The ionosphere recording equipment comprises a transmitter emitting pulses of approximately the same characteristics of duration, repetition frequency, and peak power as those from the meteor equipment; a receiver; and a camera recorder. The antenna is a modified rhombus oriented so that the main lobe is directed upward.

The ionosphere recorder operated automatically, obtaining records of the ionosphere layer heights and critical frequencies every 15 min. Few records were lost from failure of equipment or other causes. During the period of observation 16,700 ionospheric records were obtained.

Data from the two recording devices consist of (a) frequency of occurrence of reflections from meteor trails as indicated by the distinct and characteristic short duration echoes observable on an oscilloscope screen, and (b) the frequency of occurrence of reflections from E layer heights commonly interpreted as sporadic E reflections (E_s), as well as values of fE_s (maximum E_s reflection frequencies in megacycles) for each hour. The ionospheric records during the period were scaled independently of the reductions of the meteor data. The majority of the scalings of these ionospheric records were performed by an observer having no knowledge of the meteor data. Thus, as far as possible, effects of personal prejudice in the scaling of the records were eliminated. The results are presented in Figs. 1, 2, and 3.

Fig. 1 shows the diurnal variation of the frequency of occurrence of meteor reflections as compared with the percentage of time of occurrence of sporadic E reflections throughout the day. Average values are presented for each of the months in the period from November 1948 to April 1949. The meteor reflection rates exhibit characteristic maxima at about 0600 EST, while the E_s exhibits maxima around midday. It is possible that the E_s curves are biased by the diurnal variations of absorption. If so, the effect is to lower the occurrences during midday when absorption is at maximum. If corrections were to be applied to the curves to correct for this effect, they would result in increasing the midday maxima and could not bring the two sets of curves into better agreement. The absorption at the 27.2-megacycle frequency used for obtaining meteor reflections is, of course, very low and could not be expected to alter the curves noticeably.

A scatter diagram of percentage of time occurrence for E_s plotted against the meteor reflection rates is presented in Fig. 2. Lack of any appreciable correlation between the two quantities is evident. The data for January, which were the most continuous for any of the months under consideration, are plotted in Fig. 3 to show the day-to-day average broken down into dichotomous groupings from 0000 to 0900 hr and from 1800 to 2300 hr. In this case, the average value of E_s at any hour is used instead of the percentage of time occurrence. Lack of any similarity between these two curves is apparent. Interest attaches to the high hourly rate of meteor reflection in the morning hours during the first part of January—a result of the Quadrantid shower.

These data seem to warrant the conclusion that the frequency of occurrence of sporadic E reflections is unrelated to meteor phenomena, at least to those which can be detected at 27.2 megacycles. Of course, it may still be argued that sporadic E reflections are caused by meteors having such low energy or other characteristics that they escape detection by the radiofrequency used. This, of course, would require that the distribution of these hypothetical particles have a different frequency of occurrence from the distribution of those that are detectable. As far as is known there is no theoretical basis for such an assumption.

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Polymers from Chicle

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Two polymeric unsaturated hydrocarbons are found in plants—caoutchouc (rubber) and gutta (gutta-percha). Formally, both are considered to be derived from isoprene and are believed to differ in the spatial configurations of the carbon atoms around the double bonds (*1, 4, 5*), caoutchouc being the *cis-*, and gutta, the *trans-*configuration for chain continuation.

Recently, publications have appeared in which attempts to find both caoutchouc and gutta in material obtained from the same plant source were unsuccessful (*3, 6*). In one of these publications (*6*) chicle is reported to contain only the isomer corresponding to gutta.

Studies in this laboratory have indicated the existence of both types of hydrocarbon in commercial chicle. X-ray (*2*) and infrared absorption spectrum data[1] confirm the identification of the two polymers isolated with caoutchouc and gutta. Outlined here are methods used in this laboratory for separation of the two polymers.

Chicle used was the commercial product selected from lots believed to be as nearly as possible "pure," i.e., the product of a single species of tree. This chicle was melted, strained, and centrifuged in the molten state to remove bits of bark, stones, and similar impurities. The molten centrifuged chicle was cooled and allowed to stand at room temperature for about 1 week before benzene extraction.

For separation of the polymers, 1600 g of centrifuged chicle was treated with 2400 ml of thiophene-free benzene and allowed to stand for 24 hr at 30°–35° C with occasional shaking to insure complete dispersion. This mixture was then centrifuged to separate the transparent yellow-brown benzene solution from the insolubles. To the benzene solution was then added, with stirring, 4,800

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[1] We are grateful to Baird Associates, Inc. for infrared absorption spectrum curves on these materials.

ml of absolute ethyl acetate, and the mixture was set in the refrigerator overnight.

The crude gutta which separated was filtered with suction on a Büchner funnel and rinsed twice with 100-ml portions of ethyl acetate. Yield of crude gutta was 219 g or 13.7% of starting chicle.

This gutta was extracted in a Soxhlet apparatus with acetone for 24 hr to remove waxy and resinous impurities. The acetone-extracted material was then extracted for 24 hr in a Soxhlet apparatus with peroxide-free ethyl ether. The insoluble extracted gutta was air-dried to constant weight. Gutta obtained by this procedure was found to melt at about 69°–71° C (the melting point varying slightly from sample to sample) and is believed to correspond to the α-form of gutta from gutta-percha or balata. A lower melting form (mp 64°–66° C) may be obtained by melting this gutta and cooling rapidly or by recrystallizing from petroleum ether or other solvents.

The caoutchouc-type polymer was precipitated from the filtrate after filtering off the crude gutta, by addition of 5,000 ml of acetone, with stirring, to the clear benzene-ethyl acetate solution. The polymer began to precipitate immediately, and was separated, after 24 hr of standing in the refrigerator at 5° C, by centrifuging. Addition of a small amount of electrolyte (KI) to the mixture results in more complete precipitation of the polymer and allows it to be separated from the supernatant mother liquor simply by decanting. Yield of crude caoutchouc-type polymer was 76 g or 4.8% of starting chicle.

This polymer was purified by a 24-hr extraction in a Soxhlet extractor with acetone, and then it was dissolved in benzene (by standing overnight), filtered through filter paper, and reprecipitated with acetone. Supernatant mother liquor was decanted from the precipitated polymer, which was then rinsed with acetone and dried in a vacuum desiccator.

Osmometric molecular weight studies on the two types of polymers gave the following figures: gutta, 16,000; caoutchouc, 91,000. Infrared absorption spectrum measurements in the range of $2.5\,\mu$–$15\,\mu$ indicate that the gutta and caoutchouc isolated from chicle are lower molecular weight equivalents of polymers from gutta-percha (Pahang) and rubber (*Hevea*, pale crepe), respectively. They are also believed to correspond to the cold ether-insoluble and cold ether-soluble hydrocarbons isolated by Prochazka and Endemann (1879), and cited by Scheresсhewski (7).

The procedure outlined has yielded the two polymeric types when applied to a number of commercial chicle samples obtained from widely separated geographic locations. Samples of chicle before centrifuging have also been found to yield the two types of polymer.

Details of experimental procedures and physical measurements will be published later.

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Several Effects of Maleic Hydrazide on Plants

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Schoene and Hoffman (*2*) illustrated that maleic hydrazide, applied as a spray at a concentration of 2000 ppm, temporarily inhibited stem growth of tomato, and they reported that plants showing this response resumed growth from lateral buds about two months after treatment. They also observed that some chlorosis appeared and that root growth was inhibited. Temporary stoppage of shoot growth was also recorded for several other species.

The writer began to test the effects of the diethanolamine salt of maleic hydrazide on a variety of plants shortly after the report, just cited, was published. Concentrations of 2,400 and 600 ppm of the active ingredient were arbitrarily chosen for preliminary work. To a water solution of the salt enough of the detergent, Tide, was added to assure satisfactory wetting of leaves. The mixture was applied on warm, sunny days with a 3-gal compressed-air sprayer or with a nasal atomizer. Testing was done both out of doors and in the greenhouse.

Easily visible effects on plants included: (1) a temporary suspension of stem elongation from terminal buds or death of terminal buds and adjacent tissues, (2) expansion of lateral buds some time after the terminal bud had been affected, (3) a transient intensification of green in leaves of stunted plants, (4) a localized accumulation of anthocyanins or other nongreen pigments, (5) narrowing of leaves on both monocots and dicots, (6) several patterns of leaf chlorosis, (7) an interference with water absorption, apparently caused by death of root tips, (8) suppression of nodule formation on bush beans, and (9) total, temporary, or male sterility.

Stunting was common, but not a universal result of treatment. It was soon followed by an unmistakable intensification of green in the leaves of nimblewill (*Muhlenbergia schreberi*), Kentucky bluegrass (*Poa pratensis*) grown in shade, dayflower (*Commelina virginica*), bush bean (*Phaseolus vulgaris*), and two varieties of hybrid sweet corn (*Zea mays* var. *saccharata*).

Crabgrass (*Digitaria sanguinalis* and *D. ischaemum*), one variety of field corn (*Zea mays* var. *indentata*), and hybrid Golden Delicious sweet corn, all of which have the capacity to produce anthocyanins, developed considerable amounts of these pigments in the younger leaves, which had received the higher concentration of maleic hydrazide. The petals of dayflower were about half-normal