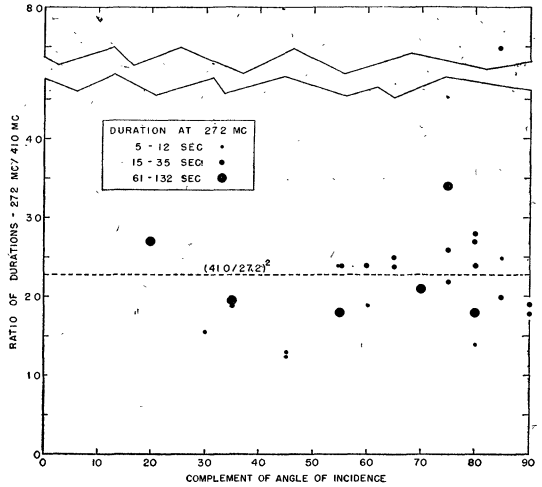

FIG. 2. Ratio of durations as a function of angle of incidence.

the shower radiant (complement of the angle of incidence). Correction for delay in the beginning of the echo (*3*) was made by reckoning duration from the time of visual appearance of the meteor. The time of visual appearance was recorded directly on the range-time record by the observer, who pressed an electric button switch each time a meteor was observed. An allowance of ½ sec was made for the observer's reaction time.

The median ratio in Fig. 2 is 2.3 ± 0.1, which is equal to the square of the ratio of wavelengths (2.27) within the probable error. During the shower observations, the powers and sensitivities were changed somewhat from the values used while obtaining the data in Fig. 1. The difference between the ratios in Fig. 1 and 2 is probably attributable to this.

As pointed out by Herlofson (*4*), simple diffusion of the ionization in a meteor trail, after the ionization has been dispersed so much that the incident radio wave intensity is not appreciably modified in passing through the trail, would result in a reduction of the echo amplitude in accordance with the formula

$$A = A_0 \exp(-16\pi^2 Dt/\lambda^2),$$

where A is the amplitude at time t, A_0 is the amplitude extrapolated to zero time, D is the diffusion coefficient for diffusion parallel to the direction of propagation of the radio wave, and λ is the radio wavelength. This formula holds true for any distribution of ionization density upon which diffusion alone is acting, subject to the condition that the incident wave is not appreciably modified in passing through. Thus, as noted by Herlofson, for a constant value of A_0 (approximately realized if power and sensitivity remain constant) the duration would be proportional to λ^2. On the average, the ratios of durations at 27.2 Mc and 41.0 Mc are in good agreement with this relation.

To account for long-enduring echoes, Herlofson suggested that abnormally low values of D would occur for the case of wave propagation nearly transverse to the earth's magnetic field if the transverse diffusion were markedly inhibited. Evidence for such an effect has been cited by Lovell (*1*). Because of the antennas used, our equipment was not well suited to record echoes from meteor trails for which the direction of wave propagation was nearly perpendicular to the earth's magnetic field; nevertheless, many long-enduring echoes were recorded. In Fig. 2 there are six examples of durations at 27 Mc which exceeded 1 min. In these cases the angle between the direction of wave propagation and the direction of the magnetic field, estimated from the visual observations, ranged from 20° to 50°. At these angles the inhibiting effect of the magnetic field would be small. Although this does not constitute evidence that the magnetic field effect does not exist, it shows that the effect is not necessary for the occurrence of echoes of substantial duration.

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Demineralization of Hard Tissues

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If calcium carbonate, basic component of certain hard tissues, is dissolved by the action of an acid reagent, the developing CO_2 bubbles are apt to destroy the pattern of the remaining organic material. Presented with the problem of how to avoid this inconvenience, one of us (H.) suggested an alkaline reagent to be used for the purpose, namely, a solution of the sodium salt of ethylene-diamine-tetracetic acid, whose interesting analytical application he has been studying for some two years (*1, 2*).

Because of the communication by Sreebny and Nikiforuk (*3*), we wish to make known our first observations, which, although incomplete, are very satisfactory.

The equation given by Sreebny and Nikiforuk leaves out of account the hydrolysis of the sodium salt or, more exactly, of the quaternary ion of the acid (represented by R----).

$$R^{----} + H_2O \quad RH^{---} + OH^-.$$

So, one of the possible formulations of the complex-forming reaction of the Ca^{++} ion is correctly[1]

$$RH^{---} + OH^- + Ca^{++} \quad RCa^{--} + H_2O.$$

This elimination of OH^- ions is the phenomenon used in one of the analytical applications of the reagent. In the demineralization process, due to the same phenomenon, an efficient buffer has to be used

[1] For a complete account of the equilibria between all combining ions, see (*4*).

with the reagent if it is intended to maintain a constant pH value.

The complex-forming tendency between the reagent and trivalent iron is greater if the acid is neutralized by quaternary sodium pyrophosphate instead of NaOH; so the velocity of demineralization of iron containing tissue (stains) is notably increased.

The velocity of the demineralization increases notably if the treated material is suspended near the upper surface of a high column of reagent. The complex-containing solution, having a higher density, sinks down and so an automatic circulation and renovation of the reagent takes place. A mother-of-pearl button will be completely demineralized in 8–14 days.

Although the mother-of-pearl is almost floating in the solution after demineralization, its characteristic iridescence remains unaffected; hence, contrary to general opinion, the light diffraction is not due to the aragonit layers of the material, but to the micellar structure of its organic component, easily recognizable under the microscope.

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The Detection and Isolation of Naturally Occurring Strains of Tobacco Mosaic Virus by Electrophoresis[1]

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Previous work (*1*) has demonstrated the utility of electrophoretic analysis of plant cytoplasmic proteins in following the development of tobacco mosaic virus (TMV) in an infected tobacco plant. The virus component is distinguishable from the native cytoplasmic protein by its different electrophoretic mobility. A more extensive electrophoretic investigation has now revealed the presence of two virus components, which differ in electrophoretic mobility, in a naturally occurring mixture in the infected cytoplasms we have examined.

These two virus components exhibit symptomatic behavior closely similar to that of the Mild and Severe strains isolated by Johnson (*2*) by biological means from a similar source. We have utilized electrophoresis in separating the components, and have further distinguished them by serological methods. The following is an account of the results of this study, which will be reported in greater detail elsewhere.

The sample of TMV used in these studies was kindly supplied, in the form of an infected dry leaf, by James Johnson, of the University of Wisconsin. Electrophoresis experiments were performed in a 0.1 ionic strength buffer, pH 6.93, containing 0.08 *M* NaCl, 0.02 *M* Na cacodylate, and 0.0033 *M* cacodylic acid. Electrophoretic scanning patterns of the total cytoplasmic proteins extracted directly from infected leaves of Turkish tobacco are shown in Fig. 1. In addition to the fastest-moving virus component represented by the large, spikelike peak (*a*) and the more diffuse mound (*b*) representing the normal cytoplasmic proteins of intermediate mobility, there is also present a small amount of a third component producing a spikelike peak (*c*) on the slow side of the cytoplasmic protein boundary. The main virus component constitutes about 40% of the total protein, whereas the third minor component, which was later proved also to be virus protein, represents only about 5% of the total cytoplasmic protein. A fourth, still slower-moving component (*d*) of unknown nature is also present.[4]

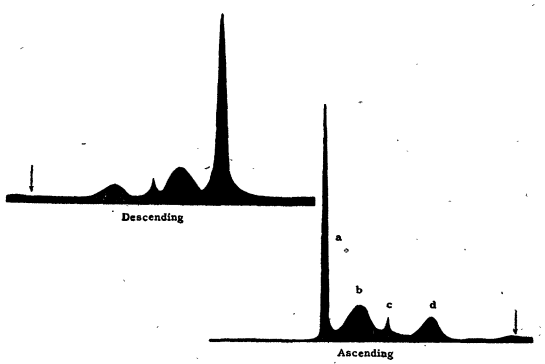

FIG. 1. Electrophoretic scanning patterns obtained in the Swingle Tiselius apparatus (*5*) of whole cytoplasmic proteins extracted from Turkish tobacco plants infected with tobacco mosaic virus; 18,000-sec migration in 0.1 μ NaCl-cacodylic acid buffer, pH 6.93, at a potential gradient of 5.10 v/cm; 1% total protein. Arrows indicate positions of starting boundaries.

In order to have enough material available for the electrophoretic isolation of the minor component, another group of Turkish tobacco plants was infected with TMV, and about 2 weeks after infection the virus was isolated according to previously described procedures (*3*). The virus preparation, freed from the lower molecular weight normal proteins and the com-

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[4] This sample of cytoplasm was extracted from a mature leaf 16 days after it was inoculated with the virus, and it may be that the extra component arises from degenerative processes that occur in the leaf protoplasm as the result of virus infection. This component does not appear in cytoplasms extracted from healthy leaves.