days of May find a cloud of marsh mosquitoes sweeping inland.

As the marshes are usually waterlogged in early spring and every pool clean up to the highland holds water, the hibernating eggs hatch in large proportion and the broods are large.

An interesting question arises here. The migrants are almost exclusively sterile females: the eggs from which many of them hatch have been on the marsh from early the year before, ready to hatch when opportunity offered. Is there any relation between the age of the egg and the sterility of the females resulting from them? The matter will not be easy to demonstrate because of the difficulty of securing pairings in confinement.

John B. Smith

COLOR INHERITANCE IN MAMMALS

Professor Castle's interesting article in Science of January 25 clears up an important point, and renders it possible to explain certain phases of color inheritance in swine and in cattle. For the most part, his factor A, which determines the arrangement of pigment giving the agouti color, seems to be wanting in these two classes of domesticated animals. Perhaps it has been lost. It seems to be present in the wild boar of Europe, which has been used in breeding experiment by Mr. Q. I. Simpson, whose work has furnished important data for the elucidation of color inheritance in swine. In a few instances there is a tendency in certain breeds of swine for red pigment to predominate near the extremities of hairs; in the Berkshire breed occasional individuals show this tendency, and I have seen the same in crosses between this breed and Hampshires. The tendency is never well marked, so that in these animals the function A is presumably present in a weakened condition.

For the most part black and red in swine and cattle evidently behave just as they do in guinea-pigs. Aberdeen-Angus (black) cattle crossed on Herefords (red and white) give blacks. The heterozygotes bred back to Herefords give blacks and reds in approximately equal numbers. In swine, red and black each appear to present more than one type, and the various reds and blacks do not behave quite the same. Tamworths, a red breed of swine, present at least two distinguishable forms of red, namely, light red and dark red. The light becomes lighter with age, and the dark darker. Light is also dominant to dark. When light red is crossed on Chester white the progeny is red roan. Dark red crossed on Chester white gives clear white.

Most black breeds of swine, when crossed with Tamworths or Duroc-Jersey (both red), give black and red spotted, but Hampshires (black with white belt) crossed with red give the Hampshire coloring. This shows that Hampshire black and Berkshire black differ.

It is highly significant that the same color factors should exist (apparently) in guinea-pigs, rats, mice, rabbits, swine and cattle. This fact may be of great service in breeding fixed color types in farm animals.

Professor Castle's clear explanation of color types in Guinea pigs will doubtless aid greatly in comprehending the data on color inheritance in swine which the committee on animal hybrids is collecting for the American Breeders' Association.

The object of this communication is not, however, to call attention to the parallel in color factors in different classes of mammals, for there is not at hand sufficient data to demonstrate a complete parallel. It is rather to call attention to a simple method of expressing the allelomorphic constitution of organisms, and one which renders it easy, when this constitution is known, to display the necessary results of a given line of breeding. We may use Professor Castle's data in illustrating the method.

The allelomorphic formula of a homozygous individual may be represented by AA, BB, CC, etc. The gametes produced by such an individual would be ABC, etc. Letting G stand for the factor which determines the agouti color, Bl for black, and R for red pigment, and letting A stand for the absence of G, B for the absence of Bl, and C for the absence of R, the formulæ for the several types of color discussed by Professor Castle would be:

(1) Agouti,	GG, BlBl, RR,	producing gametes		G Bl R
(2) Black,	AA, BlBl, RR,	"	"	A Bl R
(3) Red,	AA, BB, RR,	"	"	A B R
(4) Red,	GG, BB, RR,	"	"	G B R

The cross between (2) and (3) gives AA, BlB, RR, which is black. The gametes produced by this hybrid are ABlR and ABR. The fortuitous union of these gives, in generation F_2:

1 AA, BlBl, RR; 2 AA, BlB, RR; 1 AABBRR,
or 3 black and 1 red.

The cross between (2) and (4) gives AG, BlB, RR (agouti), producing gametes ABlR, ABR, GBlR, GBR. The fortuitous union of these gives:

a) 1 AA, BlBl, RR;	(*d*) 2 AG, BlBl, RR;	(*g*) 1 GG, BlBl, RR;
(*b*) 2 AA, BlB, RR;	(*e*) 4 AG, BlB, RR;	(*h*) 2 GG, BlB, RR;
(*c*) 1 AA, BB, RR;	(*f*) 2 AG, BB, RR;	(*i*) 1 GG, BB, RR

or

1 Black	2 Agouti	1 Agouti
2 "	4 "	2 "
1 Red	2 Red	1 Red.

This gives 9 agouti, 4 red, and 3 black.

If the cross (2) $\times$ (4) (= AG, BlB, RR), is crossed with (3) (AA, BB, RR) we get:

Gametes of (2) x (4)		Gametes of (3)
ABlR	x	ABR = AA, BlB, RR (black)
ABR	x	ABR = AA, BB, RR (red)
GBlR	x	ABR = GA, BlB, RR (agouti)
GBR	x	ABR = GA, BB, RR (red),

or 2 reds, 1 black, and 1 agouti. Professor Castle states that 4 types of reversionary agoutis probably occur in the cross (2) $\times$ (4), 3 of which have been obtained in his experiments. Table I. above, giving generation F_2 of this cross, shows that the type (*e*) (AG, BlB, RR) occurs in four sixteenths of this generation, type (*h*) (GG, BlB, RR) in two sixteenths, and type (*d*) (AG, BlBl, RR) in two sixteenths. These are the three types he found in his experiments. The fourth type, (*g*) (GG, BlBl, RR) occurs in only one sixteenth of this generation. The small number of individuals in which this type occurs doubtless accounts for the fact that it has not yet been found in the experiments.

From the formulæ of these four types we readily see why they behave as stated by Professor Castle. Type (*e*) is the same as the cross (2) $\times$ (4), and therefore gives, in generation F_2, 9 agoutis, 4 reds, and 3 blacks; (*h*) produces gametes GBlB and GBR. These uniting with ABR (red) give half AG, BlB, RR (agouti) and half AG, BB, RR (red); (*d*) produces gametes ABlR and GBlR. These uniting with ABR (red) give half AA, BlB, RR (black) and half AG, BlB, RR (agouti). The remaining type (*g*) is pure agouti, and breeds true.

The above formulæ may seem complex at first, but they are really quite simple, and render the process of determining the character content of any cross and its progeny exceedingly easy.

One of the above crosses shows how two characters that are not allelomorphic to each other may still give the numerical relations in generation F_2 of a pair of allelomorphs. An individual having the color black may have the formula BlBl, RR, the red not being noticeable because indiscriminately mixed with, and concealed by, the black pigment. A red individual may have the formula AA, RR, in which A represents the absence of Bl. The respective gametes are BlR and AR; the hybrid being ABl, RR, which is black. The gametes produced by this hybrid are AR and BlR. Fortuitous union of these gives:

AR x AR = AA, RR (red)
AR x BlR = ABl, RR
BlR x AR = ABl, RR } (black-hybrids)
BlR x BlR = BlBl, RR (black-pure)

This is clearly the same result, as far as color of progeny is concerned, as if Bl and R were a pair of allelomorphs. We know they are not, since in the pure agouti type both colors are present in such form as to be transmitted to all the progeny.

W. J. Spillman
U. S. Department of Agriculture

NOTES ON ORGANIC CHEMISTRY

DIAZOAMINOMETHANE (DIMETHYLTRIAZINE)

Many members of the important class of compounds known as the diazoamino derivatives are known, but these, hitherto, have all belonged to the aromatic series. Otto Dimroth[1] has, however, recently succeeded in isolating the first and lowest representative of the aliphatic division—*diazoaminomethane* or *dimethyltriazine,* as it may also be called, $CH_3N{:}NNHCH_3$. The compound is interesting not only for the reasons given, but also on

[1] *Ber. d. Chem. Ges.*, **39**, 3905 (1906).