reacts as against foreign bodies. The distribution of the alimentary fat into the portal and the lymph system is influenced by several different factors. These have, however, not been sufficiently taken into account in the experimental chemical carcinogenesis with carcinogenic hydrocarbons.

Provided that some carcinogenic agents enter the organism in the diet together with lipids, and bearing in mind the physiologic background, it is possible that additional light may be thrown on the knowledge of the differences, e.g., in geographic and racial occurrence of certain tumors.

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A New Development in the Measurement of High Relative Humidities

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It is often desired to measure high relative humidities in remote and confined spaces. The problem that presents itself here is twofold: First, the sensitivity of most hygrometric instruments decreases rapidly as the relative humidity approaches 100%; second, most standard methods of hygrometry are not applicable to remote and confined spaces. Falling into one category or the other, or both, are such methods as the use of the hair hygrometer, psychrometer, dew-point hygrometer, or the chemical absorption and refractometric methods.

The possibility of overcoming the major difficulties may be found in the electric hygrometer. For obvious reasons an electrical instrument would be especially suitable for remote applications. There are a number of different types of electric hygrometers, all identical in principle: the relative humidity is measured as a function of the electrical conductivity of a hydrophilic chemical. F. W. Dunmore (*1*) has developed an electric hygrometer whose sensitive chemical is a combination of lithium chloride and polyvinyl acetate. The American Instrument Company (*2*) has on the market an instrument supposedly based on that of Dunmore. H. J. Kersten (*3*) has developed an electric hygrometer whose sensitive chemical is gelatin. All these instruments have in common the fact that they are rather small, the dimensions being of the order of a few centimeters. Thus they would be ideal for use in remote and confined spaces.

The sensitivity characteristics, however, vary considerably. It has been found that gelatin is unsatisfactory for the present purposes in that the sensitivity is very poor near 100% relative humidity. Inorganic hygroscopic salts alone are unsatisfactory in that they become wet at high humidities. The combination of an inorganic hygroscopic salt and a hydrophilic colloid, such as used by Dunmore, seems to be the best approach. In the present work lithium chloride and polyvinyl alcohol are used.

The sensitive element consists of a miniature coil form such as is used in radio work, wound with a bifilar winding of #38 AWG platinum wire. Each winding has a pitch of 2 mm, a total length of 3 cm and a diameter of 19 mm. It is important that an inert metal such as platinum or palladium be used for the wire. Metals such as copper or steel produce an aging effect whereby the resistance changes with time.

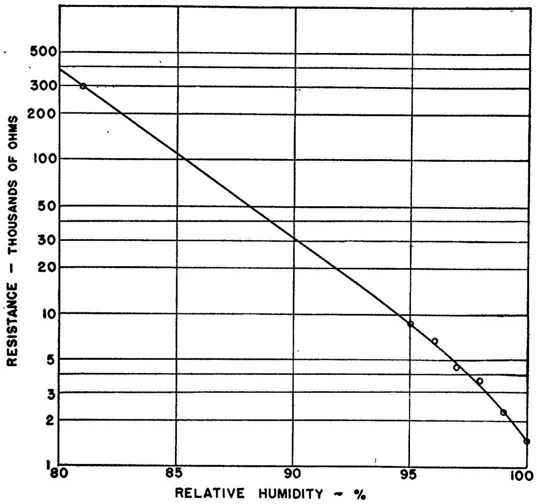

Fig. 1. Calibration curve of the humidity sensitive element.

In the process of producing a sensitive chemical film on the coil, a solution of the chemicals is first made. One part by weight of polyvinyl alcohol in powdered form is mixed with 3 parts ethyl alcohol, producing a viscous, cloudy solution. One part by volume of this solution is diluted with 6 parts of a solvent made with equal parts of water and ethyl alcohol. The still-cloudy solution is allowed to settle for a few days in a well-stoppered bottle. The top clear portion is then decanted, and to this is added 1% of a saturated solution of lithium chloride.

The sensitive film is formed by dipping the coil form into the above solution so that all the wires are covered, and slowly and steadily withdrawing the form, taking about 10 min to withdraw it completely. The element is then stored in a clean, dry place and allowed to "cure" for several days before being used. It was found that this element satisfactorily covered the range from 80% to 100% relative humidity, with a corresponding variation in resistance from 400,000 to 1,500 ohms.

The resistance of the element was measured on an a-c Wheatstone bridge. Alternating current must be

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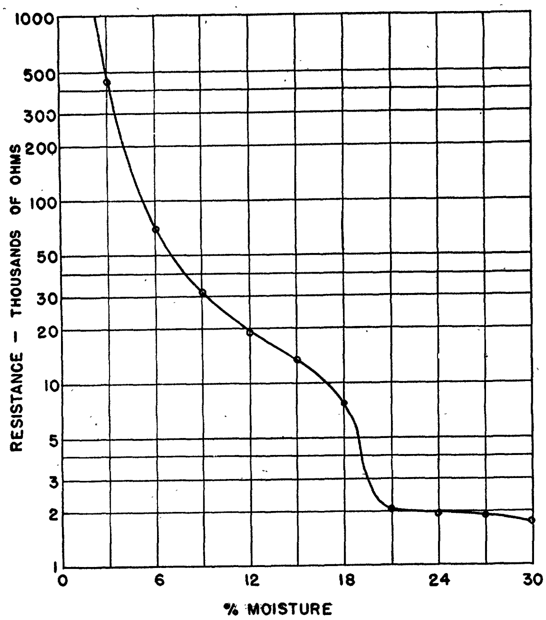

FIG. 2. Resistance of humidity sensitive element when located in an atmosphere in equilibrium with moist soil.

used since direct current would tend to polarize the chemicals, thus changing the properties of the film. The following procedure was adopted in taking readings. The element was stored in an enclosure maintained at 100% relative humidity. To take a reading the element was removed from the enclosure and allowed to dry in the air until its resistance was about 500,000 ohms. Such a resistance corresponds to a relative humidity of slightly less than 80% and so can easily be obtained in the open atmosphere. This drying process takes 2 or 3 min. The element is then put in the desired enclosure, and its resistance is read after ~~a specified time interval. Five min is adequate~~, but the data herein presented were taken at 10 min.

In this manner the calibration curve shown in Fig. 1 was obtained. The sensitivity of the element is given by

$$S = (1/r)\,(\partial r/\partial H) = \partial \log r/\partial H,$$

where r is the resistance of the element and H is the relative humidity. The straight-line portion of the curve in Fig. 1 may be represented by

$$\log r = mH + \text{constant},$$

where m is the slope of the line. Upon differentiating this with respect to H, we find that the sensitivity is equal to m. Thus the sensitivity is a constant up to about 95% relative humidity. From 95% to 100% relative humidity the sensitivity increases approximately twofold.

The principal interest in this study was the indirect measurement of the free energy of soil moisture through the measurement of the soil atmosphere relative humidity. The possibility of measuring the free energy of soil moisture in this manner is based on the relationship between free energy of the soil moisture and the equilibrium relative humidity of the enclosed atmosphere:

$$H = 100e^{(f/RT)},$$

where H is the relative humidity in %, R the universal gas constant, T the absolute temperature, and f the free energy of the soil moisture ($f = 0$ for saturated soil, $f = -\infty$ for dry soil).

The desirability of measuring soil moisture in this way lies in the fact that the presence of soluble salts in no way interferes with the results. A curve of the element resistance as a function of percentage soil moisture is shown in Fig. 2 for a typical Hawaiian soil. It follows that the same method may be applied in other cases where it is desired to determine moisture content but where the usual conductivity method is unreliable because of the presence of soluble salts.

The increasing sensitivity is a desirable characteristic because the most important range in soil moisture work is between 98% and 100% relative humidity. For this reason an even greater sensitivity would be useful. This end might be achieved by a lower concentration of lithium chloride in the sensitive film, or even by the use of other salts. For achieving a more rapid equilibrium it is suggested that a construction be used in which the wires are supported intermittently rather than continuously, so that both sides of the film will be exposed to the atmosphere.

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The Inability of Thiourea to Modify Roentgen Ray Irradiation Mortality in Rats[1]

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Two recent reports (*1, 2*) showed that high doses of thiourea protected mice from the lethal effects of roentgen ray irradiation. The greatest protection was observed when the drug was administered by intraperitoneal injection immediately prior to irradiation. However, Limperos and Mosher (*1*) did show that oral premedication with 1% thiourea drinking water for 6 days prior to irradiation reduced the total mortality. As both the above reports dealt with dosages of thiourea that were within the toxic range, and because only mice were used, we decided to investigate the possible protection afforded rats who had received antithyroid but nontoxic doses of thiourea

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