a statistical standpoint the weather associated with different types.

Colonel Gold mentions the work of Captain Brunt during the war, showing the relation between the amount of low clouds in Flanders at different hours and the general direction of the wind. It appears that with the westerly type there was decreasing cloudiness.

The scheme of indexing, tagging and classifying pressure charts is of course, not new. Odenbach, Brandenburg and others have made classifications for limited areas in the United States, and Bowie and Weightman for the whole country, giving with much detail the storm paths.

Some of the notes made on the different types are extremely interesting: Thus, type I. is very favorable for west winds at night; and a notable instance occurred during the battle of Cambrai, November 20, 1917; the transitional type of fair weather in the evening and inland fog in the morning, occurred on March 20, 1918, when the Germans began their great offensive. Evidently the German forecasters picked the hour. And again May 27 to 31, 1918. Type III. is one that worries the forecaster, for squalls come when he expects fair weather. He forecasts rain in front of the trough and gets fair weather in front and rain behind. On August 26, 1916, seven British airplanes failed to return because of a squall coming from the west while the planes were over the German lines. A different type occurred in June, 1917, during the battle of Messines, for which a week's fair weather was accurately forecast. Type IX. means unpleasant weather. "The most noticeable example in history of this type," says Gold, "is the one which persisted for the first three days of August, 1917, during the battle of Ypres." Type VI. is the typical fair weather anticyclonic type. This type prevailed at the time of the German offensive in March, 1918, and also immediately after the armistice.

It is evident that the forecaster from now on takes his place in all military councils for both offensive and defensive operations.

A. M.

SPECIAL ARTICLES

LINKED GENES IN RABBITS

The so-called "English" rabbit possesses a dominant pattern of white spotting. A homozygous English mated with non-English rabbits produces heterozygous English young exclusively. These mated with non-English rabbits produce equal numbers of English and non-English young. Facts such as these show conclusively that the English pattern is dependent upon the inheritance of a single Mendelian gene. I have recently discovered that the gene in question is linked with another gene, that for intense *vs.* dilute pigmentation. Dilution is a recessive character alternative with intense pigmentation. Intense pigmentation is seen in rabbits of the varieties, gray, black and yellow. Dilute pigmentation is seen in blue-gray, blue, and dilute yellow rabbits.

Summary of	(1) Eng. Int.	(2) Non-Eng. Dil.	(3) Eng. Dil.	(4) Non-Eng. Int.
Oct., 1919.....	5	6	4	4
Feb., 1920.....	6	9	6	4
June 1920.....	9	10	5	5
July, 1920.....	3	3	1	3
Total.....	23	28	16	16
	Non-crossovers		Crossovers	

In a certain experiment, I crossed a black English rabbit with a blue non-English rabbit. A male from this mating was black English in appearance, but from his parentage was known to be heterozygous both for English and for intensity. He was subsequently mated with blue non-English females, which of course would be homozygous for the recessive member of each of the two character pairs. If no linkage occurred between the two pairs of characters, young would be expected of four classes all equally numerous, viz., (1) English intense, (2) Non-English dilute, (3) English dilute, and (4) Non-English intense. Classes (1) and (2) would represent the original, non-crossover groups, classes (3) and (4) would represent novel, crossover groups. In a series of matings ex-

tending over more than a year, the following numbers of young have been obtained.

The non-crossover classes have consistently been in excess of the crossover classes. In a total of 83 young, 32 have shown crossover groupings of the two pairs of characters, and 51 have shown non-crossover groupings. This is 38.5 per cent. crossovers, an indicated linkage strength of 23 on a scale of 100.

In a previous paper I have shown that English pattern is allelomorphic with Dutch pattern, or very closely linked with it. If English is linked with dilution, Dutch also must be linked with dilution. Attention should now be turned to the question whether other characters of rabbits belong to this same linkage group, and whether other linkage groups can be detected in rabbits.

W. E. CASTLE

BUSSEY INSTITUTION,
July 24, 1920

THE FAT-SOLUBLE A VITAMINE AND XEROPHTHALMIA[1]

IT is generally admitted by those who have conducted feeding experiments with rats that although the essential dietary factors for growth, including the so-called water-soluble B, are present, the animals will not grow to maturity with out the fat-soluble A. The work of Osborne and Mendel, McCollum and associates, Drummond, Steenbock and associates, and others give abundant evidence of this fact. All investigators are not in accord, however, that a positive lack of the fat-soluble A is the direct cause of the eye condition in the rat which McCollum[2] designated as xerophthalmia, some considering this disease to be primarily infectious.

Bulley[3] has recently taken the most definite stand that this eye condition is not due to a dietary deficiency but primarily to infection, resulting from poor hygienic surroundings and uncleanliness. She based her conclusions on a study of some 500 rats that were fed on definite synthetic rations.

In our laboratory we have had occasion to feed white, and black and white rats on various synthetic rations and in going over our records we have compiled data bearing upon the prevalence of xerophthalmia in relation to the known presence or absence of the fat-soluble A. These results are given in the table below.

Group	Vitamines Absent from Ration	Number of Rats Reported	Positive Cases, Xeroph-thalmia	Per Cent. Positive Cases
A	Fat-soulable *A*	122	120	98.3
B	Water " *B*	103	..	None
C	None (controls)	216	..	"

It is seen that out of 122 rats, Group A, 120 of them or 98.3 per cent. showed sooner or later positive signs of xerophthalmia, and that when the fat-soluble A vitamine was present, with or without the water-soluble B (Groups *B* and *C*), none of the 319 rats showed evidence of this eye ailment. All the rats were fed individually in practically every case. They were kept in metal cages, without any bedding, which were provided with a special removable wire screen floor. The cages, and the food and water cups were always disinfected once or twice a week. The sanitary conditions were, therefore, good. The same assistants handled and fed all the rats so that the attention given them was the same for all and the possibilities of infection from this source was uniform.

It would seem to us that if xerophthalmia was primarily infectious and due to the poor hygienic conditions, that some of the rats in Groups *B* and *C* would certainly have developed it. Further, repeated attempts were made to transmit the disease by using sterile threads of gauze, passing them cautiously over the edge of the lids of the sore eyes, and then carefully inoculating the eyes of the other rats. These tests were negative, as were the controls. This was fairly good evidence that the disease could not be transmitted by this means.

Treatment of advanced cases of sore eyes with a saturated boric acid and also with a

[1] Read before the American Chemical Society, St. Louis, April, 1920.

[2] McCollum, E. V., and Simmonds, N., *Jour. Biol. Chem.*, 1917, XXXII., 29.

[3] Bulley, E. C., *Biochem. Jour.*, 1919, XIII., 103.