have been obtained in males from both bisexual and all-male broods (from single mothers) and ovarian figures have been obtained in females from bisexual and all-female broods. This makes it seem certain that the difference between the chromosomes of the two sexes represents a normal condition, not peculiar to any one stock or race and not due to hybridization of different species. It also tends to indicate that the maturation phenomena are the same in all males, regardless of their source, although this point can hardly be established until further genetic study has been completed.

Stock cultures of this species have been kept in the laboratory for a year (over 18 generations) and others have been kept for three or four generations. Many intercrosses have been made. Both unisexual and bisexual broods have been obtained from these, but no sterile combinations have been found—which tends to indicate that we are dealing with only one species. If not, and the aberrant sex-ratios are due to hybridization of true species, these species must be very similar and the crossing must occur freely in nature.

Similar chromosomal relations of the sexes and a similar type of spermatogenesis have been observed in a closely related species, *S. pauciseta* Felt, and in a more distantly related species of the same genus. It seems possible, therefore, that the chromosomal relations described above are characteristic of a number of species—perhaps of the genus.

ADDENDUM: Since the above was sent to press evidence has been obtained which indicates that probably all the spermatocyte divisions described here are from secondary spermatocytes and that the first division is very different—involving no division of the two largest chromosomes. The account of spermatogenesis should be corrected accordingly, although the main feature (the passage of both large chromosomes into all the spermatids) is not altered.

CHAS. W. METZ

DEPARTMENT OF GENETICS
CARNEGIE INSTITUTION OF WASHINGTON

THE EFFECT OF LIGHT ON THE PERMEABILITY OF LECITHIN

BECKING and Gregersen have recently contributed an interesting paper[1] under the title given above. They use an adaptation of the method devised by the writer,[2] in which the electrolytic resistance of the more dilute of two solutions separated by a more or less permeable diaphragm is measured from time to time and the permeability of the diaphragm deduced from the change in resistance. By this method Becking and Gregersen claim to have shown that the permeability of membranes consisting of lecithin and collodion in equal proportions was increased by illumination. Their paper unfortunately leaves the matter somewhat in doubt, for two reasons which are here considered.

The first doubt of the validity arises by reason of the fact that as far as one can judge from the data given, equilibrium is attained when the distilled water in one compartment has been entered by only enough salt from the other compartment to reduce its resistance from 15,000 to 30,000 ohms to about 2,000 ohms. The upper compartment originally contained 0.2N KCl, and the lower one distilled water; since they appear to have been of nearly equal volume, they should both have contained approximately 0.1N KCl at the end of the experiment. But the observed change in resistance was nowhere nearly adequate to account for an increase in KCl concentration from practically none (distilled water) to 0.1N, and the final conductance was so small that one almost unavoidably concludes that diffusion through the membrane stopped while there was still a difference in concentration between the solutions separated by the membrane, and while there was still a concentration gradient through it. In this case there must have been factors, other than light, which controlled the permeability, if in fact the membrane was permeable to KCl at all. This can not be assumed unless, as in the writer's experiments on *Laminaria*[2] it can be shown that: (1) no change in resistance occurs when both compartments are filled with the more dilute solution, so that no diffusion gradient through the membrane exists: (2) the increase in resistance in the more concentrated solution keeps pace with the decrease in resistance in the more dilute solution.

In this connection it should be noted that under the conditions of the experiment the rate of change of conductance in the lower cell should theoretically be nearly

$$\frac{dx}{dt} = K(a - 2x),$$

where x = total change in conductance of the more dilute solution at the time t, and a = original difference in conductance of the two solutions. Integrating, we obtain

$$Kt = \log \frac{a}{a - 2x}$$

from which we may, if a is known, calculate values of K from the observed data. No data being given as to the value of a, it may still be of interest to assume a probable value, namely $a = 50 \times 10^{-4}$ ohms^{-1}, and to calculate the values of K from the data given by Becking and Gregersen.

[1] Becking, L. B., and Gregersen, M. I. *Proc. Soc. Exp. Biol. Med.* (1924), XXII, 130.

[2] Brooks, S. C., *Bot. Gaz.* (1917), LXIV, 306.

The value of x at the beginning of the experiment may be taken as being so small as to be negligible. The high value, 0.31×10^{-4} ohms^{-1}, or more, which Becking and Gregersen give for their initial reading, is probably due to convective effects incident to setting up the experiment and may be neglected. The same influences probably account for the high value of x at the end of the first hour. In making these calculations the values of x were divided by the values of $\frac{\Lambda}{\Lambda_0}$ appropriate to the presumable concentrations; this correction was neglected by Becking and Gregersen.

The results of such calculations are given in Table I, and show that the theoretically correct formula gives results as accurate as could be expected, since no precautions were taken to minimize convective effects. It is accordingly unnecessary to have recourse to Becking and Gregersen's empirical formula with its many arbitrary constants.

TABLE I

Values of K in the equation $K = \frac{1}{t} \log \frac{a}{a - 2x}$ when $a_0 = 50 \times 10^{-4}$ and $x_0 = 0$.

t observed	$x \times 10^4$	$\log \frac{a}{a-2x}$	K
hours	ohms^{-1}		
1	6.49	1.0267	.0114
2	9.48	1.0394	.0084
3	13.38	1.0567	.0080
4	17.93	1.0773	.0081
5	23.43	1.1035	.0086
6	28.88	1.1306	.0089
7	36.08	1.1687	.0097

The second and more serious fault in Becking and Gregersen's argument lies in the fact that according to their data the conductance of the solution in the lower compartment into which KCl is supposed to be diffusing, increases when the apparatus is illuminated, but decreases when the illumination is over. If all changes in conductance are to be interpreted as due to passage of KCl through the lecithin membrane, then KCl must be supposed to diffuse out of the lower cell against the concentration gradient after each period of illumination. It is hardly to be supposed that water diffused into the more dilute solution, although this does occur under certain conditions (negative osmosis). Either of these explanations seems relatively improbable and one is driven to inquire whether the changes in conductance occurring during and after illumination can not be attributed to some cause other than changes in KCl concentration. Although it is stated that "temperature fluctuations during illumination kept within $\pm 1°$ C.," this still allows us to assume that an increase of 2° C. might have occurred during illumination, which would increase the conductivity by 4.6 per cent.[3] This is nearly two thirds of the largest increase in conductance which was observed, and suggests the need for further information as to whether the temperature of the solution *between the electrodes* was measured, as can be done by means of a thermocouple, or whether, for example, the measurements refer to air temperatures taken by a mercury thermometer, the bulb of which was inside the asbestos box enclosing the apparatus. Only in the former case could we be sure that the whole effect was not due to change in the temperature of the solution in the conductivity compartment.

These criticisms do not preclude an increase in the permeability of lecithin-collodion membranes upon illumination; but the hypothesis that such a change occurs is evidently in need of further experimental support.

S. C. BROOKS

DIVISION OF PHARMACOLOGY,
HYGIENIC LABORATORY,
WASHINGTON, D. C.

[3] Kraus, C. A. "The Properties of Electrically Conducting Systems." New York, 1922, p. 147.

THE MINERALOGICAL SOCIETY OF AMERICA

THE fifth annual meeting of the Mineralogical Society of America was held at Cornell University, Ithaca, New York, on Wednesday, December 31, 1924. Officers for 1925 were elected as follows: *President,* Arthur S. Eakle, University of California, Berkeley, California; *vice-president,* H. P. Whitlock, American Museum of Natural History, New York City; *secretary,* Frank R. Van Horn, Case School of Applied Science, Cleveland, Ohio; *treasurer,* Alexander H. Phillips, Princeton University, Princeton, New Jersey; *editor,* Walter F. Hunt, University of Michigan, Ann Arbor, Michigan; *councilor,* 1924–28, William F. Foshag, U. S. National Museum, Washington, D. C.

The following papers were presented:

The modern study of minerals: Presidential Address: HENRY S. WASHINGTON (jointly before Mineralogical Society and Geological Society).

Bentonite as a one-dimensional colloid: EDGAR T. WHERRY.

A tabulation of the aluminum silicate minerals: EDGAR T. WHERRY.

Bentonite and Montmorillonite: CLARENCE S. ROSS AND EARL V. SHANNON.

A new theory of the composition of the zeolites: A. N. WINCHELL.

Studies in the mica group: A. N. WINCHELL.

The temperature-pressure conditions during the formation of smoky quartz and amethyst: EDWARD F. HOLDEN.