He assumes that here also vacuoles are at work, and by their extension and subsequent collapsing produce all the movements which constitute the whole process of nuclear division, including the transportation of the chromosomes from the equatorial plane to the poles of the spindle and their subsequent assuming of the reticular condition in the resting nuclei.

In describing his observations as shortly as possible, we may start from the transportation just named. Fischer assumes movements of the granular plasm to account for this phenomenon, whilst most cytologists invoke a contraction of the threads of the spindle. But in *Spinacia* a longitudinal row of vacuoles is seen between the two separating halves of the chromosomes. Moreover, the spindle becomes larger during this process, and not smaller, as it should on the ground of the latter supposition. Often the chromosomes separate first at their free ends, instead of diverging first at the points where they are united to the threads of the spindle. This indicates the swelling of the vacuoles between them as the mechanical cause of their separation.

After reaching the poles of the spindle, the chromosomes at first constitute a compact group, but this is soon distended. Vacuoles are swelling between them; their walls are seen in the shape of fine lines of linin, giving the image of threads stretching from one chromosome to another. The swelling of these vacuoles is then seen to continue, they increase in volume, come forth from amidst the chromosomes and finally surround them on all sides, until their walls touch one another. In this way a complex group is produced, the outer walls of which combine to constitute the nuclear membrane, whilst the inner parts of the walls either disappear or otherwise become invisible.

The chromosomes now change from the compact into the reticular condition. They do so by means of numerous very small vacuoles, which slowly increase in size, and thereby distend the surrounding material. Each of the chromosomes is changed in this way into a network and the whole nucleus becomes a "*réseau de réseaux*" as it has been called by Grégoire.

When at the close of the reticular or resting period the nuclei return to activity, all these processes are, of course, gone through in the opposite direction. First the chromosome-vacuoles collapse, thereby restoring the compact condition. Then a longitudinal row of vacuoles appears in each chromosome, indicating the beginning of their division. Afterwards the nuclear vacuoles collapse, causing the nuclear membrane to disappear.

Even as in the petals of some colored flowers colored and uncolored vacuoles may be seen within the same cells, betraying different physiological properties of the individual vacuoles, Mr. Stomps assumes different qualities for his three main groups of vacuoles, viz., chromosome-nuclear and spindle-vacuoles.

The point in his description which will probably interest his readers most of all is the explanation of the nuclear membrane as a wall of numerous vacuoles, or a compound tonoplast.

In comparing the drawings and descriptions of Strasburger and others and especially those of Grégoire, with this new principle, it will easily be seen that in the main they quite well agree with it. The description of the nuclear division in the roots of *Allium* by Grégoire[2] may even be considered as good corroborative evidence. On the other hand, it is always hazardous to base a physiological hypothesis on the observation of fixed and stained material only. Experiments on the behavior of the new nuclear vacuoles during active life seem strongly required for a fully reliable proof.

HUGO DE VRIES

SPECIAL ARTICLES

UNISEXUAL BROODS OF DROSOPHILA

IN an experiment begun at Columbia University in March, 1909, several pairs of pomace flies produced broods consisting of males only, or females only. The sexes of *Drosophila* usually appear in very nearly equal numbers. Table I., A and B, gives the figures

[2] *La Cellule*, T. XXIII., Fasc. 2, 1906.

for the first set of broods, from parents one or both of which were submitted to very high temperatures at some period during the larval stage, or during the early adult stage before mating. A similar result was, however, obtained from a control series, as shown in Table II., indicating that the high temperature used was not the cause of the unisexual broods.

TABLE I. (51 PAIRS)

A. *Unisexual Broods* (*from 9 Pairs*)

	Male	Female
1	135	0
2	0	108
3	0	104
4	0	73
5	0	63
6	0	45
7	0	43
8	0	33
9	0	31
Total	135	500

B. *Bisexual Broods* (*from 42 Pairs*)

	Male		Female		Both Sexes
Largest brood	99	+	95	=	194
Smallest brood	12	+	11	=	23
Total number of flies	1994	+	1992	=	3986
Average brood	47.47	+	47.42	=	94.9

Deviations from normal sex-ratio of 50 per cent.:

Maximum ..... 15.00 % (♂ 35.00 % + ♀ 65.00 %)
Minimum ..... 0.00 % (equality)
Average .... 4.53 %

TABLE II. (21 PAIRS)

A. *Unisexual Broods* (*from 3 Pairs*)

	Male	Female
1	0	68
2	1	52
3	0	30
Total	1	150

B. *Bisexual Broods* (*from 18 Pairs*)

	Male		Female		Both Sexes
Largest brood	181	+	177	=	358
Smallest brood	36	+	23	=	59
Total number of flies	1428	+	1383	=	2811
Average brood	79.33	+	76.83	=	156.1

Deviations from normal sex-ratio of 50 per cent.:

Maximum ..... 11.01 % (♂ 61.01 % + ♀ 38.99 %)
Minimum ..... 0.35 % (♂ 50.35 % + ♀ 49.65 %)
Average ...... 3.11 %

The total number of flies making up the bisexual broods consists of males and females in almost equal proportions. The sexes of these individual broods also ran fairly even except in a single case (Table II., A, No. 2) where the sex ratio is 52:1, and which is placed with the unisexual broods on this account, as well as for another reason which will appear below.

The flies were taken from a stock originally collected at Woods Hole by Professor T. H. Morgan, and bred in large numbers in several vessels. The offspring of these secondary stocks were isolated at various times in the pupal stage, and the virgin flies thus secured were paired in separate vials; the families of these pairs constitute the broods referred to in the present note. It is hardly possible that the parents of all the unisexual broods of Tables I. and II. can have sprung from a single pair of flies, and it therefore seems probable that the twelve pairs were separately acted upon by some unknown external factor which so strongly influenced the process of sex-determination that only one or the other sex was produced. This is, of course, not definitely proved, since no record was kept of sex-mortality, but it will be observed that the number of individuals in some of the unisexual broods is high enough, as compared with that of the bisexual broods, to suggest that the effect was not due to elimination of one sex but to substitution by the other.

In a second set of controls the 27 pairs all produced normal broods. The attempt to secure further results was then continued with the same stock at the Marine Biological Laboratory at Woods Hole through the summer of 1909, and again for more than half the season of 1909–10 at Columbia University, but without success, though over 700 pairs were bred and experimented with during that period.

The second fact connected with these unisexual broods became apparent after making many unsuccessful efforts to breed from them; the flies were all sterile, including the single male and all the females in the second "unisexual" brood in Table II. Sections showed that the females have only very small, rudimentary ovaries, while no trace of a testis could be found in any of the males examined. Externally the flies appeared to be normal in every way, and the sterile males could be distinguished from females with a hand lens, by the coloration and other characters of the end of the abdomen, as in normal specimens. The preparations were made by serially sectioning the entire abdomen, in which process the hard copulatory organs, especially of the male, were always more or less torn and therefore can not be reconstructed; but from the fact that sterile males and females were observed to copulate with one another and with normal individuals it seems fairly certain that the copulatory apparatus of the sterile flies is normal. We thus have another example of development of the sexual instinct, and at least some of the external secondary sexual characters, independently of the gonads; and some additional evidence of independent differentiation of the copulatory structures.

Though the factor which caused the production of these unisexual, sterile broods was not discovered, there seems to be no reason why it should not turn up again; and it may be worth while for those engaged in breeding *Drosophila* to be on the lookout for a repetition of the occurrences above recorded, in view of their possible importance as bearing on sex-determination in general.

L. S. QUACKENBUSH

TWENTY-SECOND ANNUAL MEETING OF THE GEOLOGICAL SOCIETY OF AMERICA

THE first session of the twenty-second annual meeting of the Geological Society of America, held at Boston and Cambridge, Mass., December 28–31, 1909, was called to order at 10 o'clock A.M., on Tuesday, December 28, in the lecture hall of the department of geology, University Museum, Cambridge, Mass., by Vice-president Adams, in the absence, on account of illness, of President Gilbert. In the course of the meeting the following program was offered:

The Post-Tertiary History of the Lakes of Asia Minor and Syria: ELLSWORTH HUNTINGTON, New Haven, Conn.

A study of the lakes of the Anatolian Plateau and of Syria was one of the chief objects of the Yale Expedition of 1909. The lakes fall naturally into five groups, namely, normal fresh-water lakes with ordinary outlets, salt lakes of the common type without outlets, karst lakes with underground outlets in limestone regions, glacial lakes with no definite outlets, but kept fresh by underground seepage, and crater lakes with similar indefinite outlets. In Syria the number of lakes is small, there are no glacial lakes and the other four types are sharply differentiated. The most interesting problems are, first, the part played by lava flows and deltaic deposits in the formation of Lakes Huleh and Galilee, and, second, the former outlet of the Dead Sea and the fluctuations to which this lake has been subject in Post-Tertiary times. In Anatolia the number of lakes is large and the various types merge into one another. For instance, crater lakes are sometimes saline, normal lakes have in some cases been drained by underground outlets, and salt lakes have in the past overflowed and been fresh. A comparison of the ancient strands and deposits of the lakes of both regions affords abundant data for the reconstruction of the varied climatic history of western Asia since the close of the Tertiary era.

Discussed by W. M. Davis, F. P. Gulliver, A. W. Grabau, D. W. Johnson and Joseph Barrell, with reply by the author.

Oscillations of Alaskan Glaciers: R. S. TARR and LAWRENCE MARTIN, Ithaca, N. Y., and Madison, Wis.

The National Geographic Society's Alaskan Expedition of 1909 observed the following glacial oscillations. In Yakutat Bay the Marvine lobe of Malaspina Glacier and the Atrevida, Haenke and Variegated glaciers have ceased the advance which began in the winter of 1905–6. The Hidden Glacier has advanced over two miles since 1906, but has now begun to shrink away from the new shore moraines. The Lucia Glacier is newly crevassed and advancing this summer, and is riding up on a nunatak. These oscillations confirm the earthquake-avalanche theory for glacial advance, proposed in 1906 by the senior author, and furnish facts as to the brevity of such advances. On the lower Copper River the Childs Glacier was more active in 1909 than 1908, but the position of the front remains unchanged. The Miles, Childs and Baird glaciers are essentially as in 1884, 1885, 1891 and 1900. In eastern Prince William Sound