may have a relatively large internal surface ($R = 11.6$ to 16.3); (3) xeromorphic leaves of sun species may have a very extensive internal surface ($R = 22.2$ to 31.3); while (4) xeromorphic leaves of shade species may have a limited internal surface ($R = 8.18$ to 9.88).

Although present data do not warrant final conclusions, the frequent references to the correlation between xeromorphic structure and high transpiration rate may be explained by the high ratio of internal surface in xeromorphic leaves as noted above. The extensive internal surface of such forms is due primarily to the palisade type of mesophyll, commonly found in sun leaves of this type.

The photosynthetic rate likewise seems to be correlated with the area of the internally exposed surface. With this function, however, the importance of the internally exposed area may be somewhat enhanced by the properties of cellulose itself. A more complete account of methods with formulae, data and discussion will be published soon.

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PREDOMINANT STRAIN OF B. INFLUENZAE IN INFLUENZAL MENINGITIS[1]

IN contrast to the multiplicity of strains of *B. influenzae* derived from the respiratory tract and other sources, over 50 per cent. of the strains of influenzal meningitis fall into one group. In the original work of 1921 the author found that 4 out of the 7 strains of *B. influenzae* from influenzal meningitis in her possession fell into one group, while the other 3 seemed to be all different. Rivers obtained our 7 cultures and 6 more from outside, and though he differed from us in the grouping of our cultures, stated that he has been able to confirm and extend our results showing the existence of definite groups embracing the majority of the available strains of influenzae bacilli isolated from cases of meningitis. We continued our studies with the predominating type exclusively up to date and find that the ratio of about 50 per cent. of *B. influenzae* from influenzal meningitis fall into this predominating type (our type I). We did not attempt to group the other half. For practical purposes, however, it was reasoned that a serum which can embrace 50 per cent. of the encountered strains and more of the closely related ones is the best we can have at present until something better is discovered. Our horses are immunized accordingly with formalyzed cultures of this predominating type, to which one heterogenous strain is added. The question of standardization of these sera is as unsatisfactory as in case of antimeningococcic sera. We use agglutination and precipitin tests.

Pittman demonstrated in her studies of hemophilus influenza two kinds of strains S and R (smooth and rough colonies). They differ from each other morphologically and serologically. The S strains are stated to contain capsules and produce a specific soluble substance which is present in culture filtrates and washings of the bacteria. By means of cross precipitation and direct agglutination reactions she has been able to divide 15 S strains—7 of which were isolated from influenzal meningitis, into 2 groups A and B. All seven meningeal strains fell in group B. By this technique all her 7 meningeal strains seemed to comprise one group, whereas by agglutinin *absorption* test we have found that our strains (58) are alike only in 50 per cent. of cases. The same author also states that the S strains are easily converted into R. Because of the permanency of the serologic types, under ordinary conditions it seems to the writer that before anything better is discovered the grouping of *B. influenzae* by agglutinin absorption is by far a more sensitive and reliable test than any other suggested. Direct agglutination is not enough. We encountered many a strain which would be agglutinated by a serum even in a higher titer than its hemologous strain, to find that by absorption it was only either closely related or entirely a heterogenous strain stimulating the production of only common agglutinins.

Since 1922 the writer has received from Dr. Josephine Neal 84 cultures of *B. influenzae* from meningeal influenza; 1922, 13 cultures, 1923, 6 cultures, 1924, 5 cultures, 1926, 6 cultures, 1927, 3 cultures, 1928, 6 cultures, 1929, 6 cultures, 1930, 4 cultures, 1931, 14 cultures, 1932, 12 cultures and 1933, 9 cultures.

Grouping with the serum of the predominant strain by agglutinin absorption test was performed with 58 strains with the following results:

Identical with the predominant strain	27
Closely related to the predominant strain	18
Heterogenous	13
	58

Conclusion: The finding of a dominant type of *B. influenzae* in influenzal meningitis may hold some hope for developing an effective serum for treatment of this fatal infection.

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SELECTIVE FERTILIZATION AND SEX-DETERMINATION IN HYMENOPTERA

THE problem of sex-determination in the bee and in other forms in which males develop by haploid

parthenogenesis, females from fertilized eggs, has been "the outstanding unsolved puzzle, although before the development of the idea of genic balance it seemed one of the clearest and simplest of cases."[1] Neither genetic nor cytologic work has hitherto been able to solve the problem, although demonstration of the diploid nature of biparental males of Habrobracon[2] made it clear that the explanation was not to be sought in chromosome number.

On the basis of study of feminization of genitalia in mosaic males of Habrobracon, the suggestion was made that there are two kinds of haploid male tissue (X + A and Y + A) and correspondingly two different types of haploid males differing in sex-determining factors. The X-chromosome contained one or more dominant factors and one or more recessives (F.g), while the Y contained the allelomorphs (f.G). It was postulated that the female was the double dominant (1X + 1Y + 2A) and was digametic, producing from unfertilized eggs the two types of haploid males. Fertilization of eggs would give rise to females or to biparental males, the latter being 2X + 2A or 2Y + 2A, according to the type of sperm entering the egg. Such a hypothesis is consistent with the principle of genic balance.

All fertilized eggs from one mating would be entered by the same type of sperm, X + A, for example, but there would be two kinds of reduced egg nuclei present, X + A and Y + A. It might then be expected that homoeosyngamy, fusion of X + A with X + A, would be as frequent as heterosyngamy, fusion of X + A with Y + A. Extensive studies on ratios of males among biparentals and of biparentals among total offspring, as well as correlated investigations of egg hatchability indicate that selective syngamy takes place: the sperm nucleus uniting with the unlike egg nucleus to produce a female. Heterosyngamy always occurs when parents are unrelated, for all biparentals from such crosses are females. If parents are related, however, a few biparental males appear because of occasional homoeosyngamy. Frequency of males among biparentals, varying according to genetic constitution of stocks and temperatural conditions, is inversely correlated with ratio of total biparental offspring (males and females) and with hatchability of fertilized eggs. Thus it appears that fusion of like gametes has a lethal effect, but that a few combinations are viable, resulting in diploid males.

The theory, which was tentatively advanced a short time ago,[3] needed confirmation such as might be obtained from a sex-linked trait. A number of linkage groups were therefore tested by back-crossing heterozygous females to their recessive father. Dominant and recessive F_2 males should appear in equal numbers, except for viability differences, but in case of complete sex-linkage there should be no recessive females. If there were crossing-over between the sex-determining region and the gene in question a minority of the recessive females should be found varying according to the strength of the linkage. Another recessive male crossed with the F_1 heterozygous females should, if he were like the father (X + A for example), sire a minority of recessives, but if he were of the opposite type (Y + A) the recessive daughters should be in corresponding majority.

Dominant and recessive females have appeared in approximately equal numbers for several genes tested, but for fused (affecting antennae, tarsi and wings) the recessives were in decided minority among the females resulting from the back-cross, although their fused brothers appeared in expected numbers. Different fused males have been crossed to heterozygous females from the same fraternity. Some males give a marked excess of wild-type daughters while others give a marked excess of fused. No one male produces the two different types of fraternities by different heterozygous females belonging to the same fraternity. Wild-type crossovers average 8.7 per cent., while fused crossovers average 3.8 per cent., a difference expected on account of viability.

It was to be expected that sex-linkage would be incomplete, since all linkage groups thus far found have shown crossing-over. Two other genes have been found loosely linked with fused. These are being tested for sex-linkage.

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