such a sparsely settled area. Particulars of these returns are given in Table 1.

The resultant drifts of these bottles, with the assumed general movements, are indicated in Figs. 1

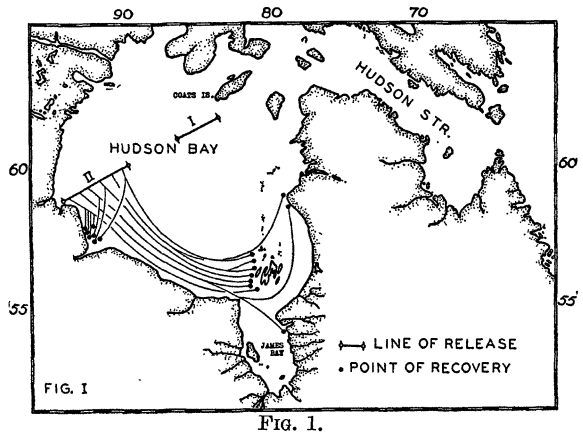

FIG. 1.

and 2. The returns from Lot 2 (Fig. 1) indicate a southeasterly movement along the southwest coast of Hudson Bay. From James Bay, the tendency is seemingly for a northerly movement holding close to the eastern coast of Hudson Bay. In plotting the meager returns from Lots 3 and 4 (Fig. 2), the in-

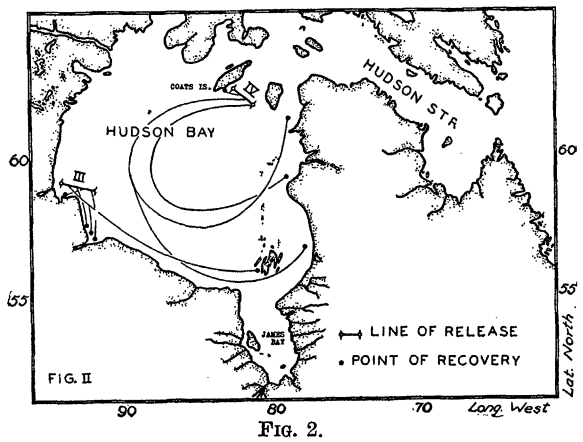

FIG. 2.

formation obtained from the returns of Lot 2 (Fig. 1) is taken into consideration. A northwesterly drift of the bottles is indicated by the one return from Coats Island. Consequently, the bottles of Lot 4 found along the east coast of Hudson Bay have probably made an almost complete circuit of the bay.

On the basis of this analysis of the returns, the general circulation of the surface waters of Hudson Bay would seem to be an anticlockwise one, with the outward movement of the waters from the James Bay area holding close to the eastern coast of Hudson Bay.

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THE ANTIGENIC PROPERTIES OF PLANT VIRUSES

THE application of serological methods to plant viruses has aroused considerable interest among pathologists, and recently several workers have presented the results of experiments which were planned to demonstrate that the active antigens are the viruses and not some other constituent of the plant. One of the most recent papers is that of Chester,[1] who has approached the problem from several angles. While Chester's general conclusion appears to be justified, the method used for presenting some of his data and likewise some of his reasoning can not be followed.

In Fig. 1 of his paper are presented line graphs showing the effect of temperature on four different viruses obtained from Turkish tobacco. The effect of temperature on the viruses was determined: (1) by the number of necrotic lesions or by the number of infected plants produced by the heated viruses and (2) by the precipitin reactions.

The writer was struck with the fact that the datum points for the infectivity of the unheated virus controls and for the seric reactions of these same controls coincide in the case of two viruses and are very close together in the case of the other two viruses used. This seemed to be phenomenal, since the actual number of lesions and the number of systemically infected plants produced by a given virus with a given species of plant is dependent on several factors other than the virus. If more or fewer leaves or larger or smaller leaves had been wiped the actual number of lesions would have been greater or less than indicated in the graphs. Likewise, the number of systemically infected plants would be reduced or increased in accordance with the number of plants inoculated and the technique used. Furthermore, the actual number of lesions is influenced by slight differences in technique and environmental conditions. Owing to the variations in all the quantitative virus infectivity methods now in use, it would be extremely difficult to plan quantitative tests in a manner to insure obtaining a prearranged number of local lesions or of systemically infected plants. It appeared, therefore, that suitable factors had been employed for the purpose of bringing the infectivity curves in close proximity to their respective seric-activity curves, though this point is not made clear in the paper.

Examination of the graphs in question shows that each of the vertical scales presumably is plotted on a logarithmic basis. However, on closer examination it is found that the infectivity scale is not truly logarithmic throughout, the upper end being abnormally compressed in relation to the lower portion. On

[1] K. Starr Chester, *Phytopathology*, 25: 702–714. 1935.

the other hand, the precipitin dilution scale is uniformly logarithmic throughout.

Since none of the data were presented in numerical form it was very difficult to determine the infectivity data from the graphs, especially in the distorted portion. However, close estimates were obtained, and these together with the seric-reaction data were replotted on standard semi-logarithmic paper. In the tobacco mosaic and tobacco ringspot, it was found that the datum points for infectivity and seric reaction of the unheated viruses do not coincide, the points for the virus of tobacco mosaic showing an especially marked departure.

Chester calls especial attention to the fact that his curves for the seric inactivation and infectivity nearly coincide for each virus, but this curve proximity is accentuated through the use of the logarithmic scale which compresses increasingly as the data increase in magnitude. By plotting these data on plain graph paper this relationship is much less striking, especially in those curves in the upper portion of the figure.

For purposes of interpreting the antigenic nature of a virus it seems apparent that the infectivity and the seric-reaction end points are of much greater significance than the other points on these curves. These end points seem to be close in the case of each virus given the temperature treatments. It appears also that these end points were close when the viruses were treated with chemicals.

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CLEAVAGE WITHOUT NUCLEI

WHEN unfertilized *Arbacia* eggs are centrifuged for four minutes at 10,000 X gravity in a sucrose solution isosmotic and of the same density as the eggs, so as to keep them suspended, they break into two nearly equal parts.[1,2] One of these parts is nucleated, *i.e.*, contains the female pronucleus, and the other is non-nucleated. This distribution is invariable; the nucleus always lies in the light half, under the oil cap. By treating the non-nucleate halves, which contain only yolk and pigment granules and the matrix or ground substance, with parthenogenetic agents, such as concentrated sea water, they throw off fertilization membranes. When transferred to sea water, cytasters soon appear, and after two hours cleavage planes appear in many of them. These divide the enucleate half-eggs sometimes into two equal cells, sometimes into two unequal cells and sometimes into three or four cells, equal or unequal. By subsequent cleavages, the enucleate half-eggs develop into blastulae, sometimes quite normal in appearance. Blastulae of approximately a hundred cells have developed from these activated enucleate half-eggs, though as yet no swimmers. Cleavage can therefore occur in eggs without either maternal or paternal nucleus. A full account of these parthenogenetic merogones with photographs will be published shortly.

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[1] E. N. Harvey, *Biol. Bull.*, 61: 273, 1931.
[2] E. B. Harvey, *Biol. Bull.*, 62: 155, 1932.

THE HATCHING OF EGGS OF THE SOUTHERN BUFFALO GNAT

IN the spring of 1927 and in other years since that time considerable numbers of farm animals, chiefly mules, have been killed in the lower Mississippi Valley by outbreaks of the Southern buffalo gnat (*Eusimulium pecuarum* Riley) (Simuliidae: Diptera). In former times this insect caused enormous losses of live stock in this region, but for some forty years prior to the present series of outbreaks, little was recorded concerning its depredations. That the sudden appearance of swarms of this pest is in some way dependent on spring floods has long been known, but the available information on the life history of the insect has failed to explain satisfactorily the phenomenon of this relationship.

After an investigation of the buffalo gnats that infest the lower Mississippi Valley, with special reference to *Eusimulium pecuarum*, Webster[1] stated that, so far as observed, the eggs of all the species dealt with hatch within a few hours, and the larvae live in the streams nearly an entire year before changing to pupae. The writer has for several years past made a careful search for young larvae of *E. pecuarum* in the gnat-producing rivers of Mississippi and Arkansas immediately after the spring outbreaks and also later in the summer.[2] During neither of these periods has he been able to find young larvae, although very small ones, which appeared to be *E. pecuarum*, were collected on November 22 and 23, 1932.

In April, 1934, several lots of eggs were obtained by confining gravid females of this species in jars over water. These jars were brought to the laboratory at Orlando, Fla., and were divided into two lots; one, in which the water was kept agitated and aerated by a continuous stream of air produced by a suction pump in a manner similar to that described by McCutcheon[3];

[1] F. M. Webster, U. S. Dept. Agric., 4th and 5th Annual Reports of B. A. I. for the years 1887 ad 1888; 456–465. 1889.
[2] G. H. Bradley, "Notes on the Southern Buffalo Gnat." (Accepted for publication in Proc. Ent. Soc. Wash.), 1935.
[3] F. Harold McCutcheon, SCIENCE, 76: 1975, 416–417, November 4, 1932.