and no injection was made; this monkey died of yellow fever 36 days after being bitten by mosquitoes. In the meantime, the colony of mosquitoes at Cornell had been discontinued.

It was not feasible to resume this work until the present year. In March, larvae (*A. triseriatus*) were collected from tree-holes at Ithaca and reared in the laboratory of the Department of Entomology at Cornell University. Mosquitoes which had previously taken an infective blood meal were allowed to feed on four monkeys. These animals showed no febrile reaction, but two of them died of yellow fever after intervals of 10 and 13 days. Blood taken from the two surviving monkeys failed to protect mice against yellow fever. The two monkeys which survived were bitten by mosquitoes which were kept for 14 to 15 days at about 28° C., whereas the two monkeys which died were infected by mosquitoes which were incubated at 37° C.

Ten mosquitoes which had ingested infective blood of dying monkeys were tested for virus after incubation periods of 13 to 16 days. Each mosquito was ground in a mortar with a little serum-saline, and injections were made intracerebrally in white mice. The virus was recovered from 6 of these 10 mosquitoes.

Briefly, the virus of yellow fever in its ordinary form was transmitted to monkeys (*Macacus rhesus*) by *Aëdes triseriatus,* and there was some evidence of attenuation of the virus in this mosquito.

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CORRELATION BETWEEN SELF-BREAKING AND BLUE NUCLEI AMONG CERTAIN COMMERCIAL TULIP VARIETIES[1]

IT has been pointed out in "The Antithetic Virus Theory of Tulip Breaking"[2] that while the virus content of the plant determines the type of breaking in all pink and nearly all red tulips some dark red varieties always self, regardless of their virus content. In such tulips the dark red anthocyanin of the flower epidermis is darkened in certain areas and left unchanged in others; the ground color is not exposed. Likewise the black tulip, La Tulipe Noire, when infected with a virus, merely darkens. Several years ago the writer made the unpublished and then unrelated observation that nuclei apparent in mounts of the flower epidermis of La Tulipe Noire are sometimes blue. A study of virus effects on the new race of tulips known as Mendel tulips has shown that without exception every red Mendel variety bearing flowers with a white ground and blue base, selfs or darkens when inoculated with inoculum containing tulip virus I, the color-removing virus. Of the 49 red varieties studied, 21 evidence a blue pigment in the epidermis of the basal portion, which occurs (1) free in the cytolymph of epidermal cells, (2) as prismatic crystalline masses, (3) *within the nuclei of the cells* or (4) in combinations of these three conditions. Frequently, the nuclei are so blue that no structure can be seen within them. The pigmentation of the nuclei is greatest in cells that are beginning to degenerate but is also evident in cells that are apparently healthy. There is no correlation whatever between the presence of a virus and the occurrence of these blue nuclei. The pigment is present in both healthy and diseased individuals, and blue nuclei are evidenced wherever it is abundant. A further study of La Tulipe Noire shows that its approach to blackness is due to the presence of intensely blue cells scattered among the dark red cells of the flower—the nucleus-staining pigment is not confined to the base of the flower. The blue pigment reacts positively to the qualitative reactions for an anthocyanin, changes to a rose color at pH 4.5 and to a yellow-green between pH 7 and 8. Solubility tests tend to differentiate it from the conspicuous red anthocyanin of the tulip flower. Blue nuclei are found in the bases of red Darwin tulips that likewise self in the presence of the color-removing virus. It is not claimed that all red tulips having this pigment will always self, but no exception has been found for dark red Mendels.

Freshly made mounts of tulip flower epidermis are beautiful microscopical objects. The clarity of the self-staining of the pigmented nuclei offers an exceptional opportunity for nuclear study, especially since the pigment seems confined to the karyolymph. Moreover, the blue pigment acts as a selective intravital stain and exhibits vacuolation phenomena with astounding clearness.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE COMBUSTION TYPE OF CARBON MONOXIDE ESTIMATOR

THIS method depends upon the conversion of carbon monoxide into carbon dioxide by combustion and the reaction of this carbon dioxide with strontium hydroxide (or other alkali-earth hydroxide), using phenolphthalein as an indicator. Obviously any carbon dioxide or hydrocarbon vapor which may be present in

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[2] *Annals of Appl. Biology,* 25: 254–270, 1938.

the air must be removed or high results will be obtained. A simple and inexpensive apparatus using this principle and sufficiently accurate for industrial health purposes is shown in Fig. 1.

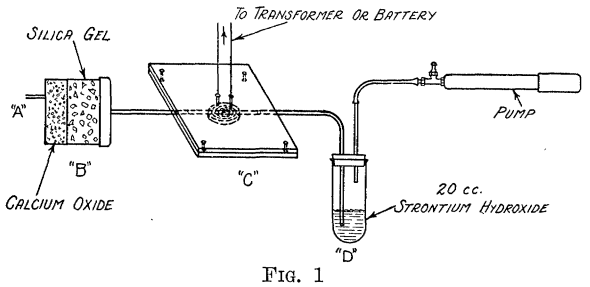

FIG. 1

The letter "A" designates the inlet to the apparatus. 3/16 inch copper tubing with brass fittings similar to those on automobile gasoline lines are used. The canister "B" is of tin and should have a capacity of at least four cubic inches. This canister is two thirds filled with silica gel and one third with calcium oxide for removal of hydrocarbon vapors and carbon dioxide, respectively. The copper outlet tube from canister leads to the combustion unit "C." This unit consists of two 3 inches × 3 inches × ¼ inch pieces of transite (Johns-Mansville) board bolted together with 4-⅛ inch brass bolts. A suitable central recess is made in one board as shown to carry the heating element of a nineteen cent automobile cigar lighter unit. These units are obtainable with one bolt terminal, and the other terminal may be made by notching out the head of a small cylindrical headed bolt and swedging the other end of the element in this notch. The edges of the transite board are made air-tight by the application of a small amount of furnace cement. The exit tube of the combustion unit is connected to a small bubbler "D," as shown. A suction pump of 55–60 cc capacity per stroke can be conveniently made from a 10 inch bicycle pump. A 3/16 inch tee is sweated to the bottom of the pump and then two ball check valves to the tee as shown. The current for the combustion unit may be furnished by a toy transformer supplying nine volts or from a six-volt storage battery.

The solution used in the bubbler is 1/2,500 normal solution of strontium hydroxide. This solution is conveniently standardized against 1/50 normal sulfuric acid (0.55 cc of conc. sulfuric acid (sp. gr. 1.84) in one liter of solution). 100 cc of strontium hydroxide solution is equivalent to 2 cc of N/50 sulfuric acid. Each liter of the strontium hydroxide solution should contain 15 cc of 0.1 per cent. phenolphthalein in 85 per cent. alcohol. The solution is stable if kept away from air containing carbon dioxide. If 20 cc of this solution is placed in bubbler and air pulled through at a rate of 100 cc per minute, then Table I will apply.

TABLE I

If red color (phenolphthalein) disappears after: Number of pump strokes	Parts per million of carbon monoxide present
1	2,000
2	1,000
4	500
8	250
16	125

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GROWING FUNGI ON CELLOPHANE

VARIOUS saprophytic fungi (Aspergillus, Fusarium and Verticillium) isolated from dead leaves were grown successfully on rolls of filter paper and of Cellophane in test-tubes. Each tube contained a few cc of Knop's solution with which the rolled sheets were in contact and by which they were continually moistened. Growth was equally good on both media. The transparency of the Cellophane permitted one to observe the growth of the organism directly, even with considerable magnification. The cellulose acetate appears to be partially hydrolyzed during sterilization and to improve the Knop solution as a nutrient for the fungi.

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