange and that's not redbrown. So what duckwing Leghorn is it the author uses as an example for the Sulmtaler rooster? The red duckwing Leghorn can't be it either since that one has goldbrown hackle. What the heck is this article about? :-)

Two lines lower is stated that the colour of the Sulmtaler rooster looks like the 'ordinary' duckwing colour (which one?) and that only a bit of brown is allowed in the breast of the Sulmtaler rooster. What is 'ordinary' duckwing according to the author, do we have ordinary duckwing in the Standard?
There is an extra mix-up for the ones who read the article in Dutch because in Dutch duckwing and partridge are used both, the colour is called patrijs, which looks like partridge, only there is in the word patrijs nothing told about which one: e+ or eb? Why is this extra confusing? Because partridge eb roosters do have some ground colour in the breast as well especially the multiple laced ones from one pen breeding. Not to be mixed up with hen-breeding and cock-breeding pens which are separate and the other sex is never shown so the pattern doesn't matter. You get a great black breasted rooster, but their sisters are way too dark for the show and lack an open lacing.
Because hen- and cock-breeding practice is practice due to mistakes in the Standard from decades ago, breeders are forced to continue. Today in Holland there is a growing awareness that two different breedings for only males and females is crazy. Therefore in the partridge colour varieties some ground colour is allowed so the sisters have a nice open lacing.

Above: a red silver wheaten (salmon colour hobbyname) Faverolle. Below: a red gold wheaten Faverolle. Or is it a Sulmtaler hen without tassel, with beard and feathers on the legs?

Duckwing seems to be ordinary duckwing to the author (a most qualified judge -all breeds- who bends, good-natured, over to us to our toddler level, it seems?). Then something is mentioned which is absolutely impossible in a Sulmtaler rooster if you assume its not a mix between a chicken and a crow: calling the severe fault of lacking a wing triangle! This is completely unnecessary talktalk if you ask me. A wildtype coloured rooster whether e+, eb or eWh always has a wing triangle; its brown when the ground colour is gold (s+), white when the ground colour is silver (S). And a yellow duckwing rooster with a gold diluter (ig) will have a wing triangle which is cream coloured just like hackle and saddle are.

The sentence about more severe faults (next to missing a wing triangle) and white in tail and wings, expresses there should be no white in wings and tail of the Sulmtaler. Clumsy written if you ask me, he probably means there should be enough red or black pigment, and 'white' is only a shortage of one or the other pigment, no reason given.
I give up on explaining the confusing words of the knowledgeable and respected author of this article.
Its a waste of writing to de-confuse what's written, the overall quality of the article on the Sulmtaler is abominable, each line contains nonsense like comparing apples with pears, open doors just to make page-text, this looks like 'When it rains you will become wet and also the street and trees and houses and cars will be wet, unless you build a roof over all of it'. This is the level of the article, so at what level are the readers of this magazine estimated? Or does it tell something about the knowledge of the author? Or perhaps his eyesight?

Tassel

Whether a crest or a tassel it has the colour of the neck. You can compare it with the colour of the beard, and its feathers as well. Concerning the feather structure and colour, the tassel also follows the sex, in hens short and ground colour and the rooster have so called streamers (elongated like the neck feathers/hackle) which are a sex characteristic, just like the long saddle feathers.

The Sulmtalers in the article are red-gold-wheaten birds without 'much conviction'. They are very pale compared to the Austrian Sulmtalers, the older paintings and their silver counterparts (Faverolles).The photos on the Dutch Sulmtaler club website show both large and bantams which are gold-wheaten, without the dark red ornamental feathers where is asked for in the standard description. So, or change the chicken or change the standard description I would suggest. I hope I can assume the Dutch Sulmtaler website shows good representatives of the breed in the photo part? (called: Foto's).

On the first page of the article its obvious there isn't paid attention to mahogany and its expression on the photo of the rooster, although the bird matches perfectly to the birds on the Sulmtaler website. The fact they used a red Orpington bantam to create Sulmtaler bantams as written in the article, shows that at that time red (mahogany) was considered as important, and not only Orpington for type (to make it a bit shorter) and skin colour (white). This red doesn't seem to exist anymore in the Dutch Sulmtalers. Perhaps a change of the name would be better as well?

When there is more expression of mahogany the back of the hen will improve too by becoming more red. This can be seen a bit on the blotchy hen on the left of page 7 in the article. This is also the more natural image of wheaten coloured hens. The back a bit more red/dark compared to the belly, this is camouflage. Perhaps breeders or judges or both just preferred even coloured gold-wheaten, without the characteristic darker red back as on the older illustrations is shown and the way they still are bred today in Austria (large fowl)? Just a different taste up here in the North? Due to this ambivalence not choosing light or dark back, this results in blotchy birds which are neither of the both. The rooster on the first page of the article is a brother of the light hen on the right of page 7, which doesn't have a good photo colour compared to reality (matter of prepress and no colour correction done). I didn't put that photo of the article here because the bird is similar to the hen I photographed myself for this article. The red rooster on the second page of the article has sisters with the blotchy top cover. What happened between the days of the drawing of the Sulmtalers in the past was made and today, that makes the birds look so different? When you want hens with an even ground colour on the back (top like belly) then you'll get roosters as on the first page: gold-wheaten without mahogany. If you want roosters with deep dark red hackles, then you'll get blotchy hens. Separated hen and cock breeding seems to be inevitable in this not-matching combination? I can't look in the kitchen of the Austrian Sulmtaler breeders, nor do I know anything of the breed because I don't breed them myself...

A pretty Sulmtaler cock with a nice amount of mahogany was shown on a local show in Holland. On the photo his type is a bit weird due to perspective, he was big and the cage small.

Comb

The comb of the hen has a crinkle because the single comb bumps into the tassel and her weak comb structure (sex characteristic) causes the crinkle. The tassel is small enough not to cause a crinkle in the comb of the rooster which is much more firm (sex characteristic as well). When vitality is less, the comb of the rooster will fall over to one side because there is more pressure on it due to the tassel. When the comb of the rooster is too long in length, it will crinkle above the nose, the comb has to go into a direction and above the nose the structure is thinner.
You can see the same effect in single combed Silkies (rosecomb versions without a beard and with wattles). In the former Burmah bantams the line with the single comb and tassel showed the same comb shape.

Till here additions and substantial comment on the Sulmtaler article published in the Dutch magazine October 2012 including the Dutch Standard of perfection. Translated October 2013 for Glenis Marsh from www.javahillfarm.com, Ca. USA.

Chickens | Art & Knowledge

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