neo-Inositol was synthesized by Angyal and Matheson³ in 1955, but has not hitherto been found in Nature.

The phosphorylated *neo*-inositol was traced to an eluate fraction ('component V')¹ from an ion-exchange column separation of soil phytin which also contained lower phosphates of *myo*-, *scyllo*- and *DL*-inositol. *neo*-Inositol was isolated from hydrolysates of this fraction by thin layer chromatography⁴ of the mixed hexa-acetates. After purification by fractional crystallization the *neo*-inositol hexa-acetate crystallized as colourless prisms, m.p. 251°–253°, from methanol. The identity of this product with authentic *neo*-inositol hexa-acetate³, m.p. 253°, was verified by a mixed melting point (251°–253°) determination and comparison of infra-red spectra. The behaviour of the free inositol on paper chromatograms was similar to that of *neo*-inositol.

A sample of *neo*-inositol hexaphosphate was prepared by the method used by Posternak⁵ for the synthesis of phytic acid from *myo*-inositol. The product was examined by ion-exchange chromatography¹ and shown to be a mixture of several *neo*-inositol phosphate esters. The final component eluted was the main constituent and its position corresponded to that of 'component V', the main *neo*-inositol phosphate present in soil phytin. It is, therefore, concluded that the *neo*-inositol in the latter is present mainly as its hexaphosphate.

The origin of these isomers of phytic acid is unknown.

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Structure of Carboxyl Groups in Humic Acids

Schwartz and Asfeld¹ have recently reported that four moles of water were evolved to one mole of carbon dioxide when humic acids, obtained from lignite, were decarboxylated at 150° in a stream of dry nitrogen. Consequently, they suggested that the carboxyl functions of these acids were in the ionized form, $\text{---COO---H}_3\text{O}^+\cdot 3\text{H}_2\text{O}$, although they were aware that this structure was contrary to that expected for relatively weak carboxylic acids. Since carboxyl groups, carboxylate ions, and hydrated hydronium ions all have characteristic absorption bands in the infra-red, it was possible for us to check the validity of the proposed structure. A sample of lignite was, therefore, obtained from the same source (North Dakota lignite of the Leonardite variety, marketed as 'Carbonox' by the Baroid Division, National Lead Co., Houston, Texas), and humic acids were prepared and decarboxylated by the procedures of the above authors. The infra-red spectra of potassium bromide pellets of the above materials (Fig. 1) were then recorded on a Perkin-Elmer 237 grating spectrophotometer.

The vibrational spectrum of the hydrated H_3O^+ ion² includes characteristic strong infra-red bands at 2,900, 1,750 and 1,205 cm^{-1} . Appreciable quantities of H_3O^+ ions cannot be present in the lignite or humic acids since the band at 1,750 cm^{-1} is absent from their spectra. Furthermore, since none of these materials shows strong absorption near 1,550 and 1,400 cm^{-1} they do not contain

Fig. 1. Infra-red spectra of lignite, humic acids, and of humic acids partially decarboxylated by heating for 48 h at 150° C in a nitrogen atmosphere

carboxylate ions³. On the other hand, the strong absorption bands characteristic of non-ionized carboxyl groups are present in the three spectra at 2,600 cm^{-1} (very broad), 1,712 cm^{-1} , and 1,225 cm^{-1} . As expected, the ratio of the intensities of these bands to other bands in each spectrum is greatest in the case of the humic acids. A broad band centered near 3,000 cm^{-1} also has a higher relative intensity in the spectrum of humic acids, and may be due to water molecules held to the carboxyl groups by moderately strong hydrogen bonds. It is of interest to note the appearance of weak bands at 1,843 and 1,768 cm^{-1} in the spectrum of the partially decarboxylated humic acids. These bands are probably due to small amounts of acid anhydrides formed by condensation between neighbouring carboxyl groups⁴.

On the basis of the infra-red evidence we conclude that the carboxyl groups in humic acids are mainly in the non-ionic form. This conclusion is probably valid for all humic acids, since materials such as weathered sub-bituminous coal, *Sphagnum* peat and podzol soil yield humic acids the infra-red spectra⁴⁻⁶ of which are similar to the spectrum of humic acids shown here.

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In a recent communication¹ we reported that four moles of water were evolved to one mole of carbon dioxide when humic acids, derived from a North Dakota lignite, were decarboxylated at 150° in a stream of dry nitrogen. It was suggested that some of the acid function of the humic acids was in the ionized form, $\text{---COO---H}_3\text{O}^+\cdot 3\text{H}_2\text{O}$, although it was noted that relatively weak solid acids were not expected to be readily ionized. At the time the original experiments were carried out, infra-red spectra of potassium bromide pellets of the resultant humic acids which had been dehydrated and decarboxylated at 150° for 65 h were recorded on a Beckman IR-5 spectrophotometer. It is the purpose of this communication to compare the original spectra with those reported in the preceding communication by Falk and Smith.

The spectra show strong absorption bands at 2,900 and 1,205 cm^{-1} and also show a shoulder at 1,750 cm^{-1} . Based on previous work by Falk and Giguère², the presence of these bands may be indicative of the hydrated H_3O^+ ion.