Color Breeding In Pigeon Plumage

BY
Dr. J. METZELAAR
University of Michigan

COLOR BREEDING

—in—

PIGEON PLUMAGE

By
Dr. J. METZELAAR
University of Michigan

Published by
American Pigeon Keeper
Geneva, Illinois 1926

Reprinted
The Pigeon cote
www.pigeoncote.com

To
T.A.HAVEMEYER
New York City
Promoter of Scientific Pigeon Breeding
Dedicated by the Author

PUBLISHER'S INTRODUCTION

As the first edition of the brochure on Color Breeding of Pigeons by Mr. Chapman has become exhausted, we are publishing a new edition by the same title, written by Dr. J. Metzelaar. By way of explanation for this change of authorship, we beg to say that the undersigned purchased in 1920 the copyright of Mr. Chapman's, work and all the remaining copies of the first edition. Last winter, in talking with Mr. Metzelaar about color breeding, we found he had a number of advanced ideas upon this subject, which were not explained in the previous work, hence, when the edition became exhausted we engaged this author to write a new work and the following treatise is the result.

It will be observed that the subject is treated in a different light and a new explanation is given of the relation of each of the several pigeon plumage colors to each other. From the undersigned's long experience in breeding pigeons he feels safe in saying that, while this explanation and theory are new, they are certainly based upon the facts and are borne out by the latest scientific investigations.

Our visit with Dr. Metzelaar revealed that he was not only a scientist of high standing but was also a pigeon fancier of many years' experience and as such he brings to the pigeon fancy a practical experience that should be of great benefit in solving the problems of color breeding.

This is a broader subject than the average man supposes. In it are involved many of the factors of animal heredity and there may be some rare cases which science cannot, at present, explain; but we have every confidence that all pigeon breeders can safely rely upon the theories as announced and explained in this work.

E. J. W. Dietz.

COLOR BREEDING

Foreword

The object of this booklet is to present before the reader what is definitely known about the inheritance of colors in pigeons, according to controlled experience of both Science and Fancy. It is intended primarily to be used by intelligent breeders.

Breeding practice nowadays has come to a point where the progressive breeder can hardly go any longer without some firm, scientific foundation of his art. The existing color varieties have been largely established in the old world along empirical lines of tradition, experience, trial and error, with a large sacrifice of time and money. Lack of the former rather than of the latter may account for the scarcity of new fancy breeds created in America. Therefore, I think a general account covering the whole field of color breeding, as far as known at the present moment, will appeal to the mind of the modern American breeder.

The writer has made an honest effort to be intelligible for both fanciers and scientists; still, he knows how difficult a task it is to satisfy both parties at the same time and he is perfectly aware that he has not succeeded in avoiding scientific terms and preserving scientific accurateness, nevertheless. For instance, when he speaks of a "factor" or an "agent," this term is quite consistent with the scientific conception of a genetic factor. These entities will sometimes be spoken of as units; yet, the writer is satisfied that some "factors," as defined by Dr. Leon J. Cole and, his students—certainly the most competent recent authorities in the field—are complex rather than unit characters, and stress is laid upon the complicated results in crossings.

Accordingly it is suggested that Mr. Fancier go carefully over these pages, follow the line of thought which runs through them, and with some study he will be able to get "the dope." If he succeeds in grasping the real idea, he will soon find out that color breeding is not gambling or guess work, nor that it can be ruled by superstition or tradition alone. He will find that an effort has been made by the author to co-ordinate a mass

of isolated facts and a seemingly lawless variability into one strictly logical system. He who works in this field, though he be a simple fancier, may rise far above the level of petty show competition and enjoy operating with one of Nature's great laws.

On the whole, the writer has confined himself to well-established facts. It has been a pleasure to him to show the underlying truth in some old, practical rules. He has not gone into the details of any particular breed. On the other hand, the geneticist reader will soon be aware that some of the gaps in our scientific knowledge about the subject are rather boldly filled with hypotheses, which it will take several years more to work out. For the time being they are offered to the geneticist as suggestions only, which may help both him and the fancier in solving some of the outstanding problems. The present writer is still engaged in breeding work to check these theories, especially with Swallows and Modenas, and any correspondence or help from his brother fanciers will be sincerely welcomed. It is hoped that this correspondence and further investigation will enable the author to revise future editions of this work and keep the subject up to date. His thanks are due to trustees of the "Bache Fund" for financial help.

A final word to the geneticist readers, in particular. Reference is made in this work, of various transitional "Series" of colors, as for instance—from dominant red to black. I regard the existence of at least three groups of such "Series" as a fact. The checker series (from blue to black wings) has been analyzed by Van Hoosen Jones. None of the others has been thoroughly analyzed as yet; the probability is that they represent so-called "Multiple Factors." The present author is engaged in the details of this part of the work.—Museum of Zoology, Ann Arbor, Mich., October, 1925.

The Original Color

Under the mighty influence of Charles Darwin it has been assumed for long time that the so-called Blue Rock dove, *Columba livia*, was the sole ancestor of all domestic breeds of pigeons. In recent times, however, this assumption has been severely criticized and nowadays it is highly probable that other species, notably from the Orient, have largely entered by crossing into our domestic strains. It is the opinion of the present writer that these species must have been very closely related, because the

whole body of colors can be comprised in a well-balanced unit system, involving a limited number of hereditary factors.

As to the Blue Rock, since Charles Otis Whitman published his classical treatise we know that a chequered pattern must have preceded the blue black-barred pattern in pigeons; the checks are original, the bars represent the derived form.

We speak of blue and checks as a pattern and do not call them colors. The two contrasting "colors," black and blue, are both formed by black pigment and differ only in the arrangement of the same. Nevertheless, the chequered and barred patterns formed in this way are of fundamental importance throughout the range of colors in pigeons. One of the most curious and striking instances is the following: In the chapters on Red and Lacing, reference is made to the existence of red checks and red bars in solid blacks, white checks and bars in blacks, duns, reds, yellows. This means that, for instance, the chequered pattern in all its details stands out in white on a black background, the white in this instance corresponding to the black parts of a normal check. This white check pattern is a link in the series which leads, on one hand, down to white bars, and thence to solid black, and on the other hand up to black laced and thence to solid white.

The Colors

Their number is so overwhelming in pigeons that they defy complete description. However, two things are very important for a clear understanding of the whole system:

1. The pigment is always present in the form of infinitely small granules.

2. There is not a distinct color of pigment corresponding to all the different colors which our eye observes. The same pigment granules, if arranged in different ways in the cells, are able to produce very different effects which we call "colors." Take, for example, the common Blue Rock. The neck is glossy, the bars on wings and tail jet black. The tips of the flights are dull black, the shoulders are gull blue, but the inner vanes of the flights are of a darker blue and so is the breast. All these tints are made by one single kind of black pigment, clumped in little heaps in the blue parts, spread out evenly in the black parts. The more complete this spreading is, the deeper the black will be. Intermediate hues between blue and black (smutty, smoky, dusky, gray) represent intermediate stages between clumping and spreading.

Now if we discard for the time being the checks, we may conveniently arrange the intense "colors" in two groups; the barred patterns to the left, the solid, or "self" patterns to the right. So brown and brown silver are formed by the same kind of brown pigment; in the same way red and mealy.

Intense Colors

Barred—	Solid—
Blue	Black
Brown silver	Brown
Mealy	Red

In order to avoid confusion we will define our names right here:

Brown-silver we call the color occurring, for instance, in the English Pigmy Pouters, Runts, Kings, Mondaines, Dragoons and Homers. The ground color is an extremely delicate faded pinkish gray; the wing bars are chocolate and invariably there is a crossbar of the same color near the end of the tail; the neck is ditto, but glossy. (It is very objectionable to call this plainly "silver," as this involves confusion.) The corresponding solid color, the whole bird having assumed the tinge of the bars in the preceding one we call brown which occurs, of course, in the same breeds as brown silver.

To some fanciers it may seem surprising that we regard brown, being intermediate between black and red, a principal color, and not an offshade. This method, however, is based on experiments. The true brown as defined here is a well defined and absolutely constant color, and entirely different from dun. It is, however, apt to fade in the direct sunlight, especially in the wings.

Now these are the six principal intense colors; it may be advisable to repeat that brown-silver is intense, not dilute. To everyone there exists a corresponding dilute color. This means that in a given feather there is about one-third of the pigment present as compared with the intense condition.

If we now draw up a table and put under each intense color the corresponding dilute, we get the following dozen:

Barred—	Solid—
Blue	Black
Silver	Dun

Brown-silver	Brown
Lavender-silver	Lavender
Red barred (mealy)	Red
Yellow barred (cream)	Yellow

This dozen colors forms our basic material. White is no real color, but the absence of color. If we consider it separately we have 13 principal "colors" in all, instead of seven as formerly assumed. Some of the colors mentioned here, as lavender silver, are rather rare and not readily available, which is no reason, however, to omit them. Lavender is still scarcer. It crops out occasionally in carriers and is sometimes confused with either dun or yellow; nor is the name lavender constant in its use.

It is the earnest hope of the writer of this little book that by giving to each well defined color a special name he may aid in eliminating that awful confusion prevalent in pigeon nomenclature.

Breeding for Color

In general, if you have a strain of birds of good color the best rule is to stick to it and not experiment, by trying to cross any other colors to improve it. Let well enough alone. True experimentation is a complex problem and requires much research and study into the science of genetics and it is an expensive proposition.

Scores of records have been published by breeders, who have spent quite a little money and time on their private experiments, and yet these records are of very little actual value for our knowledge of the genetic laws, controlling the heredity in domestic animals because they are not carried out along scientific lines. Our advice is: Leave it to the scientist. But, if you want to experiment at all, do not monkey with wild out-crosses, but take your mates as closely alike as possible; do not cross the offspring again but mate the young with each other or with the parents, thus raising as large an offspring as possible from the same parents year after year.

The trouble in the Pigeon Fancy is that we have so many colors and varieties that few fanciers have a sufficient supply of any one breed to follow this subject into all of its various branches. Hence our purposes in the following exposition will be to confine ourselves to crossings of closely allied colors, so that it might be

possible for the average pigeon breeder to follow and these recommendations will all be made from the standpoint of trying to improve the color, as required by the standard for the different varieties.

It is sometimes claimed that a certain color, if kept by its own, will run down and deteriorate unless occasionally fortified by crossing with a "stronger" color. We have to accept this statement with some reserve. If we inquire into the facts, it will often appear that only part of the offspring is of poor, pale color, say 50 per cent. This applies especially to yellow and to spangled and laced varieties and will be dealt with under the corresponding colors. Let us confine ourselves here only to the observation that the phenomenon of "running white" seems to be due, in many cases, to "heterozygosity" or genetic impurity, which simply means that the case can be compared with that of the blue Andalusian fowl, which can not possibly be made constant for color; being essentially a direct cross of black and dirty white, these paternal colors are always produced in mating the blues together.

Again, the similarly colored mates which have constituted the pairs for a number of years will often appear closely related, so that inbreeding and constitutional weakness as its consequence has brought about the deterioration of color more than the external equality of the parents. In this case, crossing, e. g., of yellow with red is highly desirable.

I. Blue

The normal blue pigeon has two black wing bars and a black terminal crossbar on the tail. The tips and outer vanes of the flights are smoky, the outer vanes of the lateral tail quills white and the neck purple-black.

It will be obvious from the foregoing pages that blue (with silver) and black (with dun) belong together in a group, which is characterized by the presence of a pure black pigment. It may sound strange for the extremely delicate shade on the wing of a silver baldhead or satinette; yet, it is the truth; the minute granules (about one 10,000th of an inch) are scattered in fine clumps and streaks through the feather, thus giving the illusion of silver. The definition of a dilute color is that it contains about one-third of the pigment mass compared with the same area in an intense bird. This, then, is the relation between silver and blue. We repeat again, that blue and black are made up of

the same kind of pigment, viz., black pigment granules. The only difference is that in blue these granules are clumped together, whereas in black they are spread out evenly; however, the amount of them is the same in both cases.

White rumps. If we mate a pure bred white rumped blue to a dark rumped the young will come light rumped. This means that the white rump is dominant over dark rump; it is a dominant character derived from the wild blue rock. Consequently it is hard to breed out, but fortunately there have been introduced other wild strains with a blue rump (Columba intermedia, from India). . Now, if we have no dark-rumped blue available the best cross is either black or dun, although white rumps may even occur in these colors. The subject is not yet fully cleared.

Both these crosses yield not only black, but eventually also different grades of chequering, from black shoulders down to blue. This means that these check-patterns were hidden, but invisible in the black, due to some cross in the past, and revealed now in a suitable cross. Now, this is in reality not so strange as it seems to be. We remember that blue and blue-check are essentially identical, differing only in the amount of spreading of the pigment granules. For instance, take a feather from the bar-region of a blue bird. You will find a black block in the outer vane. Compare this with a corresponding feather in a chequer. The block has increased in Size and may extend somewhat on the inner vane. This means simply that more clumped pigment is spread out. The blue may be reduced ultimately to a small tri-angular area at the top of the feather and eventually it is lost and then you have a solid black wing covert.

The details of the heredity of chequering are described at length by Dr. Sarah van Hoosen Jones in a paper: "Studies on Inheritance of Pigeons; checks, bars and other modifications of black" in "Genetics" 7, September, 1922, pp. 466-507, reprinted in the February issue of the American Pigeon Keeper, and here given in abstract.

"There is a wide range in the amount of blue which may occur, from full black, where no blue at all is present, to a type known as barless, in which nearly the whole bird is blue. The variations form a series of gradations of increasing 'bluing.' The six types, which have been distinguished in this work, are fairly distinct, though there is some intergrading in certain cases. The breeding behavior, however, seems to

Figure 1.—Full black with uniform rump (grade 5) and uniform outer vanes of outer tail feathers. (Wisconsin No. 1673A.)

Indicate their genetic distinctiveness. It is probable that the integrading is due, in some cases at least, to some modifying factors, and it is also not improbable that other genetically distinct grades may exist behind those described. These six types are described in the order of their progressive bluing (decreasing amount of black in relation to blue) and it is interesting that they appear to be 'epistatic' in their hereditary manifestation in the same order, i. e., each dominant to the one that follows. It is to be noted that blue appears in the rump and in the outer vanes of the outer tail feather independently of this series.

"Full black (as used in the present paper) refers merely to the absence of blue everywhere except in the rump and outer vanes of the outer tail feathers. Blue appears first in the tail, making the 'black-blue tail' and its further invasion results in the 'checked,' 'sooty,' 'blue black-barred' and 'barless' types, all of which, however, have the characteristic blue tail.

"Black blue-tail is the next stage below full black. The chief distinguishing characteristic from black is the blue tail with a black terminal band. This pattern shows variability in itself,

Figure 2.—Black Blue-tail with uniform blue rump (grade 3) and light outer vanes of outer tail feathers. The white feathers in the rump are not considered. (Wisconsin No. 1457E.)

since all the birds entirely black except for blue tails to those with blue or almost white rumps and with or without some bluing in the primaries but with unchequered wing-coverts are included in the class.

"Check originates from the so-called 'checked' appearance of the wing. This condition is caused by the presence of two black marks situated respectively in the inner and outer vanes of the wing coverts, the central and proximal portions of which are blue. The rest of the plumage of checked birds is like in the blue but for the not infrequent presence of checks on the upper back. The rumps may be either white or a shade of blue.

"Sooty is the fourth variation of the bluing series to be considered. The black blue tail represents a character which is 'blacker' than the check, while the sooty is representative of the opposite condition, in which the wing coverts have a mere sprinkling of black, giving the bird a sootied appearance. The black on the wing-coverts is insufficient to take on a definite pattern as in the typical check.

"Bar refers to the pattern commonly called 'blue black barred.' The wings of a barred bird are blue with two transverse black wing bars, one of which extends through the tertiaries and innermost secondaries, while the second extends through most of the secondary coverts. The so-called blue of the pigeon is in reality a gray which corresponds to Ridgeway's 'gull-gray.' The tail and rump are similar to those of the check, without check marks on the back.

"Barless, the sixth and last variation is, so far, as known at present, the lowest stage for the bluing series. As the name implies, the wing lacks any bars. In the barless pigeon the blue has entirely replaced the black wing-bars, leaving a clear blue wing, except for the darkened tips of the primaries, secondaries and tertiaries.

Summary:

"The present paper is a study of several interesting factors which produce varying amounts of black and blue color in pigeons.

"The basic factor is *B* (black pigment).

"The first group of factors consists of five which belong to a series. The lowest is *Ba*(r), spreading black pigment in the region of the wing-bars; the next is sooty), which produces a sprinkling of black in the wing-coverts; the third is the checking factor.

'Note: This is commonly called "smutty."

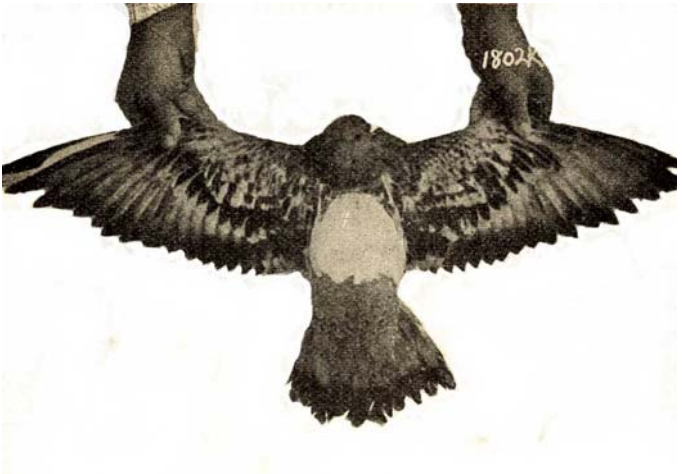


Figure 3.—Medium chequered with extreme light blue rump; outer vanes of outer tail feathers only slightly lighter than those of other tall feathers. (Wisconsin No. 1802K.)

Figure 4.—Sooty [Smutty] Blue with light blue rump and light outer vanes of outer tail feathers. (Wisconsin No. 1777A.)

(C) producing the check patterns; the fourth, *T*(ail), spreads black throughout the wing coverts, leaving a blue tail; this is the black blue-tail pattern. *S*(pread) is the highest member of the series, spreading black pigment throughout the tail, thus producing a full black.

"The inheritance of *C*(heck) has been amply proven, while that of the others is only indicated. All, however, have been shown to lie in an 'epistatic' series."

So far van Hoosen Jones. We may resume her valuable work thus: When we run up the whole series from barless through checks to deep black, any upper member can never be produced by any pair of "lower" members in this series; that is, with less black (or spread pigment). According to these experiments it would be vain to try to produce a solid colored pigeon from any pair of checks in any color.

The main result of van Hoosen Jones' work is, that a pair of' checks may yield young with less chequering, but that they will not produce offspring, proceeding in the direction of the solid color. (However, the present author raised some dark checks fromm light ones.)

Let us now return to the cross of white rumped blue with black, which produced checks. You mate your dark rumped checks and you will get

Figure 5.—Blue black-barred with light blue rump (grade 2). Wisconsin No. 1790A.)

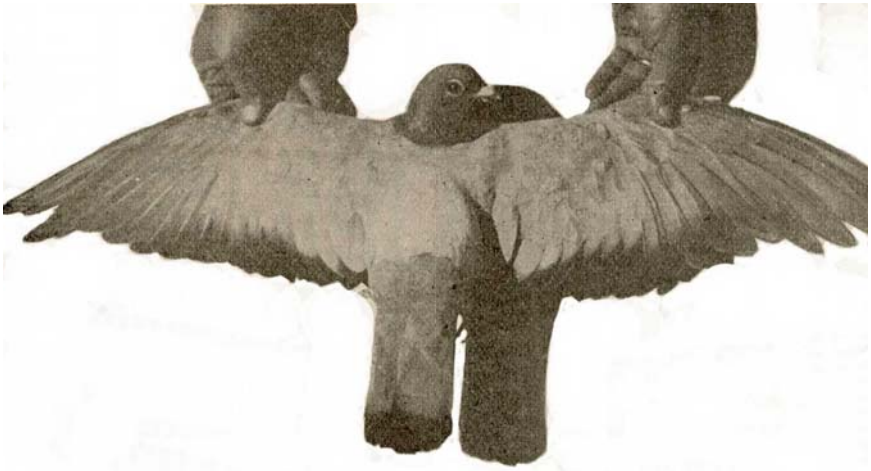


Figure 6.—Blue barless Homer with light blue rump (grade 2). (Wisconsin No. 1751A.)

one-fourth of their young blue. Or, if you mate such a check with blue, one-half of the offspring will come blue. But the former method is safer to get rid of the white rumps.

It is commonly believed that white rumps are brought about by crossing with silver. This is not correct. There are white rumped and silver rumped silvers and the latter is an excellent cross for blue, the very best, in fact, to "clear" it. Brown-silver is another excellent cross for blue.

There is an objectionable smoky kind of blue which is sometimes so dark that the bird almost resembles a black, although the bars still stand out prominently on the wings. Further reference to this "diffusion" of the blue will be found under the chapter on black.

In a blue pigeon the wing and tail bars ought to be jet black. If a blue bird shows kite, this means an admixture of red. Now, in the chapter on red it will be explained that there exist two kinds of red, a "dominant" and a "recessive" type. Most likely kite belongs to dominant red. The very best thing to do is to discard them in both instances, notwithstanding the fact that recessive red disappears very easily on crossing with blue in the first generation.

Special mention should be made of the barless blue, that is blue with a black bar in the tail but not in the wings. It occurs among Strassers, Priests, Swallows, Archangels and Homers.

II. Silver

Silver should perhaps be called "blue silver," to distinguish it from the brown silver. The word "silver" has been much abused by the fanciers and much nonsense is talked and sold about it. Sometimes it is claimed that a silver may have black, dun, kite or brown bars, which is, of course, absolutely misleading.

The true silver, then, is simply a dilution of blue and shows all the peculiarities of blue in a diluted way. It bears the same relation to blue as yellow to red and as dun to black. Now, the color of a pigeon is either intense or dilute, seldom both at the same time in different regions, and so a silver bird with black bars is impossible. The bars on the wing as well as on the tail ought to be dun, deep dun, and so are the tips of the flights — let us be honest about it. If they are yellowish and the tail-bar

is lacking your bird belongs to or has been crossed with another color class.

Mention should be made, however, of a dun-tailed silver raised by the author. This would correspond to a black-tailed blue. The affinities of this type are obscure.

Another mystification is that all silvers are of female sex. True, there are more female than male silvers. Suppose you cross a true silver baldhead hen with a blue cock, which has been bred from blue for many generations. All the offspring will come blue; perhaps only a trifle lighter than the father.

Now you take one of the male young and pair him the next season again with silver. Half of the young will then be blue and half silver, quite irrespective of sex, if. you only raise a sufficient number. There is no reason whatever that there should be born more female silvers in this case.

But now you take one of your silver males and mate him the next year to a blue hen. Invariably the result will be a blue cook and a silver hen in the nest. This so-called "criss-cross" inheritance is what has caused so much confusion: *The intensity of the parents is reversed in sexes of the offspring if the father was a dilute*.

It needs no comment that the right cross for a silver to improve its qualities is a dark-rumped blue. But, if you have a good strain of silvers, keep them by themselves. Again here it is often claimed that this will deteriorate the bars and the neck, these becoming kite and this may be ultimately true for part of the young. But above all, wait until after the first or second moulting before sentencing them! And, have some patience!

In general, no color has been so mistreated, any old offshade being mixed up under this name as just our beautiful silver. People have brown-silver, mealies, yellow barred and lavender silver and go on mating them with silver and wondering that in some generation these colors prove to be still "alive." Why, you cannot kill a color, like a painter mixes his shades. If you mate a true silver dragoon with a brown silver hen, the male young will be blue, the females blue silver. But now your brown silver is not mixed or destroyed, it is present in the hereditary qualities of all your offspring, only hidden under some stronger color and it has to appear again some time or other and then it is your own fault. The lack of discrimination and the misunderstanding of

true heredity has caused so much disappointment in pet-fancying, nor are the older writers always reliable in their suggestions.

Of many off colors in various breeds it is claimed that "you cannot show them, but they are valuable for crossing as stock birds," and definite results are cited. Well, if you do not want to see the very same colors cropping out again, do not use them at all but try at least to get the desired result in another way. How in the world shall we ever succeed in making our colors pure when we keep on crossing and crossing?

It is an infinitely curious thing that nobody has ever before grasped the real difference between a brown silver and a blue silver, although these colors are so strikingly different that no woman would fail to see it. The error of mixing up these colors is exactly parallel to the error of mixing up *brown* with *dun*, as in Carriers and Maltese, these being the corresponding solid or spread colors. Blue-silver is the diluted form of blue. Brown-silver, however, belongs to the *intense* group and its dilute counterpartner is lavender-silver (with the lavender tail bar). When will the fanciers shake off their conservatism and adopt a better set of names for better mutual understanding?

Just as blue, silver occurs sometimes without wing-bars, especially in the ice pigeons, where the darker shade of the neck is also absent, and further in the silver-winged light Archangel and in some swallows.

Checks. Just like in the blue to black series, there are chequered birds as intermediates between silver and dun. If the pattern comes close to silver we call it silver check, and if it is nearer to dun it is named dun check; in the latter case the dun is generally of a dull kind just as in the real black check the black is generally poor. To be more accurate: Of course there exist smoky silvers, corresponding to smoky blues. We call this the "diffusion" of the clumped pigment. The same applies to checks. Now, if the contrasting, lighter color between the chequermarks is darkish, showing "diffusion"—this applying also to the rest of the "clumped" feathering—I call this a *dun check*; if the contrasting color is just as bright as in a true silver (no diffusion) I call it *silver check.*

As a rule the writer is not much in favor of checks in any breed excepting homers; checks are intermediate patterns and in our Fancy we are always in for extremes in any respect. It is too easy to get checks. Silver with good dun will, in most cases, yield silver check or dun check,

but so will silver with self yellow or a silver cock with a red hen; in the latter case the male young are, of course, black check to blue, the females dun check to silver (criss-cross). The darkest checks we get, of course, from silver male and black female, although only the young *hens* may be silver checks in this case. Easy and simple as this is, we can apply these crosses directly to produce silvers in a breed where they are not yet known or scarce. For this, all we have to do is to breed a good dun male with a blue female, and to mate the checquered young the next year with each other. This gives a second generation of checks, blues and silvers, the latter averaging one-eighth of the total number.

Silver check, combined with a yellow head and neck, occurs in the Nuernberg Lark, and so does silver.

III. Black

Black is the highest stage of pigmentation in the pigeon. It is generally assumed that the chain from blue to blue check leads to black wings and finally to solid black. This is erroneous and van Hoosen Jones has confirmed this error. Chequering never leads to solid black. A pigeon may have solid black shoulders and yet the inner vanes of the primaries may be just as blue as in a regular blue pigeon, and so may be the tail and the breast. We repeat, that in blue the pigment granules are clumped, in black they are spread out.

If we want to understand black, it is very confusing to consider the shoulders at all; we had better study the breast, tail and flights. Everybody knows that in a good black bird the tail shows no trace of a terminal bar, nor is there any lighter color in the inner vanes of the primaries. If compared with blue, it appears that the corresponding blue areas in those feathers have become black by a very gradual process of *diffusion*, which is entirely different from the process of invasion of blue by chequering, in which there is a sharp line of demarcation on the individual feathers. To be accurate, black *may* originate from black-shouldered blue through diffusion of the blue parts of such a bird. But it may just as well originate from a check, with a black check as intermediate stage. In fact, black may be formed directly from blue by diffusion.

By this we mean that there exist numerous intermediate stages, for instance, between blue and black with an increasing degree of diffusion

of the clumped pigment unto spread pigment. Although no actual breeding work has yet been done by anybody in this line, it seems highly objectionable to line up the checkering with black in one series. Glossy black appears to be dominant over dull black and is fundamentally different in its behavior toward dominant red.

The practical consequence of this theory is, that imperfect diffusion will not only cause pale tails and flights, but often also the appearance of the shadows of checks and bars. Deep, lustrous black appears to be dominant over the inferior types of black. This does not apply to a deterioration by kite.

Whether kite shows up in the form of a vestigial lacing, or in a more sprinkled form, it is dominant and hard to breed out.

For raising black, this color should never be crossed with blue or with checks as the offspring are liable to show intermediate stages of diffusion of the pigment, which means bluish tails and other misery. Neither is it recommendable to cross with yellow or red, except in some special breeds like Barbs, where practice has proven the feasibility and, we may add, where all colors are usually equally miserable. The only real crosses for black are, of course, dun and brown (which is generally called dun, too.) These three colors belong together and I would never advise a man to cross with anything else. Mate black with black, and if the offspring would deteriorate it simply means that their hereditary composition is not pure. The thing to do, then, is weeding out, not crossing. If we do cross black with red we very frequently get black with a certain amount of coppery red, especially in the inner vanes of the flights. By using different reds for this cross it is possible to get various combinations of red and black (Tipplers, Kite Tumblers). This is referred to in the chapter on *red.*

IV. Dun

Dun is the regular dilution of black and a lustrous, shiny dun is very attractive; it is a recognized color in Carriers, Barbs, etc., and the highest stage of pigmentation in the dilute series.

It is sometimes claimed that dun will run in any shade from yellow to poor black, that it is apt to fade in the sunlight and is not constant at all, but all this is not so. In the first place, the regular brown is nearly always confused with dun. Now brown is likely to get pale in the sunlight. You examine the tips of the flights of a so-called dun Nun (which in reality ought to be called a brown Nun) and you will find the tips of the feathers much paler than the parts which are invisible in the closed wing. Here is

one cause of confusion. Regular dun hardly bleaches up at all.

Second: The regular dilution of brown is also popularly called *dun*, as occurring for instance in African Owls and in Carriers which really should be called "lavender." Fancy has certainly not found their true characters!

If I would succeed only in getting the real idea about the mutual relationship of the 12 main colors firmly understood and established in the fanciers' minds, my trouble of writing this little book would be well paid.

Here is another error: Dun is no mixture of colors, but a principal one. You take the real dun this time, the color of the *bars* in the blue silver, and examine the feathers under the microscope, and you will find only one kind of pigment granules; *black granules*. In a so-called dun Maltese, which is, of course, a brown, the pigment is brown, never a mixture of different colors together. Dun and brown are fundamentally, genetically different; really, in view of the present confusion, I might ask how it has been possible that authors will discourse about color breeding without a concise definition of the twelve colors as they really are. To be frank about it, the whole literature about breeding "silver" and "dun" is practically of no value.

Dun can be best improved and crossed with black; a dun cock with a female black gives dun female and black male young (crisscross inheritance). Of course, dun shows just exactly the same kind of defects as black, of which it is the dilute form. If the "diffusion" of the pigment is incomplete you get a dun check rather than a regular dun, that means duns with traces of chequering or barring. Brown is another excellent cross for dun; a dun cock with a brown hen giving, of course, dun female and black male offspring.

I am not in favor of crossing dun with red or yellow, except in those breeds where the practice is firmly established with good success. The best way in that case is to mate a yellow cock to a black hen. We then expect only the female young to come dun.

If I had good black and were anxious to make dun, I would rather mate with lavender, if I could get it. Let us bear in mind that all we have to do is to introduce the dilution factor into the black, and *not* to introduce any fresh kind of pigment or pattern or anything else. A lavender Owl with a black

hen ought to give directly the finest dun young hens in the world. Dun and lavender belong together, as the dilute counterparts of black and brown.

V. Brown Silver

This rather attractive color has been much neglected and confused with others in the history of pigeon fancying. It is so extremely easily recognizable and yet what a mass of speculation has been heaped upon the birds of this design!

Brown silver occurs in many breeds, but especially in Kings, Runts, Mondaines, Maltese, Pigmy Pouters, Dragoons, Carriers, Homers and New York Flights and Orientals. It has exactly the same pattern as blue; as to the color of the bars, this is like that of unpolished milk chocolate in the wings *as well as m the tail*. The ends of the flights ought to be brown too, but they are often bleached to nearly white; the neck has a similar but more glossy hue, the rest of the feathering being of a delicate brownish lilac tinge which passes into bluish on the keel.

This color, which is absolutely constant in heredity and a principal color, is so clean cut and well defined that there is not the least excuse for confusing it with "blue" silver or with mealy. Why, look to the pale tail of a mealy and notice the difference. It has *no* chocolate bar. Well, it might sometimes have a blackish or grayish bar in the tail, but brown would be quite an exception for a mealy, and still then the bird lacks that *touch of uniformity* which is prevalent in the brown silver. (See under XI.)

Another big difference with the true silver is that the latter is dilute, whereas the *brown silver* is an *intense* bird. So, they are not even closely related and there is no reason whatever to put these widely divergent colors into one class in our shows, perhaps distinguishing them as "brown-barred" and "black-barred" silvers. This is inefficient and misleading, as it suggests relationship with only minor differences, whereas in reality every feather is different.

Now, if you cross brown silver with true silver you get blue. If the silver parent happened to be a male, you get blue male and silver female young. This proves satisfactorily the *intensity* of the brown silver as a color, because that of the blue is derived from it.

There exists, of course, a chequered series from brown silver to brown exactly parallel to the false series from blue to black.

Brown checks are often seen in the dragoon. Some self yellows or reds will readily produce them with brown silver. In these checks the tails are, of course, always dark brown at the tip. Other reds and yellows, however, mated with brown-silver produce offspring with black pigment (so-called synthetical black) running all the way from blue to black. (See under Red.)

In Pigmy Pouters the brown silver is often crossed with red; we are not in favor of this practice. Blue is a much better cross for them, but it is preferable to keep them by themselves.

Brown-silver may occur with light and with dark rumps, exactly parallel to blue. There is a considerable variability in this color, quite as large as in blue, the best, soft but brilliant shade with clean cut bars being exceedingly pretty. The writer submits his findings and observations on this color to the fancier with a desire for serious consideration. Brown silver bears the same relation to blue silver as brown to dun, and their erroneous confusion is of the same type.

VI. Brown

Brown is not so often seen; we notice it sometimes in Dragoons and Mondaines, it is frequent in Maltese and Carriers. There are some Homers and Tipplers which might be called brown, but they belong to an entirely different type of coloration, and we exclude these from our definition of brown.

The true brown as adopted here is deep chocolate and has the same glossy lustre as black. It has been frequently confused with *dun* especially by the Germans, who have no separate word for dun. But brown is just as distinct from dun as the corresponding colors are in rabbits, where the brown is called *havana*. Rabbit fanciers have a better eye for color than we pigeon people, and accordingly they have a better set of names. I guess some readers will think that they have a regular brown Homer, and if so I pray them to inspect his tail. If it is paler than the rest of the body, your Homer is simply a stage between ("dominant") red and black. The true brown has a brown tail of the same shade as the rest; in fact, the whole bird is absolutely uniform in color; it is a rather pretty color and it should be encouraged in our shows with some specials, for it is by no means easy to obtain. (So-called "golden dun" in Carriers.)

Brown can be bred from brown silver or brown check with good red or

yellow. We seldom get a good brown in this way, checks being more frequent; even blue check and black may appear. The latter is due to some hidden agents in the red, which always produce black pigment if working on brown pigment (see below). In this case we have to resort to another red bird (or yellow). On the other hand, black with brown silver will produce, of course, *black* (perhaps some checks) and on inbreeding the black young we will get the next year about one-eighth of their offspring brown.

Technically: Black is completely dominant to brown and brown in its turn is completely dominant to red, provided the latter is free from "dominant-red" and other hidden factors, as is frequently the case.

It is just as difficult to produce a good brown without any chequering or pale tint in the inner vanes of the flights and in the tail as it is to make a good black.

VII. Lavender-Silver

Lavender-silver is the corresponding dilute color to brown silver. It is sometimes cropping out in Homers but seldom seen in fancy breeds, being of a somewhat faded appearance. It can, of course, be easily obtained from brown-silver females by crossing them with yellow males. If black or blue check appears then we should try another yellow male, until we get, according to our well known criss-cross rule, *intense male* young, running anything from *brown silver* to *brown check* and *brown*, and *dilute female* young, running from *lavender-silver* to *lavender*, including lavender checks. These birds have a conspicuous terminal band in the tail, which distinguishes them perfectly from yellow barred and the corresponding checks. It is more difficult to make lavender-silver males. We have to cross, therefore, the females with brown silver cocks; the offspring will be again brown silver and yield on inbreeding the next season some lavender-silver young (one-fourth), irrespective of sex. So this takes quite a number of years, and it is a real sport. I once crossed a yellow male with a brown-silver female, and one of the male young was *blue*. Mating this again to brown-silver; one in eight of the offspring will be lavender-silver, irrespective of sex. One cannot breed without a little luck!

Concluding, the three kinds of "silvers" mentioned so far in these pages, we have blue silver, brown silver and lavender silver. The first and

third are dilute, the second is intense. A common feature for all of them is that there *is a bar m the tail of the same color as the bar on the wing.* This; is the critical test, and it is a very easy one. Any bird with the two bars (on tail and on wing) different is no true "silver."

I suggest the Fancy to adopt this nomenclature as it will prevent much confusion and disappointment. In previous papers I have used the name "yellow-silver" which is not so well adapted.

VIII. Lavender

Lavender is a rather attractive, uniform color, in Europe it is occasionally so called, though this nomenclature is by no means constant. It would cut an especially good figure in the Dragoon, the elements to make it being so close at hand in this breed. It occurs, for instance, among African Owls where it is called "dun."

We have mentioned already the fact that on mating the right kind of yellow cock to a brown hen we get anything from lavender silver to lavender check and *lavender female young*. The kind of yellow to be used cannot be judged from the exterior of the cock but must needs be tested in the very mating. Again here it is a much more difficult proposition to constitute a *lavender male* Dragoon, which would be quite an achievement for our shows, being worth at least a gold medal.

In case there are some real brown males in our first cross (from the yellow male and brown silver female) it is not so difficult. We mate them, then, with their lavender (check) sisters and may expect one-fourth of their offspring lavender, irrespective of sex. But if we have obtained nothing but checks, we cannot raise the grandchildren "above" the check pattern and have to resort to a cross with a brown (say, a good Carrier), which gives again brown to start with and takes another year to attain our aim. This is quite a job. Therefore it is easier to start with a yellow Carrier cock and a brown Dragoon hen. Because blue and checks are rare in Carriers, this cross will most likely not produce any checks, but on the other hand the probability is greater that we get black instead of brown and dun instead of khaki in the first generation. Trying out is the only way here.

Lavender has been called khaki by the author in previous papers.

IX. Red and Mealy

We have now arrived at the most difficult chapters, i. e., red and yellow. These have been dealt with by the present writer in an article "Inheritance of Red in Pigeons" in March, 1924, of the "American Pigeon Keeper," from which will be quoted freely:

"I want to state the main point of the theme right here: There are two kinds of red, absolutely different in their appearance and mode of inheritance. One is dominant over black, the other recessive to it. This means that if we cross a dull black hen with a red of the first type, we will get red in the children. If, on the other hand, the red cock had been of the second, the recessive type, the young will be black or at least have black pigment. It is necessary to grasp firmly this idea before proceeding any further.

"Now our principal aim for the time being is to demonstrate the difference between these two types of red. They have hot generally been recognized by the Fancy and in certain breeds, where they occur together, they have been mixed up with most disastrous results. Let us try to unravel them here."

So far we have made the acquaintance of a black and a brown pigment in pigeons, both giving rise to four different "colors." Now, we get a third kind, a red pigment, and again this may produce four different colors, thus making the full dozen altogether.

It appears that these three different fundamental pigments, black, brown and red, are not wholly independent; by some chemical agent or other it must be possible to transform them into each other. Perhaps this is by way of oxidation and reduction.

Now let us pause and start in our thoughts from the red. We transform it into brown, and the brown again to black. This black, thus obtained, is the highest stage of pigmentation. Therefore, if we cross it with one of the lower stages, either red or brown, we get *black.*

But now the reverse process seems to be possible also. Starting from the black the former chemical process can be reversed and neutralized again and we get back from black to brown and thence to red, and then even to white.

Summarizing the fundamental facts, we recognize the following series

of colors. In the first place there is total absence of color which must be called recessive white. Dominant over this is red, dominated by brown which again is dominated by black. Dominant over black is an agent, which reduces black to a not yet analyzed brown, which is usually further reduced to red. Dominant over this red again is dominant white, covering all the preceding stages. This takes no account of glossy black.

As far as *red* is concerned the main thing for the fancier is that there exist two fundamentally different types of red; one dominant over black, the other recessive to it. The breeding of them is equally different.

Absolutely pure recessive red can not be distinguished from absolutely pure dominant red. But this is almost a theoretical case. At least I have seen the like in dominant red only in Oriental Rollers. In both series there exist many transitional stages between black and red and when we call a bird "red" it frequently means that the prevailing color is red, but that there are traces of black present. From the character of these traces we can decide whether our bird belongs to the dominant or to the recessive series. However, quite a few pigeons appear to bear a combination of both "dominant" and "recessive" characters.

For a better understanding of this difficult proposition we will begin with the study of the dominant series.

I. Brick red. It will be obvious from the foregoing, that chemical agents, reducing the pigment of a black pigeon, are apt to give rise to various shades. A complete expression of the agents concerned in this color-series reduces a dull black pigeon to pure red, a blue check to red check, a blue to red-barred. This means that the clumped and the spread pigment are reduced in a corresponding way. Birds of this type are probably extremely rare. If we cross a red male of a pure strain of this type with a dull black, we would produce red young. If the female was of this red and the male black, the male young would be red, the female young black (criss-cross inheritance). But in practice the red of the young would not be so pure as that of the parent, and either show some dusky mixed into the red, or, which is worse, there might be black flecks. The safest thing to do is to breed this type of red (and yellow) only by itself.

The case just mentioned is highly theoretical, because as a rule another mate comes into the play, which tends to complicate things: examination of the tips of flight and tail-quills will reveal these to be whitish instead

of red. The pale area at the tip of the flight extends along the outer vane;in the tail the washed-out area, as it is technically called, extends as a terminal bar across the quills; but sometimes large parts of these quills are included in the washing-out, leaving not infrequently only a narrow strip along the shaft of the feather red. So common is this feature that it may serve as a practical way for the average pigeon fancier to discriminate between recessive red and brick red: pure recessive red (which will be dealt with below) may sometimes have a pale tail, but never the characteristic washed-out tail, in which the regions with clumped and with spread pigments are so typically differentiated. The writer made sure that a so-called recessive red may even *carry* the agents for producing washing-out without being able to show the least trace of this feature in the appearance of the self red bird. Let us repeat that the typical dominant mealy or red-barred pigeon has a red neck and wingbars, mealy head, shoulders and breast; the rump is neutral gray; the tail has at least a washed-out crossbar and the tips and outer margins of the flights are of the same, almost white color. Contrary to expectation, however, the inner vanes of the flights and the proximal parts of the tail quills are not mealy, but red, although they correspond to a blue that is a clumped area in a blue pigeon.

Professor Cole and his co-workers have thought that a single factor, which they symbolized by an A, was responsible for this very complicated change of a blue pigeon into a mealy one (and of a black into a dominant red, which amounts to the same), although they laid stress on the immense variety of colors and shades included in this group.

However, we will demonstrate that this is not so. We will see that for one thing the "washing-out," although so commonly associated with this type of red, is an independent feature that can be separated. Furthermore, the ordinary dominant reds are usually a mixture of two types: the regular brick red and the "tippler-red." Again, in the former one another characteristic viz., *lacing* is invisibly concealed.

We may call the corresponding spread or self-color to mealy: brick red. It is common in homers. We will also find that glossy black and dull black behave quite differently toward the dominant reds.

II. The color in Danish Branders and Show Bronze Tipplers is very important. In both breeds the entire plumage of typical specimens is red

of a deep mahogany red, except the tips of the flight and tail-quills. The roots of all other feathers are black or dusky. This color is dominant over blue, but no mealy is ever produced, which I interpret in this way: that *clumped black pigment* is reduced completely to *spread red pigment*. Of course the black (spread pigment) of neck and wing-bars is directly reduced to deep red color. Now on further examination much of the mystery is revealed: It seems that, for instance, in the inner parts of the flight-quills the (clumped) blue is *first* diffused to black and *then* reduced to red (sometimes an unreduced black margin remains). This feature certainly links the "tippler red" with the "lacing red" and, in fact, the only practical difference is a matter of arrangement of the resulting red, not a matter of principle. But the outstanding fact seems to be an *extreme development of a character* which in mealy or brick birds is only present in the *inner parts of the flights and tail and in the breast*. In fact, it seems as if some tippler-red were present in most pigeons of the dominant (coarse) red type (1). The well-known group of *Archangels* seem to belong in the same group with the Bronze Tipplers. Here the head, neck, breast and belly, including the lower tail coverts, are of a shining self red or yellow, whereas the tail is not infrequently just blue and the wings black with the inner vanes of the primaries often blue or kite. The writer possesses a strain of Archangels in which the black upper parts are replaced by yellow-barred or creamy (called Goldgimpel in Germany). Crossing a female Goldgimpel with a normal black-and-red Archangel male he obtained blue check female young in which the breast only was yellow. This proves that in general the red (yellow) of Archangels is of the dominant tippler type, and that in the Goldgimpel *both types* of dominant *yellow* are present. Most likely the brick red is recessive to the second, or tippler-type of red. In the Goldgimpels the bases of all feathers are white, never dusky.

This second form of dominant red, which we have termed the "tippler red," is much less developed in the Koburg Lark with its reddish breast. Intermediate between this and the true Archangels are the Nuernberg Larks. Here the head and breast are of a soft, even yellow, but the keel is

---

(1) Extracted blues from Mealy x blue crosses frequently have Tippler red in the flights, inherited from the Mealy grandparent. (Cole.)

not included. The writer found the light Archangels a very profitable cross for Nuernberg Larks and made sure of their kinship in this way.

In crosses of a glossy black Tumbler with a Danish Brander and Archangel the writer found the red of both these breeds to be recessive versus the glossy black. Mating brother to sister of such a cross the red reappeared in the second generation. This is quite a noteworthy fact.

Again I want to call attention to the existence of a full series of intergrading colors between the Bronze Tippler type and the Black Tumbler. These are the so-called Kite Tumblers, which show the red sprinkled over the black in an irregular way with a certain preference, however, for the inner primary vanes, the head and the breast. The Kite Tumbler is one of the constituents in the makeup of the Almond Tumblers, highly unstable forms dealt with in an appendix to this book.

And now the practical consequences of this long, unwieldy but necessary discourse! It gives the only satisfactory explanation of certain curious experiences of fanciers of show Tipplers and Kite Tumblers. We know that in these breeds the black has always a tendency to increase. A pair of good Bronze Tipplers, for instance, may yield young with an ugly black tail and black rump: impurity of ancestry causes this. Now in order to increase the amount of red one is inclined to try a cross with a solid, self red (recessive red, see below). Invariably, we will see that this only increases our troubles: such a cross will, perhaps, yield some solid self red and some bad kites with more black than ever.

Acquaintance with the facts as stated above solves this mystery. Our Bronze Tippler is essentially a bird with *black* pigment in which a large share of this black is suppressed unto red. Now by crossing this with an alien form, not containing any of these dominant suppressing agents, responsible for the Tippler-red, we needs get forms with less of this Tippler-red, that is, with more black. Therefore, no such outcrosses; better keep on, selecting for more and better red in our strains of Tipplers. Occasionally we see forms in which red has (almost) completely encroached on the terminal black of flights and tail, thus making a solid red. Compared with the ordinary, coarse kind of brick red discussed above, with its washing-out and other liabilities, the "tippler red" is an infinitely superior form, indispensable in many breeds.

III. We have to come back now to "washing out." As stated above, in its restricted form this feature is represented by white tips and outer vanes to the flights and a white subterminal band in the tail. This means that some areas of dominant red are reduced to a "lower" color in the normal representatives of the dominant-red group, say, for instance, in a red check Homer. Quite frequently, however, the white is extended considerably farther. This extent depends to a high degree on the amount of "Tippler-red" (as we termed it) present in our bird, as contrasted with the other forms of dominant red. As a matter of fact, this "Tippler-red," so frequently present in the tail-quills, seems hard to be "washed out." It is not uncommon to find dominant reds, in which the washing out has encroached on the rest of the tail, on the rump, the belly, yea, on all the clumped red (or yellow) areas. We know "mealies" with a red neck and red wing bars on an almost white background, the flights being also very pale. In the meantime the dusky at the root of most feathers in a normal dominant red is also reduced to white.

Extension of washing out on a dominant red with very little red and much black left results in a curiously ugly, ticked form, so called dominant gray.

The writer knows of one really pretty form of washing out:

a self red (apparently Tippler-red) in which all the terminal black on flights and tail is reduced to pure white, thus making nice white bands in the red birds—in some particular cases washing out is hard to distinguish from grizzling, although the favored areas are almost mutually exclusive.

Washing-out affects both spread and clumped pigment.

To get a clear understanding of the disasters resulting from a cross of ordinary dominant red with black or blue we have to realize that we are likely to get the dirty offshades of red referred to in a former paragraph, and in addition we may get some phase of washing-out in tail and flights. This makes a three point proposition. What a scope this gives for various tints and offshades. Mentioning only a few:

Mealy with red wing bars and pale tail bar.

Red with pale in tail and flights.

Dirty gray with a trace of red on wing-coverts.

Bad red with ashy flights and ditto tail-bar.

Brown-red with black ticking.

White with black ticking.

Black with washed-out tail and Hights, etc., etc.

It will be obvious from the foregoing that washing out is not especially desirable in pigeons. Yet it is present in many Jacobins, Pouters, Tumblers, and we have to admit that Fancy has achieved great results even in this difficult line. Still, the tail and fights remain the main trouble. Have them as white as possible and never cross with anything but dominant yellow.

The best red in pigeons is the *recessive red.* As a rule it is solid, even, self red. Recessive means that this color is completely dominated in crosses with black or brown pigment. Cole has clearly shown this dominance: in crossing with black the offspring was black. Mating these together he raised a second generation in which one-fourth was red, the rest black. These so-called extracted reds are often disfigured by a bluish cast on the rump and in the proximal parts of the tail feathers.

In a Carneau-Mondaine cross the writer obtained a curious mongrel, half red, half brown-silver. This bird has true brown wing bars, but the flights are deep red and so is part of the neck. The distribution of the red is very irregular, in an almost "piebald" way. The red is recessive, of course.

This hen illustrates another very important feature. Unlike in dominant red, in the recessive red no clumping of the pigment granules exists. Pure recessive red never occurs in the clumped condition, even when the factors for clumping are present. Whatever its genetical composition may be, a recessive red shows up as a self red. (Therefore we are likely to produce checks and blues in crossing this red with blue, which is objectionable.)

No other kind of red can be bred so free from black as recessive red. For sheer, even *color* it can't be beaten.

If the reader has understood our analysis so far we will proceed one step farther. The recessive red may contain the genetic factors for dominant red without showing any external trace of it, as this can only be revealed by the presence of black pigment. The consequence is that if we cross such an unhappy bird with dull black we immediately get some

shade of red and washed-out tails in at least part of the offspring. Of course, red pigeons of this type are absolutely worthless for crossings and in no case is it more imperative to know the pedigree of a pigeon than in this case of recessive red, because of the various hidden qualities, not betrayed by the looks of the bird but betraying themselves in crossings.

To impress this still more on the reader's mind I will summarize here the full series of risks we run in crossing a red (or yellow) pigeon of unknown descent with any other color outside the red and yellow group. We will see that truly no other colors equal them in hidden properties.

First: Be sure that your red is recessive. If the tail is sound red all over, the probability is that your red is recessive.

Second: Even then the bird may hide some "dominant" red factors.

Third: It may contain an agent which darkens brown of any pattern to the corresponding black design.

Fourth: It *may not be a true self* color *genetically*, and therefore only fit for crossing with a solid color, like black, dun or brown, but not with a barred pattern.

Two, three and *four* can only be tested in crossing. Crossing with red of unknown pedigree is experimenting in the dark. Fortunately there are certain breeds in which red has always been crossed with black and dun with good results, like the Barbs and certain Pouters, Jacobins, etc. This is a matter of practical experience and infinite detail and the present writer is only intimately acquainted with about two dozen different breeds and has to refer to the practical breeding literature for detailed information about these things in the other breeds. For instance, he worked with German beards (which belong to the Tumbler family) and found crossings of red (or yellow) with blue (or blue silver) objectionable as they yielded checks as well as various shades of washed-out red. However, one particular red female produced a good black in this way. Again, he found yellow dean leg Tumblers and Steiger Pouters of small value for crossing with brown on account of hidden "blackening factors," but one particular yellow Tumbler produced the desired brown all right in this way. He found the red and yellow of many swallows to belong to the dominant red series. He will not discuss here the so-called "red Modena's," because they belong to the group of black-and-red-laced birds.

X. Yellow

Yellow is the regular dilution of red; all the dominant and recessive red pigeons have their corresponding yellow partner, and practically all that has been said about red applies also to yellow so that we can be brief.

Yellow is the weakest color, "weaker" even than yellow silver. A very soft shade of yellow we call "Isabel," which goes frequently with white wing bars (Bruenner Pouter, Swallows); below Isabel comes white. The danger of whitening is always lurking more or less behind yellow; the young of two yellows may for some reason or other come very pale, which has given rise to the practice of crossing with red. Red and yellow are the best crosses for each other; a yellow male and a red female will, of course, produce red male and yellow female youngsters (criss-cross inheritance).

Leon J. Cole, Madison, Wisconsin, has done much valuable work in investigating this dilution of colors, but part of the problem remains yet unsolved. It has been assumed, for instance, that the presence of the "Intensity factor" will cause an intense color all over the bird and yet in the almond Tumbler red and yellow occur close together. The breeding of almonds is so difficult that we have reproduced Chapter IX of the well-known Book of Pigeons of L. Wright as an appendix to this book.

Again in the light bronze Archangel the black parts correspond exactly to the black parts of the dark bronze Archangel, but the rest is yellow and the writer admits to be puzzled by this occurrence which is of the same kind as the Almond case.

Imperfect specimens of light bronze Archangels never show any dun. Their lower tail coverts show yellow and black in the *same* feathers. This means that there might be a dominant inhibiting factor linked with the dominant Archangel-red and preventing the intensifying of color of the area covered by this reddening factor, leaving it yellow.

Yellow would seem to be a desirable cross for lavender silver (which is the dilution of ordinary brown silver). If tested out, however, we will find that many yellows will produce anything from dun to silver check and blue silver in this way. It is the exceptional recessive yellow that will produce a regular lavender. A "tested" yellow Carrier or Dragoon is an invaluable bird for this purpose, especially if it is a male. Just as in reds, there is infinitely more similarity between different yellow specimens

than between a number of blue checks or a collection of blues or dun. However, the similarity is an exterior one and the internal differences may be just as great.

XI. Yellow Barred or Creamy

Yellow barred is the regular dilution of mealy. It has true bars on the wings only, the terminal area on the tail being pale washed-out, which distinguishes this type from lavender-silver.

Intermediate shades between yellow barred and true silver are sometimes wrongly called "Isabel," which color, however, is entirely different and confined to a pale yellow in the presence of white wingbars, as in Bruenner Pouters, Swallows, etc.

Yellow barred occurs in the same breeds as mealy. Neither of them are, on the whole, very desirable colors, and whereas it is very easy to breed them from blue and dominant red or dominant yellow, we will not go into the details because they ought to be discouraged, being so very liable to throw off-shades in the direction of the blue.

It needs no comment that mealy and yellow barred are the regular matches for each other, and that a yellow barred, cock gives with a mealy hen mealy male and yellow barred female young.

Yellow check is, of course, the intermediate pattern between yellow barred and dominant yellow and easily produced in their crossing. Most yellow barred males with a red chequer female will yield yellow check female offspring.

Pale yellow barred is sometimes called "creamy," in which any trace of (blue-) silver ought to be absent even from the lower part of the tail. This is very rare. Creamy homers are rather pretty birds. Yet, because of the essential impurity of tail and flights they are inferior in the writer's mind to true yellow. They can, of course, be crossed with nothing but mealies. Therefore, let us improve them in likewise manner as the mealies. Let us give them yellow instead of the washed-out areas. If the author's general analysis is right, the possibility of this is granted.

XII. Grizzle

Grizzling is a peculiar type of coloration, typically occurring in a blue bird, caused by the fact that part of the barbs in the feather are white. According to the fanciers it seems to exist in the desirable pattern only in the heterozygous

condition, which means that it has to be kept up by constant crossing with blue or blue check, to which it is dominant. This is to be compared with the blue Andalusian fowl. Grizzles, mated together, throw a too white offspring (on the whole) but mated with non-grizzles they throw 50 per cent regular grizzles. Very light grizzles as occurring commonly in Tipplers have only the terminal margins of tail and wings black, the rest being white with traces of wing-bars left, because grizzling subdues blue more readily than black. There may be separate grizzling factors for spread and clumped pigment.

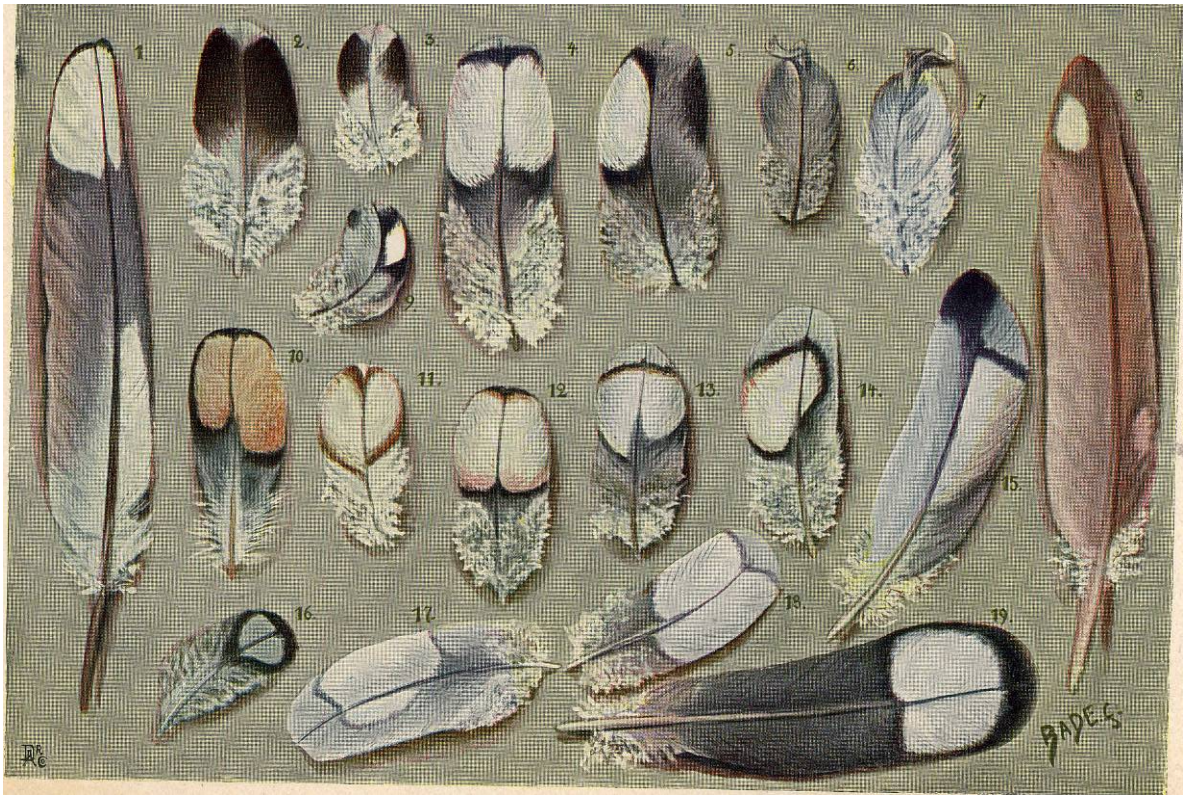
As all dominant red colors derived from black can be further reduced to white, so probably grizzle represents the corresponding form of white to "tippler red," just as washing-out corresponds to brick.

XIII. Lacing

Lacing is the type of coloration farthest remote from any natural color or pattern in pigeons and therefore the greatest achievement of Fancy in this field. We define lacing as "central reduction" of pigment and will explain this as we continue. We comprise under the term lacing also *spangling* and red or white bars.

Fundamentally the phenomenon of lacing is intimately connected with "tippler-red." In any lot of common pigeons we will find some blacks or checks with a little "rust" on the shoulders. Sometimes this rust is in the form of an irregular sprinkling and may extend on other parts of the feathering as well. This red has been mentioned already before in the kite Tumbler. Sometimes, however, the red occurs exclusively in the central parts of the black feathers, preferably in the region of the wing-bars and checks. This is dominant red; at the same time it is lacing. The presence of *mealiness,* as in most red Homers, will easily conceal all evidence of lacing and yet I believe it is invisibly present in most of them.

We find a better developing of lacing in the Modenas, especially in the Schietti. A Schietto may be blue, having the wing-bars red with a narrow black line encircling the red block. The central reduction of the black fleck leaves the terminal or rather peripheral black unaffected and this we call lacing. Lacing is present as soon as this peripheral black is sufficiently narrow.



LEGEND COLORED PLATE

Illustration Showing Spangling and Lacing Characteristic of Pigeon Feathers of Different Breeds

Nos. 1 and 8 illustrate flights of Blondinettes, showing the independence of the terminal and the central white in lights of spangled pigeons.

Nos. 2 and 3 from wing coverts Koburg Lark.

No. 4, spangled Polish Lynx.

No. 5, white barred Polish Lynx.

Nos. 6 and 7 Frillbacks.

No. 9, spangled Polish Lynx.

No. 10, laced red Bloindinette.

No. 11, spangled Bloindinette, in which the black is entirely suppressed by red, but the red in its turn incompletely by white.

Nos. 12 and 13, Satinettes, laced and spangled with interior red margin.

No. 14, from the wing bars of Bluette.

No. 15, spangled Blondinette.

No. 16, from wing covert Bluette.

Nos. 17 and 18, from wing coverts Ice pigeons.

No. 19, a tail feather of a Bluette.

. .

If true black-and-red lacing is present in a self black pigeon, every feather is red but for the margin. Eventually this margin may become red, too, and this merges into solid, self red. We find this condition in the wing coverts of many mahogany Modenas.

However, the relations between dominant red and lacing are still more complex. The question of the physical condition of the pigment comes in. It appears that the agents controlling true lacing act exclusively on spread pigment, not on clumped pigment, Thus in the black-and-red laced Modenas, if the bird is fundamentally a blue, only the wing-bars are red; if she is fundamentally a blue check, the chequer marks may become red, having black margins just as the bars have. This is *spangling.* The difference between spangling and true lacing is consequently one of fundamental pattern only.

After these introductory remarks we will compare some different laced breeds. Even if we confine ourselves to fundamentally black pigeons we find the extent of lacing, i. e., its *completeness, very variable*. The most complete forms exist among the Oriental frills. The least development in fancy breeds we find in Bruenner Pouters and some Swallows (black, red barred). Intermediate between these is black, red chequered, both forms occurring in Modenas.

A black, red-barred Modena frequently has black primaries. Red checks on a black background represent a more complete phase of lacing; red terminal spots on the flights (in the place where the black tips are in a *blue* flight) begin to appear. In completely laced birds, the flights and tail quills are completely laced, but this is only possible on a self colored background, for instance, *black*. It appears that a red-barred blue may genetically represent a very high completeness of lacing, and not show this on account of the pigment in the shoulders being largely clumped and "irreducible."

In the chapter on dominant red, we have already referred to the fact that the reduction of the blue of inner primary vanes gives rise to well spread red ("Tippler-red"), powerless against glossy black. It is curious to note the parallelism between the completeness of true lacing on the wing coverts and the reddening of the inner primary vanes with tippler-red. Sometimes the latter area merges with the terminal red tip of the flight,

which has a different origin. The red, black tipped flights of the red spangled Modena are independent from true lacing and neither characters are truly sex-linked.

In a laced pigeon agents for reducing clumped pigment outside the flights ought to be absent, but frequently they show "gay" tails, that is partial reduction in the blue. Of course, we have to admit that there is no fundamental difference between gayness of a blue tail and the same feature in the flights. We scorn the one and welcome the other. So we recognize the following groups: a. The attack on the black areas of the wing coverts. b. The attack on the black (spread) tips of the flights, c. Attack on the tail bar. d. Tippler-red in flights and tail. A, b and c constitute the "completeness" of the lacing.

The above analysis is of some importance to guide our matings. If we want to cross a black-and-red spangled Gazzo with a red-barred blue, we should be sure that the latter shows a large amount of tippler-red in the primaries. On the other hand, I would not cross a black red-barred with anything but a black, red-check, as black flights are desired here. In general, the type of the primaries requires attention on account of that curious parallelism in the series of an increasing amount of "tippler-red" in the flights and that of increasing completeness of lacing.

There is a kind of glossy black, immune to all lacing factors.

In the next class, the reducing of black pigment drops down from red to *white*. Many red laced birds show some central traces of white in the red areas. Black-and-white laced birds are even more common than black-and-red. We find them among Strassers, Lynxs, Ice Pigeons, Starlings, Monks, Priests, Trumpets, Brunner and Saxonian Pouters, Prague Tumblers, Suabians, Modenas, etc. All that has been said about "red lacing" applies also to "white lacing." If the central whitening is incomplete there is a reddish margin between the white and the peripheral black; all combinations of the two types of lacing are objectionable. This white is, of course, dominant to red and in fact often shows up as red in the nest, becoming white in moulting.

It is obvious that we can cross white barred blue, spangled and black laced exactly according to the rules given for blue, check and black. For instance, if we cross the white barred blue with the laced we are apt to get many spangleds, etc. Again, two spangled birds should never yield a true

lacing, but two (impure-bred) laced might give spangled. In the same way, two spangles might yield a blue-white bar, but never two white bars. will give a spangled, etc.

If we mate a very white laced bird with a black white barred, we may expect the young to have an intermediate amount of white, that is: white check. The same is true for spangling.

Again, there is a white in the inner parts of flight and tail-quills, exactly corresponding to the areas of "tippler red." For instance, a black-and-white spangled swallow will show white inner vanes of primaries quite independent from their white or black tips. This is identical with grizzle.

Other colors; Reducing of pigment to white may occur in all other colors; reducing to red may also occur in pigeons with brown pigment, which is a feature of general importance. For instance, white bars on the wings are found in a great many red and yellow German varieties, more frequently than lacing or spangling. All reds and yellows with white bars the writer has seen belonged to the dominant types.

Lacing attains its highest stage of evolution in the Oriental Frills. Let us for a moment recall to our mind the twelve fundamental colors and let us think them to be true, completely "white laced." We then get the following set of new patterns:

Blue white barred and blue spangled (check); blue silver white barred and blue silver spangled (check); black laced; dun laced; brown silver white barred and brown spangled (check);

lavender silver white barred and lavender spangled (check); brown laced; lavender laced, called "sulphur"; mealy white barred and red spangled (check); creamy white barred and cream spangled (check); red laced; yellow laced.

Of course, just as brown is always confused with dun, so true brown laced, so common in Orientals, is nearly always erroneously confused with and called "dun laced"; other people prefer to confuse them with red laced. The matter is highly complicated by the fact that in Blondinettes different feathers may show different lacing; thus a bird may be essentially a brown check; there is a white bar in the tail. However, on the wing coverts there is no marginal brown left; the central area is white and the margin red. I call this brown spangled, although there is much

red. We have to admit that there is a perplexing variety of colors in the Orientals, but this makes a system of some kind more urgent. Let us base the nomenclature on the fundamental color of the bird. Again, if in a black laced Blondinette some feathers have lost their black margin, I still call that bird black laced. A brown laced crossed with a brown-silver white barred may produce brown spangling (arrow points), etc. In a general way the intercrossing of the twelve main colors may be practiced exactly in the same way among the corresponding laced patterns.

Of course the four white-barred varieties may be mixed together and if you have understood from the preceding pages how to produce lavender silver from brown silver, you will be able now to make the same things in white bars. Again, as the sulphur laced *probably* corresponds to lavender, we understand that same is a dilution of brown-laced and that a sulphur-laced cock with a brown-laced hen will give males of the latter and females of the former color, etc.

For all these reasons I prefer to call the fundamental color on which the lacing is superimposed the *ground color*, which seems to be contrary to custom. There is another reason for this. So far we have silently assumed that the spread-out pigment has been really suppressed and replaced by white, but for the edging. But here again this is the ideal condition. In the young birds this suppression is in reality hardly ever complete, the black, for instance, being reduced to some tinge of brown or red, which may clear up in the next moult to white. Yea, this complete reducing to white may take place only in the center of the lightened area, thus leaving the circumference on the half-way stage which leads to a double lacing (so-called tri-coloration). In this way blue may seem to be purple, etc. Remember, that all lacing factors are *centrifugal suppressors.*

So, if we want to apply the rules, formulated in this book for crossing of the different colors, we must look in the first place to the color of the exterior edge of the lacing, this being the fundamental one, and not subject to material changes in the adult bird and following the common rules. On the other hand, the center is of secondary importance and depends largely on the age and general conditions of the bird. A red-barred blue swallow may moult into a white-barred, etc.

Concluding: The exterior appearance of a "laced" pigeon is controlled by the following groups of agents: 1st. The fundamental color. 2nd. The

fundamental pattern (checks, bars, etc,). 3rd. The degree of completeness of lacing (full lacing, chequer-stage, bar-stage). 4tti. The chemical level (either reduction to red or white). Finally by age and health.

XV. White

We will deal very briefly with white. We have already met two types of white, both dominant to black. One is the final stage of the reduction of dominant red to white, as in "white Tipplers" the other the complete "washing out" of black. These, if properly differentiated, yield three kinds of white among which one is partial and two solid white. In addition there is a pure recessive white.

White is unfit for any crossing. Suppose we cross the first type of dominant white with black and mate the young with each other. *Dominant red* and different types of grizzle may appear by and by. Again, two white pigeons may give a colored offspring.

Splashed, pied and mottled patterns are too difficult to be treated here. Some remarks are in the appendix on almond tumblers. The genetic study of these patterns in general has proven extremely unfruitful and unsatisfactory.

XVI. Summary

Conclusion: Definite evidence is given about the fundamental checkered pattern throughout the range of pigeon colors. This pattern is based on the condition of the pigment grains; either clumped or spread in definite areas and the relation of this condition to all other color factors concerned in the keynote of the whole system.

A complete account of this entire system shows that it naturally consists of two parts: The first group is composed of colors which *lack* certain single factors as compared with the true black pigment (brown, red). On the divide we arrange all factors controlling the microscopial arrangements of black pigment granules. (The affinities of "glossy black" are incompletely analyzed.)

The second group comprises the factors responsible for reducing black pigment to a lower chemical level (first red, then white). Of these there are six groups, and they are all of multiple nature. This simple scheme is the framework on which all the dazzling variety of colors in domestic pigeons is displayed.

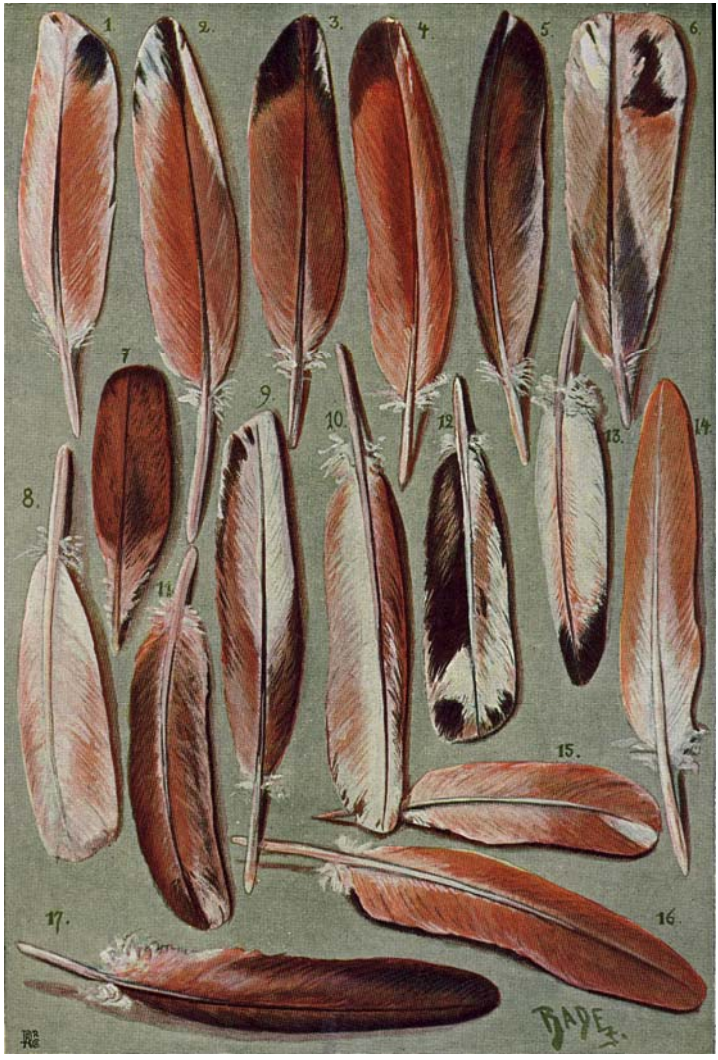
COLORS OF DOMESTIC PIGEONS

Intensity				or	Dilution		
Recessive White	Recessive Red	Brown Pigment. Complete line of patterns	Black Pigment. Complete line of patterns	Centrifugal Red Black-and-Red lacing	Brick red. Complete line of patterns	Tippler red No pattern	Glossy black
(No pattern)	(No pattern)			Centrifugal White Black and White lacing	Washing-out No pattern in complete stage (white)	White Grizzle No pattern	No pattern
Recessiveness ←			Occurring in wild forms				→ Dominancy

In this diagram the main results of the book are summarized "PATTERN," refers exclusively to the various combinations of the spread and clumped phases of the same pigment, such as chequers and bars. The groups are arranged to the left and right of the group with black pigments, according to their respective recessiveness and dominancy. The three whites are each dominant over the red above them in the same column.

Characteristic Feathers of Almond Tumblers

1. Flight of almond cock, two years old.
2. Flight of almond cock, three years old.
3. Flight of almond cock, four years old.
4. Flight of almond cock, five years old.
5. Flight of almond cock, six years old.
6. Tailfeather almond cock, two years old.
7. Saddlefeather almond cock.
8. Flight of an almond hen, one year old.
9. Flight of an almond hen, two years old.
10. Flight of an almond hen, three years old.
11. Flight of an almond hen, four years old.
12. Tail feather of a splashed almond.
13. Flight of a black agate mottle.
14. Flight of a yellow agate mottle.
15. Saddlefeather of a red agate mottle.
16. Flight of a red mottle.
17. Flight of a kite female.



APPENDIX

Robert Fulton on Breeding Almond Tumblers

The breeding of almond Tumblers forms an independent chapter in the practice of color breeding, which has so far not been taken up by science, partly on account of the extreme complexity of the subject, partly because those Tumblers are very poor breeders.

For this reason, we have copied some paragraphs upon color breeding of almonds from "The Illustrated Book of Pigeons," by Robert Fulton and Lewis Wright, as the book is now out of print:

"We have now to consider the breeding of this fascinating little bird, but it is first necessary to mention and describe the various colors which occur in breeding it, and which are used again in crossing. Probably the almond was first formed by crossing and combining these various colors. At all events they are of constant occurrence, and when properly 'almond-bred' birds, are as valuable in breeding almonds as almonds themselves.

"First we will take the red and yellow agate mottles. Many of these in their nestling feathers appear to a careless eye precisely to resemble in marking a regular black mottle; and we have known many such purchased by amateurs, who thought they had obtained a fine cross for their breeding of mottles; of which, as they will be treated of in the next chapter, we only need say here that a mottle is a bird of the same color all over, except a rose of small white spots on the shoulders of the wings, and with or without other small white feathers on the back. But every time the agate mottle moults it shows more and more white, so that such a purchaser's hopes are soon blasted, and not seldom in such cases the seller has been reproached for having trimmed the bird, whereas, all that was wrong was the purchaser, and perhaps seller also, not knowing the difference between a true mottle and an agate mottle which is almond-bred. Yet this is readily to be seen. Though at first sight the agate in its nest-feathers may show all the color of a true mottle, if the flight and tail feathers be opened, the quill of the feather will be found either altogether or in places white, or nearly so, and the color of the feather itself will be seen to be in places a little grizzly towards the center, especially in the

flight. Often also there will be a feather nearly all white in the tail or flights, besides the white markings on the body. Such a bird it is which so often deceives inexperienced amateurs, and is termed an agate mottle. Briefly, it is a bird which possesses more white than the true mottle feathers. On the other hand, the true mottle, when the flight and tail feathers are opened out, shows the feathers, both in the quill and the web, of a sound distinct color, be it red or yellow, the quill being free from white and the web from any grizzle.

"There are also met with a lighter class of agates, which are nearly all white, and sometimes even all white. In the latter case the birds seldom have pearl eyes, being more generally black or bull-eyed, and being thus, can hardly be called anything but white almond-bred Tumblers.

"There are again what is known as whole-colored agates, red or yellow, which are frequently confounded by those who do not know the difference, with whole-colored reds or yellows. There is, however, just the same difference between the whole-colored agate and the whole-colored red or yellow, as between the agate mottle and the true mottle. On opening out the quill-feathers of the wing and tail, the true whole-feather has the quill and web of the same sound color as the body, while the whole-colored agate will have the quill white and the web a little grizzled. We point out these differences because they are important to those who wish to breed sound reds or yellows.

"Next we may describe the splash or splashed bird, which is termed by some the almond-splash, and by some are even called almonds. The difference is, however, great, and lies in this, that the ground color, instead of being yellow as in the true almond, is mixed with too much white, and the break of the feather nearly all black, so that the bird is short of yellow. The tail and flights also, instead of showing the three colors, have in most of them only the black and the white, with perhaps an almond feather here and there only. Some of these splashed birds appear beautiful almonds from the head to the rump, but there the true almond ground ceases, and the want of yellow on the rump and the too much black and white in the tail, betrays the splash. Of course, these birds are often most valuable for the breeding of well-spangled almonds.

'"There is in the next place the dun, and it is very singular that nearly all the dun short-faced Tumblers are hens. In all our experience we do not think we have met with half a dozen cocks of this color. When these birds are of the shade known as golden dun they are most valuable for breeding from. These golden duns are such birds as are of a much lighter shade—in fact a pretty good yellow—on the breast, compared with the darker dun of the body. Some of these golden duns are slightly mottled on the rump; this we prefer to those showing no white.

"Next to these is the red or yellow whole-feather. These to be true must be of the same color throughout the whole body, and especially on the rump; and it will in fact be found that if good in color upon the rump, there will be little the matter anywhere else upon the body, though, as we have said, this outward appearance is not sufficient, and no bird is really a whole-feather unless the quills of the tail and flight feathers are the same color as the body.

"Finally, there is the kite, perhaps the most useful color of all, especially when of the right or best color, for there be kites and kites in almond-breeding. To outward seeming, these birds are what most would call black, but there is a bronze lustre, or as others call it, a red or fiery glow over and through the black, which makes the true kite-color. This is especially noticeable in the quill feathers; but if all over the body, so much the better.

"All these colors are produced, more or less, in breeding almond Tumblers, and are used in breeding them, grand specimens having been produced with every one of them judiciously mated. Of course, one or other of them may have been bred for several generations, red from red, and so on, in which case they are of far less value, but when almond-bred birds they are of the greatest use. No doubt the almond was produced by combining them all, though how and when and where no man can now say. All we can do is now to give our advice in pairing. It will be readily understood, after what we have said, that perhaps a larger element of real chance enters into the breeding of almonds than of any other pigeon. No one can speak with certainty, or say that such a pair of birds, mated with the most sedulous care, will breed thus and thus. All we can do is to say what we have known produce good results, and may be expected to do so again. But, above all, much depends upon what each bird was bred from;

and we are supposing each, in the following remarks, to be bred from almonds. Again, if the produce of any pair be really good, of either sex, and especially if those which are almonds be of good color, carriage, and head properties, we strongly advise never to separate a pair which has been thus proved to 'hit' well, so long as they will breed, or continue to breed thus satisfactorily. No one, again, must expect to see pairs of almonds in the nest, but must be satisfied with one in most cases. We have known pairs of almonds produced through a whole season, but it is very rare indeed to breed good cocks and good hens from the same pair—that is, good color as well as head and beak. On the other hand, should a pair fail to produce what the breeder desires; for example, should he get no almonds, or if he does, find them poor and mealy in color, then if the cock be a choice bird we would not advise losing the whole season with him, since if the first pair be almonds and of a bad color, the rest are nearly certain to be the same, though they may be excellent in every other property. But by all means in such a case we would rematch the birds otherwise and try again, for it will be found needful to seize every chance in almond-breeding of obtaining what benefit is possible from any particularly good bird.

"The most usual, and a very old plan of breeding almonds, is to breed an almond cock with a kite hen, and many first-rate specimens have thus been bred, particularly exhibition cocks, since, as in most other color crosses, the progeny are very likely to be the same, or still almond cocks with the kite hens, though in some cases the reverse happens. Then to breed almond hens we would, if possible, and for the same reason, reverse the process, putting a good almond hen to a kite cock. This is now seldom done, but is one of the best matches we know for breeding what is so rarely seen and so difficult to produce—an almond hen of good sound color all through the body. Of course, in these and all other matches, the breeder will get, and must expect, a large proportion of other colors, such as red and yellow agate mottles, red and yellow agates, whole-feathered and even duns. The cross between almond cock and kite hen is rather too dark to repeat often.

"It sometimes happens the breeder has a strain of birds so valuable, both for its own properties and its power of transmitting them, that he is anxious to breed from them without a cross. In this case each parent

should be crossed with one of its own progeny the following season. If the cock should be of a rather deep color, and the young hen a yellow agate, agate mottle, or splash, either would be a good match; and if a whole-feathered yellow, or even a golden dun, so much the better; but on no account a kite, which, for obvious reasons, is unsuitable for the darker or very sound-colored almond cocks, breeding often too dark, especially when of the same strain. For a sound-colored hen we would recommend a similar cross with one of her offspring of the same lighter shades, and we have known both breed remarkably well.

"The cross above mentioned between a kite cock and almond hen is not easy to procure, as good kite cocks are always scarce to be got; but we like it much, and when the kite has plenty of 'the bronze it makes the progeny almost always of a fine rich ground color, if they happen to be almonds. We know no cross so likely to produce good hens and in fact, all hens bred from this cross —be they agates, splashes, yellows, duns, or what not— we would consider as most valuable for breeding, if of fair quality in other points, even though they might grow a trifle coarse. Hens should in fact, if good in head and beak, never be too hastily condemned for this fault, as they often very foolishly are. Our reason for this advice is that nearly all the very small Tumbler hens are bad breeders, some laying but few eggs, others small yolkless ones, and others again being too weakly to lay at all, but dying egg-bound, unless relieved. Others again only lay a pair or two during a whole season. If, however, the hen be of good size, she can be depended on to lay six or seven pairs of eggs, without at all affecting her health for the following season, while her offspring will give far less trouble in rearing, and be as a rule a more vigorous class of birds. The young bred from small weakly hens, as is well known, give the greatest trouble to rear, and even when reared, cannot stand the least exposure. Again, the offspring of weakly hens never look so close and tight in feather as those derived from strong birds. We would, however, on no account breed from such a strong hen with a large cock, as the progeny would infallibly be oversized; but, as the finer points come most from the cock, and constitution most from the hen, we would, so far as possible, choose a small handsome cock of good carriage, and put him with a strong, motherly hen, with a view to getting fair-sized birds of a vigorous constitution.

"We will again suppose the breeder has an almond cock, which has become too dark for the show-pen. Such a cock makes a fine match for either an agate mottle, a splashed agate, a splash, or even a dun. A bird in his prime of feather we would give either an almond splash hen, or a whole-colored yellow agate free from white feathers. This last is a match we are particularly fond of, not unfrequently producing pairs of almonds in the nest, and often of splendid colors too.

"Take again an almond cock too mealy in feather, but which it is desirable to breed from. We would advise matching him with a red agate whole-feather, if such can be obtained; if not, then a red agate mottle, the less white about it the better. If such could not be obtained, we would match him to a kite hen, and the more of the kite or bronze tinge she shows on tail and flights the better, and the more likely will the progeny be to be of good color. We look upon this last as more of a chance cross than any of the others; still, we give the best advice we can, for the sake of such as may have these faulty-colored birds, and wish to know what affords them a fair chance in breeding from them.

"Again, we will take a class of birds which are often at command for breeding, viz., those which have too much kite blood in them, as shown by their dark and rich mahogany color, rather than yellow. These birds are often found in the lofts of breeders who keep breeding in succession from kites and almonds, without using the lighter colors. They are so strong in feather as to be equal for breeding depth of color to a kite cock, the kite being chiefly used either to strengthen the color of mealy-feathered birds, or to assist a too soft-colored hen. Such a dark cock, accordingly, makes a splendid match for a soft-feathered almond hen, which shows no break of feather in body, flights, and tail, of which there are always more to be had than of the desired color. This is, therefore, in general an easily-managed match, and will often produce birds which will surprise the breeder, particularly as regards a real ground of the true and proper color. The want in the hen being break of feather, which the cock helps to supply, and both being almonds and almond-bred, we have seen more birds of the rare and proper yellow ground-color produced in this way than by all the other crosses we know of; and we believe it was the mode of breeding adopted by Mr. Hale. who produced more of this coveted color than anyone else we are acquainted with. His next fancy

was the same dark class of cock with a well-spangled splash hen, and this, too, answers well. "We come next to the splashed almond cock, which is a most useful bird, when bred with hens of any of the following colors; First, a really sound-colored almond hen will in most cases breed something good. The next to suit him will be a red whole-feather hen, or still better a yellow whole-feathered agate, but if it can be got, a real whole-feathered yellow will be best of all. If none of these hens can be obtained, we would put him with a good-colored kite hen, but should the kite be nearly black we would not use this cross, only attempting it if the bird showed plenty of bronze.

"Next comes the whole-feathered yellow agate cock. The proper hens to breed with this color would be, first, an almond splash, or an almond if well broken or spangled in feather, or a good-colored kite.

"Next again is the whole-feathered red agate cock. The hen most suitable for this bird would be an almond; whether young or old, good or bad in color, does not much matter, since no cross is more apt to improve the color of the progeny of a faulty-colored almond hen than the red agate. So also will the real whole-feathered red, if bred from almonds, and it is very seldom the real red does come from other parentage.

"There is again the real whole-feathered yellow cock. This is very seldom to be met with, and is a most valuable bird; in fact, were there more such there would be far less trouble in breeding birds with the proper yellow ground, and we have often wondered that breeders have not tried to breed a strain of yellows and reds, having in the red and yellow agates so nearly what is wanted. When a breeder, then, is lucky enough to get a really fine yellow cock, he will have little trouble, if he mates him with a well-spangled splashed hen, as the hen will give the spangling, while the ground will come from the cock. No bird would, of course, suit this class of cock so well as a good almond well broken in feather, but the difficulty, of course, is to get an almond hen well spangled, which is necessary, for which reason we put up with the splash. The reason of this we have already hinted at—it is simply that an almond hen rarely becomes properly spangled till from four to six years old, and even more rarely ever breeds at such an age. She might, if let alone, perhaps, but in most cases, when any amateur is fortunate enough to possess such a hen, he sends her to be exhibited, and then, if successful,

all chances of her breeding are gone. Hence we see very few almond hens of the proper color to breed with a yellow cock; since, by the time they have got the color, their breeding days are over, and most of such birds fall into the hands of the great exhibitors and dealers, showing being, all they are then good for. It is needful to be plain about this, and we repeat distinctly that no one in purchasing must or can expect an almond hen to be a breeder, if she has become in feather what she is expected to be in order to gain honors. We know there are occasional exceptions, but they are very few. What we say is an almost universal rule.

"Some fanciers we have known match up two good almonds; that is, a cock and hen each fit for competition. We will not affirm it is so in all cases, but we can state with confidence that when this is done, the result is very seldom at all satisfactory, the progeny being generally either light-colored agates or splashes, or too often nearly all white. But even worse than this is the fact that birds from such matching often come, which are what is termed "bladder-eyed." This singular term denotes birds which, instead of having pearl eyes like the parents, have large projecting eyes, quite black, and perfectly blind. There is, therefore, great risk in breeding birds together, both which are really good show almonds, and it seems as if it was necessary to have a considerable difference in feather in order to get the color desired. In all the various matches, it will be seen that the one bird supplies what is wanting in the other, a bird too light being matched with one too dark, and any bird containing only two of the three desired colors being always matched to another containing an excess of the third. Such a plan is the most likely to produce the coveted but rare result of two almonds in the nest. But one thing above all others should be carefully avoided, and, that is breeding together two soft-colored almonds, the progeny being generally mealy chequers, chequered duns or bull-eyed white splashes.

"Red agate-mottle cocks should be mated to almond or kite hens, and the better the color of each, the more likely to produce valuable progeny. We would breed yellow agate-mottle cocks to the same hens as the red agate-mottle, both as a rule producing very similar offspring when mated to the same bird. But to speak frankly, the almond is such an artificial or composite bird in color, that no one can say with certainty that any two pigeons mated together will produce almonds. We have known many

cases where birds were mated, of such a quality and matching that the owners made .sure of success, yet not one single bird came of the desired color the whole season, while the very same cross as regards color, with another pair, produced nothing but almonds. And still more strange, to all but those who are accustomed to the lottery of almond-breeding, the very same pair of birds the following season have precisely reversed these results, the one which had failed the year before now breeding almonds, and the other not. That is the reason of our laying stress not only upon what a bird is in matching, but on the actual color it has at that time attained from age. But even with this his qualification all we can do is to state what are the most promising matches to adopt. .Of course, anyone who has bred his own birds can attain much more certainty than in employing stock of whose breeding he is ignorant, as two off-colored birds, which are in themselves a suitable match, if the produce of almonds direct, are much more likely to produce almonds than when they are themselves the offspring of off-colors."

BOOKS AND SUPPLIES
FOR PIGEON KEEPERS

The following books and articles will be found useful to all who wish to keep an accurate record of their pigeons and to secure the latest success in management.

Pigeon House Plans and Fixtures—By E. J. W. Dietz

This book is designed to assist those who want the most serviceable, convenient houses and fixtures. It illustrates many pigeon houses and gives working details of over fifteen different styles. There are over 120 illustrations and the text gives reasons for the advantage of certain forms of construction. Price $1.00, postpaid.

"**DOVELAND" Picture, with a Key.** This fine, large picture in full colors on sheet of strong paper 19x26 inches, showing practically every variety of pigeons; with a key giving name and kind of each. Mailed in tube for keeping a record of a flock of 35 pairs of pigeons. Perfect records lead and suitable for framing. Price $1.00, postpaid.

American Loft Register—This is a blank book ruled to give proper forms to success and this book supplies the method and forms. Price 40 cents postpaid.

Nest Record Cards—Some fanciers prefer to hang up a card alongside the nest and keep their breeding record on same. These cards are just the thing for the purpose. Price 25 for 25 cents.

Pedigree Forms—For Racing Homers and other stock. Spaces for four generations. Price 3 cents each or $2.50 per 100.

Judging Sticks—Vest pocket size; just right for pigeon fanciers. Closed 5 1/2 inches and extend to 20 inches. Nickel plated. Price $2.60.

Pigeon Nest Eggs—These are made of glass and are used extensively by Racing Homer Fanciers as "dummies" under their racing birds. By this means you can keep a racer on eggs several days longer than normal and there is no danger of their breaking or hatching the eggs. Price 60 cents per dozen by mail postpaid.

Practical Hints for Beginners, by E. R. B. Chapman. This book is designed to show young fanciers how to make the right start and contains valuable hints for beginners. Price 50 cents postpaid.

Line Breeding (Revised Edition), by E. R. B. Chapman. This revised edition of this famous pigeon work contains an introduction and supplement by the editor of the A. P. K. which explains some additional breeding factors never gathered together for pigeon men before. Price 60 cents.

Pigeon Diseases and Feeding Management, E. J. W. Dietz. This book Is the latest work on pigeon diseases and is compiled from all authentic sources. It is well illustrated and many

who have purchased a copy have given testimonials. Price 75 cents.

Color Breeding, by Dr. J. Metzelaar. A new work explaining the pigmentation of pigeon feathers and is the only scientific treatise on this subject available. Price $1.00.

Racing Pigeon Guide, by B. A. Burnell. A concise treatise explaining all about the Racing Homer Pigeon and giving details about racing. Price 60 cents.

SEND ALL ORDERS TO

AMERICAN PIGEON KEEPER

224 West State Street **GENEVA, ILLINOIS**

CHAS. SIEGEL & SON

2039 WEST 13TH STREET

CHICAGO ILLINOIS