

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 *Aedes triseriatus*, and there was some evidence of attenuation of the virus in this mosquito.

BYRON L. BENNETT

FRED C. BAKER

ANDREW WATSON SELLARDS

#### CORRELATION BETWEEN SELF-BREAKING AND BLUE NUCLEI AMONG CERTAIN COMMERCIAL TULIP VARIETIES<sup>1</sup>

It has been pointed out in "The Antithetic Virus Theory of Tulip Breaking"<sup>2</sup> 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made the unpublished and then unrelated observation that nuclei apparent in mounts of the flower epidermis of La Tulipe Noire are sometimes blue.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.

FRANK P. MCWHORTER

OREGON AGRICULTURAL EXPERIMENT STATION,  
CORVALLIS

## 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

<sup>1</sup>Published as Technical Paper No. 289 with the approval of the director of the Oregon Experiment Station. Contribution of the Department of Botany, Oregon Ex-

periment Station, in cooperation with the Bureau of Plant Industry, U. S. D. A.

<sup>2</sup>*Annals of Appl. Biology*, 25: 254-270, 1938.