Trials of the method have been made during the 1929, 1930 and 1931 seasons by the simple expedient of adding a known number of live larvae to the sample before testing. In only two instances out of 76 trials was there a failure to recover the full number of larvae added.

J. D. WILDMAN
MICROANALYTICAL LABORATORY,
FOOD AND DRUG ADMINISTRATION,
U. S. DEPARTMENT OF AGRICULTURE

SPECIAL ARTICLES

PATERNAL AND MATERNAL INHERITANCE IN FRAGARIA

IRREGULARITIES in the behavior of Fragaria in breeding have been recorded by several investigators. Many cases are recorded where the F_1 seedlings have the characteristics of the female parent only, while a few cases are mentioned by Millardet[1], Solms-Laubach[2], Longley[3] and Ichijima[4], where the F_1 seedlings have the characteristics of the male parent only. In all the cases where pure maternal or paternal inheritance has been observed by the various writers, the seedlings have been crosses between parents having different chromosome numbers. That this type of inheritance also occurs in cases where two plants with the same number of chromosomes are crossed is shown by results obtained at the Oregon State Experiment Station at Corvallis, Oregon.

Several different selections of the wild field strawberry, commonly known as *Fragaria cuneifolia,* were crossed with horticultural varieties by C. E. Schuster in 1929. These were set in the field in March, 1930, and the results were observed in May and June, 1931. One set of crosses consisted of the horticultural variety Gold Dollar[5] (derived from *F. virginiana* x *F. chiloensis*) x *F. cuneifolia,* both of which have 28 chromosomes. In a set of 2,015 seedlings there were 37 plants which showed paternal inheritance only. In a set of 420 plants of Ettersburg 121 x *F. cuneifolia* there was one plant that showed apparently pure paternal inheritance and three that were doubtful. A set of 948 plants of the cross U. S. D. A. No. 147A x *F. cuneifolia* contained two plants with apparently pure paternal inheritance and seven dwarfs. In all there were 43 plants with paternal inheritance only out of 3,519, or 1.2 per cent.

In addition to the above crosses, using *F. cuneifolia* as the male parent, there were two sets of crosses in which pistillate selections of this species were used as the female parents. In a set of 207 plants of the cross *F. cuneifolia* x Gold Dollar, there was one plant with apparently pure maternal inheritance. The flowers were pistillate but sterile. Another selection of *F. cuneifolia,* also crossed with Gold Dollar, contained one plant which appeared to be pure paternal in inheritance in a set of 216 plants. There was also a set of 216 plants of the cross Corvallis x *F. cuneifolia* which had no cases of pure maternal or paternal inheritance that could be detected.

The plants which showed the inheritance from the species (*F. cuneifolia*) parent only were much smaller than the true hybrids, and had all the plant characters of the wild species. A single typical plant of each of the two types in the set of Marshall x *F. cuneifolia* crosses was measured with the following results:

	Plant with pure paternal inheritance	True cross
Fresh weight in grams	130	700
Number of leaves	67	105
Average size of leaves, sq. cm.	16.6	106
Total leaf area, sq. cm.	1,109	11,130

These figures are from only one plant of each kind, but they were representative of the lots and the figures are sufficiently striking to show the difference between the types.

The true hybrids were large vigorous plants, showing the effect of hybrid vigor. Almost without exception they were larger than most of the crosses between cultivated varieties. One plant of the cross Ettersburg 121 x *F. cuneifolia* had as many as 1,352 flowers on it. They showed considerable variation, but were intermediate in most characters between the types of the two parents. The plants with the pure paternal or maternal inheritance of the species were almost or entirely sterile, but the berries produced were distinctly of the type of the species.

No chromosome counts have been made on these plants, and it is not known whether the haploid or diploid number prevails in the somatic tissue of the plants showing inheritance from only one parent. If only one nucleus went into the make-up of the plants the number could have been reduced to haploid through the lack of conjugation, or the diploid number may have been restored by doubling in microsporocyte, as suggested by Ichijima.

It is easily possible that this type of inheritance

[1] A. Millardet, "Note sur hybridation sans croisement ou fausse hybridation." *Mem. Sci. Phys. et Nat. Bordeaux,* 1894, 4 ser., IV: 347–372.

[2] H. Solms-Laubach, "Uber unsere Erdbeeren und ihre Geschichte." *Bot. Ztg.* 65, 1 Abt. 45–76, 1907.

[3] A. E. Longley, "Chromosomes and Their Significance in Strawberry Classification," *Jour. Agr. Res.,* 32: 559–568, 1926.

[4] K. Ichijima, "Studies on the Genetics of Fragaria," *Zeitschrift für Induktiv Abstammungs und Vererbungslehre,* Bd. L V, Heft 4: 300–347, 1930.

[5] In all references to strawberry crosses the female parent is mentioned first.

is common in the crossing of strawberry varieties but that it has not been recognized because of the similarity of the parent plants used. In the cases reported here, the parent plants were so strikingly different in size and appearance, in spite of their having the same number of chromosomes, that paternal and maternal inheritance could be easily recognized. The knowledge that this type of inheritance can be obtained from crossing two plants of the same chromosome number which readily hybridize is useful in making studies on inheritance, and it will obviate the necessity of working with crosses between plants of different chromosome numbers which are rather difficult to obtain.[6]

G. LEONARD RYGG
OREGON STATE AGRICULTURAL COLLEGE
AND U. S. DEPARTMENT OF AGRICULTURE
GEORGE M. DARROW
U. S. DEPARTMENT OF AGRICULTURE

PASSIVE IMMUNITY TO INFECTION WITH A LARVAL TAPEWORM OF THE ALBINO RAT[1]

THE results of a preliminary experiment show that the albino rat can be protected against infection with onchospheres of a cat tapeworm, *Taenia taeniaeformis,* by transfer of serum from immunized rats. This appears to be the first demonstration of transfer of what are probably circulating antibodies resulting from intra-peritoneal injections of cestode material.

It has been shown[2] that an active acquired immunity against infection by onchospheres of *T. taeniaeformis* can be artificially produced in the albino rat as a result of a standard series of six intra-peritoneal injections of a 1 per cent. suspension of powdered worm material of the same species. Complete or almost complete inhibition of development of *Cysticerous fasciolaris* (larval stage of *T. taeniaeformis*) in the liver of the rat resulted from the injections; while cyst development took place normally, for the most part, in control animals. Such artificially immunized rats were used in the present experiment as a source of the serum which was donated to the experimental rats. Thirty-four rats were given the standard series of injections from July 24 to August 8, 1931; they were reinjected with 2 cc of a 1 per cent. suspension of worm material on October 5 and 7. Serum was collected on October 9 and used the following day; normal serum from stock rats was also obtained on October 9.

Fifty-nine rats from 6 litters born May 16 to June 1, 1931, were used; individuals of each litter were distributed through three groups: one (Group A, 22 rats) to receive immune serum; another (Group B, 12 rats), normal serum; and the third (Group C, 25 rats) untreated. All rats were infected with equal portions of a uniform suspension of onchospheres, and the injection of serum begun 2 hours later. The rats of Group A received either 2.5 cc or 7 cc of immune serum intra-peritoneally, and those of Group B either 3 cc or 7 cc of normal serum. All animals were autopsied 34 to 38 days after infection. The data are shown in the following table.

Further experiments are in progress.

	Treatment	Number of rats	Average number of cysts	
			Living	Dead
Group A	7 cc immune serum	10[3]	11	25
		2	142	8
Group A	2.5 cc immune serum	3	12	46
		7	110	19
Group B	3 cc or 7 cc normal serum controls	12	167	14
Group C	Uninjected controls	25	276	16

HARRY M. MILLER, JR.
MARGARET L. GARDINER
DEPARTMENT OF ZOOLOGY,
WASHINGTON UNIVERSITY,
ST. LOUIS

BOOKS RECEIVED

Bulletin of the Museum of Comparative Zoology. *Classification of Insects.* CHARLES T. BRUES and A. L. MELANDER. Vol. LXXIII. Pp. 672. 1121 figures. The Museum.

CAYLEY, NEVILLE W. *What Bird is That?* Pp. xix + 319. Illustrated. Angus and Robertson, Sydney. 12/6.

GREAVES, JOSEPH E. and ETHELYN O. GREAVES. *Elementary Bacteriology.* Second edition. Pp. 535. 138 figures. Saunders. $3.50.

KENLY, JULIE C. *Children of a Star.* Pp. xi + 242. Illustrated. Appleton. $2.50.

KIPPING, F. STANLEY and E. BARRY KIPPING. *Organic Chemistry.* Pp. xi + 614 + xxix. 24 figures. Lippincott. $3.50.

LONG, J. S. and H. V. ANDERSON. *Chemical Calculations.* Third edition. Pp. ix + 259. 16 figures. McGraw-Hill. $1.75.

Report of the Library of Congress for the Fiscal Year, 1931. Pp. viii + 463. Illustrated. U. S. Government Printing Office.

ROBSON, G. C. *A Monograph of the Recent Cephalopoda.* Pp. xi + 359. Illustrated. British Museum (Natural History), London. £1.

[6] Published as Technical Paper No. 157, with the approval of the director of the Oregon Agricultural Experiment Station, a contribution of the department of horticulture.

[1] This investigation was in large part made possible by a research grant made to Washington University by the Rockefeller Foundation.

[2] H. M. Miller, Jr., *Proc. Soc. Exp. Biol. and Med.,* 27, 926, 1930; *Jour. Prev. Med.,* 5, 429, 1931.

[3] No living cysts present in four rats.