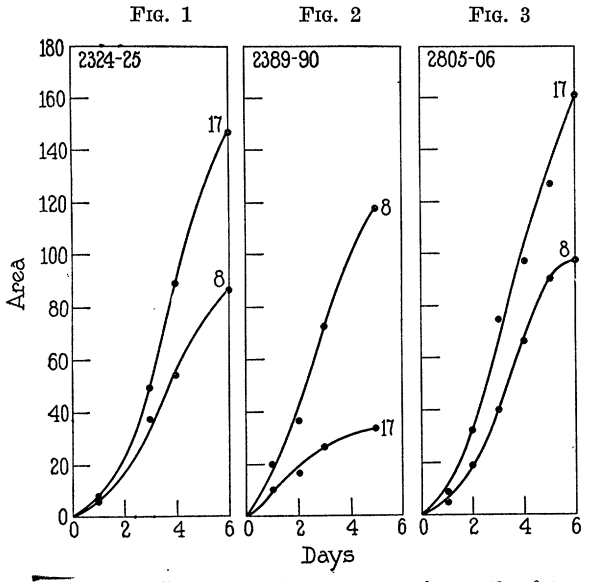

FIGS. 1–3. Curves showing the rate of growth of two strains of fibroblasts isolated simultaneously from the musculature of the lower limb of an 8- and a 17-day-old chick embryo, respectively, and subjected to identical treatment from the beginning until the 26th day. Fig. 1 shows the last 6 days of this treatment. Fig. 2 shows the rate of growth of the same strains for the second of two 5-day periods, during which time the 8-day strain was subjected to more than the usual amount of food substances, and the 17-day strain to less than the usual amount. Fig. 3 shows the rate of growth of the same strains after the previous treatment had been discontinued and both strains had again been cultivated on the same medium for 29 days.

continued for two successive periods of cultivation, they were replaced in media of the same composition. The original characteristics reappeared immediately (Fig. 3), and continued to persist until the termination of the experiment, at which time the strains had been cultivated *in vitro* for a total period of 75 days.

It is clear that the properties characterizing the different races of fibroblasts are real and persistent. They are retained by the cells in an unaltered state in spite of profound alterations in their environment. It is therefore erroneous to suppose that cells removed from the organism revert to an embryonic or indifferent type. While the properties that the cells manifest under various conditions of cultivation outside of the organism are, in part, an expression of the nutritional conditions under which they are placed, they likewise depend upon their origin and upon the age of the animal from which they are removed. The organism is able to effect progressive and irreversible changes in the constituent cells. But when the cells are released from the influence of the organism, they remain permanently stamped with the characters imposed upon them by the peculiar conditions that had existed in the tissues and organs of which they formed a part.

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CONTROL OF THE BLOSSOM BLIGHT STAGE OF FIRE BLIGHT[1]

IN a previous article published in this journal,[2] evidence was presented which indicated that the early blossom blight stage of fire blight was traceable to the dissemination of the germ by honey-bees. If this is true, it would seem that blossom blight might be controlled either by the removal of contaminated beehives and bees or by the application of a germicide to the open blossoms.

Both of these methods are being tried, and the results obtained by the latter appear so promising that it appears desirable to present them, even though the investigations are not complete.

A block of 167 Jonathan apple trees, 21 years old, which had suffered a loss from fire blight of 95 per cent. of its blossom clusters in 1930 and 60 per cent. in 1931, was placed at our disposal by the owner. Four rows, comprising 64 trees, served as controls, receiving the regular early season spray applications common in many of the apple sections of America, consisting of a cluster bud or pink spray, a calyx spray and a first cover spray, the material being one and one half gallons of commercial lime sulphur to 50 gallons of water, to which was added one and one half pounds of arsenate of lead in the calyx spray and in the first cover spray. Seven rows, comprising 103 trees, growing alongside of the check trees, received the experimental spray applications for the control of blossom blight. The material consisted of a weak Bordeaux mixture, made up of one pound of powdered copper sulphate, three pounds of hydrated lime, and 50 gallons of water. To this was added arsenate of lead in the calyx and cover sprays in the same amount used for the checks. The applications were made as follows: First, as a cluster bud or pink spray (April 8 and 9); second, when approximately 25 per cent. of the blossoms were fully open (April 12); third, when approximately 80 per cent. of the blossoms were open (April 16); fourth, when about seven eighths of the petals had fallen (April 20); and fifth (May 9), when the first brood of codling moths was anticipated.

It is to be noted that, aside from chemicals, the main point of difference between the experimental spray program and that of the standard spray schedule is the application of two sprays when the blossoms

[1] Research paper No. 287, Journal Series, University of Arkansas.

[2] SCIENCE, 72: 301–302, 1930.

were fully open. The danger of injury from spraying such delicate organs was present of course in the mind of the owner and of the investigator, but the latter's previous experience in other orchards of applying one spray of Bordeaux mixture to open apple blossoms, for three successive years previous to this experiment, suggested that two such sprays would not result in injury to blossoms or in excessive russeting of fruit. It is well known that the latter type of injury, depending on weather conditions, may be had with the regular lime sulphur sprays as with Bordeaux mixture, although most observers agree that during cool, moist weather Bordeaux is likely to cause more russeting than lime sulphur. However, the writer's work up to the present suggests that in the Ozarks of Arkansas early season applications of weak Bordeaux on Jonathan apples, the only variety investigated, have not caused any large amount of injury to fruit and from this point of view have been satisfactory to the grower in every instance. The necessity of two spray applications to open blossoms is obvious. Very rarely will any large proportion of the blossoms open at the same time on any pome; often as much as two weeks or more intervenes between the opening of the first blossoms and the later ones.

The observations and results of this particular experiment to control blight may be briefly recorded as follows:

First, while much of the blighted wood of the previous year had been pruned out, numerous blighted twigs remained. Nevertheless, no exuding cankers were found on any of the trees prior to the first signs of blight.

Second, blight was first noted on April 25 in 22 blossom clusters on check trees. None was found on the Bordeaux sprayed trees. A thorough search on every tree for active hold-over cankers resulted in failure.

Third, blight was found in greater or less abundance on May 5 on almost every check tree, while the Bordeaux sprayed trees remained without any signs of blight. However, the amount of blighted blossom clusters on these checks was as a whole not nearly as great as in the past few years. Only one check tree showed as much as 308 blighted clusters, or 60 per cent.

Fourth, diseased blossom clusters having turned brown by May 9, the disease was now more easily detected. Accurate counts were made again on each blighted tree. The amount of disease on the checks appeared to be the same as that noted on May 5. On the Bordeaux sprayed trees, out of the 103 trees only three showed any blight, the total for the three being five blighted blossom clusters.

Fifth, on May 18, when many of the fruits had attained the size of one inch in diameter, secondary blight was noticeable, though not in great quantities, on about one third of the check trees, and on two of the Bordeaux sprayed trees standing in the row next to the checks. Four blighted leaf shoots comprised the total number of secondary infections on the Bordeaux sprayed trees, a number which represented a very small fraction of the total number, uncounted, on the checks. These secondary infections occurred on leaf shoots devoid of fruit clusters as well as on twigs bearing both succulent shoots and fruit clusters.

The results of this experiment are so clear cut that there can be no doubt about blossom blight having been almost completely controlled in the experimental spray plot. Viewed from a background of recurrent and disastrous epidemics of blight on pears and apples experienced in America for over a century, the results here cited are almost too good to be true. It appears doubtful to the writer that such nearly perfect control will always be obtained by this schedule. The results of this test, however, appear unmistakable. There remains to be determined the influence of this schedule on russeting of various varieties of pears and apples; its influence on setting and dropping of fruit; its effect on foliage, twig and limb growth; and its efficiency in controlling twig, limb and root blight. It is also possible that it may be effective in some years and in some sections of the country and not in others.

H. R. ROSEN

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BOOKS RECEIVED

Annual Report of the Smithsonian Institution. Pp. xii + 592. U. S. Government Printing Office.

BALDWIN, S. PRENTISS and S. CHARLES KENDEIGH. *Physiology of the Temperature of Birds.* Pp. x + 196. 41 figures. Cleveland Museum of Natural History.

COLLINS, A. FREDERICK. *The Metals: Their Alloys, Amalgams and Compounds.* Pp. ix + 310. 54 figures. Appleton. $2.00.

CONVEGNI BIOLOGICI. Pp. 147. Illustrated. Instituto di Chimica Biologica, Naples.

FREUDENBERG, K. *Stereochemie.* 4. Lieferung. Pp. 481–638. Franz Deuticke. Leipzig.

GLAZIER, HARRIET E. *Arithmetic for Teachers.* Pp. xv + 291. McGraw-Hill. $2.00.

GRAVES, HENRY S. and CEDRIC H. GUISE. *Forest Education.* Pp. xvii + 419. Yale University Press. $2.50.

HENDRICK, BURTON J. *The Life of Andrew Carnegie.* Vol. I: Pp. xi + 434. Vol. II: Pp. vii + 425. Illustrated. Doubleday, Doran. $7.50.

KUCZYNSKI, ROBERT R. *Fertility and Reproduction.* Pp. 94. Falcon Press, New York. $1.85.

MATHESON, ROBERT. *Medical Entomology.* Pp. xii + 489. 211 figures. Thomas. $5.00.

NEWMAN, HORATIO H. *The Gist of Evolution.* Pp. ix + 154. Macmillan. $1.50.

PAGE, VICTOR W. *Prevention of Automobile Accidents.* Pp. xvi + 172. 30 figures. Henley. $.75.

SELLARS, ROY W. *The Philosophy of Physical Realism.* Pp. xiv + 487. Macmillan. $4.00.