characterize as truly Gallic dogmatism. In regard to the relative importance of humoral and phagocytic factors in immunity statements of the most sweeping nature are made. So we read on page 205: "Are the opsonins substances or properties new and unknown before Wright's researches? Numerous experiments ascribe to the opsonins of normal serum the same properties as characterize the complement. They are products of the leucocytes." And again on page 227: "There are only two 'theories,' that of Ehrlich and that of Bordet, which, with their conjectures, their uncertainty, their attempts at explanation, and their continual state of incompleteness, are striving to round off the positive doctrine, the expression of undoubted facts, namely, phagocytosis." "It is no way of recognizing the capital importance of phagocytosis to admit that anti bodies and other humoral properties are produced by the phagocytes. The essential fact is the destruction of the microbes by incorporation and digestion. Extraphagocytic destruction is so much an exceptional case that it can not even be brought in as opposition."

The illustrations are for the most part crude line drawings of the type found only in French texts. The English translation is somewhat unfortunate, abounding in constructions like the following (from p. 171): "To prepare an anti-endotoxin, as in the preparation of an antitoxin, it is necessary to inject several times into an animal, for example, the horse, the toxic substance, in this case the bacterial bodies, entire or broken up"; so that the reader is almost reminded of the fate of the famous jumping frog after his translation into French and back again.

C.-E. A. Winslow

SPECIAL ARTICLES

A THIRD GROUP OF LINKED GENES IN DROSOPHILA AMPELOPHILA

The existence of a group of sex-linked genes in *Drosophila ampelophila* which are linked to each other in different degrees has been demonstrated by Morgan in numerous papers ('10, '11, '12) and by Sturtevant ('13). The fact that the black and vestigial factors, which are not sex-linked, are linked to each other, was reported by Morgan and Lynch ('12) and by Morgan ('12), and these genes were considered as lying in the "second chromosome." The present paper presents evidence showing the existence of still another group of genes, which are located in the "third chromosome."

The pink-eyed fly, first described by Morgan ('11), has been shown (Morgan, '11, '12) to behave as an ordinary Mendelian recessive to the normal red. That this factor is independent of those in the second chromosome is shown by the following experiments:

Red black ♀ × Pink gray ♂	→ red gray ♂ and ♀ →	red gray	113
		red black	52
		pink gray	47
		pink black	22
Red gray ♀ × Pink black ♂	→ red gray ♂ and ♀ →	red gray	279
		red black	96
		pink gray	107
		pink black	40
F_1 red gray ♀ from above × Pink black ♂	→	red gray	96
		red black	111
		pink gray	67
		pink black	77
Vestigial red ♀ × Long pink ♂	→ long red ♂ and ♀ →	long red	717
		long pink	268
		vestigial red	136
		vestigial pink	50

Except for disturbances due to differences in viability these are obviously 9:3:3:1 ratios, except the third, which is 1:1:1:1, as expected. Evidently pink is not linked either to black or to vestigial.

In the balloon-winged stock (see Morgan, '11) there appeared a very dark mutant, which has been named ebony. This fly is darker and more shiny than the black fly, and has a slightly greenish, smoky color when young. It behaves as a simple Mendelian recessive to the normal gray color, though the heterozygous form is often somewhat darker than the wild fly. The females of this race are often sterile, and seldom produce many offspring, but the males breed freely when mated with other females, and produce many offspring. That the gene concerned is not in the second chromosome is indicated by the following experiment:

Vestigial gray ♀ × Long ebony ♂ → long gray ♂ and ♀ →

long gray	268
long ebony	79
vestigial gray	94
vestigial ebony	24

This is a simple 9:3:3:1 ratio, except that the viability of the ebonies is not quite as good as that of the grays. Ebony has also been shown to be independent of two other wing factors in the second chromosome—curved and balloon.

When pink-eyed flies were crossed to those with ebony body color, the following result was obtained:

Gray pink × Ebony red → gray red →

gray red	3764
gray pink	1369
ebony red	1112
ebony pink	0

This count includes a few F_3 flies derived from F_2 red grays mated together, but also includes large numbers of F_2's from each of the reciprocal crosses—ebony ♀ × pink ♂ and pink ♀ × ebony ♂. In the later generations from these crosses the writer was able to obtain a few ebony pink flies, and a pure stock of this combination was then made up. When these flies were used for "coupling" experiments the result was as follows:

Ebony pink × Gray red → gray red →

gray red	272
gray pink	12
ebony red	10
ebony pink	65

The result indicates that the two genes involved are really linked in the ordinary sense. In order to get more exact data doubly heterozygous flies have been crossed to double recessives (ebony pink). Owing to the difficulty of breeding ebony females it has not yet been possible to make any extensive tests of the amount of crossing over in males, but the 88 flies so far raised from doubly heterozygous males by ebony pink females have none of them been cross-overs. Similar tests of doubly heterozygous females have disclosed the existence of much variability in the amount of crossing over, the extreme values so far obtained being about 1 per cent., on the one hand, and about 27 per cent., on the other. This matter is being further investigated, and it seems probable, from results already obtained, that external conditions play a large part in it. The detailed counts are reserved until this side of the question is more thoroughly worked out, but the totals are given below, because they show beyond question that linkage occurs. When females that showed "coupling" (in Bateson's ('06) sense) —*i. e.*, in which red and gray, pink and ebony were linked—were tested by mating to ebony pink males, the result was as follows:

Gray red (heterozygous) ♀ × Ebony pink ♂ →

gray red	880
gray pink	86
ebony red	65
ebony pink	691

Tests of females showing Batesonian "repulsion" (having red linked with ebony, pink with gray—Bateson and Punnett, '11) gave the following result:

Gray red (heterozygous) ♀	gray red	3
×	gray pink	601
	ebony red	584
Ebony pink ♂	ebony pink	4

This gives a total of 158 cross-overs out of 2,914 flies, but the absolute proportion is not very significant, because of the variability mentioned above. That rather strong linkage exists, however, there can be no doubt.

A. H. STURTEVANT

COLUMBIA UNIVERSITY,
May, 1913

THE NORTH CAROLINA ACADEMY OF SCIENCE

THE twelfth annual meeting of the North Carolina Academy of Science was held in the Science Building at the State Normal College, Greensboro, on Friday and Saturday, April 25 and 26, 1913.

Following a meeting of the executive committee early on Friday afternoon, a session was held for the reading of papers. At the night meeting, after an address of welcome by President J. I. Foust, of the college, President C. S. Brimley, of the academy, delivered his presidential address on "Zoo-geography." Adjournment was then had to the Students' Building, where the members of the academy were given a reception by the faculty of the college.

On Saturday morning the academy met for its annual business meeting. Reports were then made by the secretary-treasurer and the several stated committees. Twelve new members were elected. The finances were shown to be in good shape—all bills being paid, with $125 in the savings bank. It was noted that Dr. C. W. Stiles, one of our members, had by action of the executive committee been appointed to represent the academy at the Ninth International Zoological Congress at Monaco, March 25–29, 1913.

The following officers were elected for the ensuing year:

President—Franklin Sherman, state entomologist, Raleigh.

Vice-president—Z. P. Metcalf, professor of entomology, North Carolina Agricultural and Mechanical College, West Raleigh.

Secretary-treasurer—E. W. Gudger, professor of biology, State Normal College, Greensboro.

Additional Members of Executive Committee—W. C. Coker, professor of botany, University of North Carolina, Chapel Hill; J. J. Wolfe, professor of biology, Trinity College, Durham; C. S. Brimley, naturalist, Raleigh.

Following the business meeting, the reading of papers was resumed and continued until the program was finished and adjournment had at 1:15 P.M. The attendance was 27 out of a membership of 76. There were 22 papers on the program. Four of these were read by title, one was presented by another member in the absence of the author, and the other 17 were read by their authors in order as called for on the program.

The papers read were as follows:

Zoo-geography: C. S. BRIMLEY, Raleigh.

Briefly discusses the primary life areas of the world, which the author believes to be five in number, namely, an Australian, a Neotropical, an Ethiopian, an Indian with the limits usually assigned to them by zoologists, and lastly a Northern Realm, including all of the earth's land surface lying north of the other four. The paper then divides the Northern Realm into three regions, an Arctic, a Eurasian and a North American, and proceeds to divide the North American continent into the usual seven life zones, Arctic, Hudsonian, Canadian, Alleghanian, Upper Austral, Lower Austral and Tropical. The life zones entering the state of North Carolina are then discussed at greater length and found to be four in number, the Canadian, Alleghanian, Upper and Lower Austral. The first is stated to occupy the summits of the mountains above about 4,500 feet, the second that portion of the mountain region lying between 2,500 and 4,500 feet elevation, the third comprising the mountain valleys under 2,500 feet, and the central part of the state lying between the mountains and a line drawn from Weldon to Raleigh, and thence to Charlotte, the fourth including the remainder of the state, namely, all lying south and east of the above-named line. The animals distinctive of these zones are named and certain irregularities and anomalies in distribution are pointed out.

This paper will appear in full in the May issue of the *Journal of the Elisha Mitchell Scientific Society.*

Will Cells of the Embryo Sea Urchin, when Reintroduced into the Body of the Adult, become Tissue Cells of the Latter? H. V. WILSON, University of North Carolina, Chapel Hill.

Plasmodia formed by union of lymph cells were allowed to engulf blastulæ, and were grafted on the wound membranes which close in apertures