The possibility of co-ordinating with two other oxygen atoms of each pyrophosphate radical is eliminated by the fact that the rings formed will be four-membered, which are not very stable, and the co-ordination number of nickel or cobalt will be eight, which has not yet been observed in any of their complex compounds. The usual co-ordination number of nickel and cobalt is six, so it is probable that the other two co-ordinating positions are occupied by water molecules. But nothing can be said with any certainty, for the hydration of the complex ions in solution is not definitely known. The complex ion of the type $[M(P_2O_7)]^{-2}$ can be represented in a similar way with a six-membered ring.

Magnetic susceptibility measurements with solutions containing sodium pyrophosphate and nickel or cobalt chloride give the effective magnetic moments of the complex ions $[Ni(P_2O_7)_2]^{-6}$ and $[Co(P_2O_7)_2]^{-6}$ as 3.281 and 4.937 Bohr magnetons respectively. These values indicate that the complex ions have ionic bonding.

The behaviour of pyrophosphato complexes of nickel and cobalt in solution is found to be similar to that of copper, the results of which I have already reported².

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¹ Rosenheim, *Z. anorg. ind. allg. Chem.*, **153-4**, 125 (1936).

² Bassett, Bedwell and Hutchinson, *J. Chem. Soc.*, Part II, 1412 (1936).

³ Haldar, B. C., *Science and Culture*, **14**, 340 (1949).

An Improved Method of Detecting Sugars on Paper Chromatograms

MOST of the methods of detection of sugars depend upon the formation of furfurals by the treatment of the sugar with mineral acid or fairly strong organic acid (for example, trichloroacetic acid), and subsequent formation of a coloured compound with an amine or a phenol. The most common faults of the reagents hitherto tried are: (1) a partial destruction of the paper, making it fragile; (2) a dark background colour; (3) poor distinction between the various classes of sugars.

To avoid the destructiveness of large quantities of mineral acid, we decided to try various phenols and amines with traces of hydrochloric acid. The use of very dilute aqueous hydrochloric acid or aqueous/alcoholic acid did not prove successful. Success was obtained, however, with solutions of phenols and amines in absolute alcohol to which small quantities of acid (0.1-0.5 ml. of 4 N hydrochloric acid) had been added. It was found later that improved results were obtained by decreasing the volatility of the reagent by the addition of *n*-butanol to the mixture. The best results were obtained with a β -naphthylamine spray of the following composition: absolute alcohol 50 ml., *n*-butanol 50 ml., 3.8 N hydrochloric acid 0.4 ml., water 0.2 ml., β -naphthylamine (pure) 0.1 gm., ferric sulphate 10 per cent solution, 1 drop. Spray evenly and dry at 160-170° for about ten minutes.

Fructose is the first to show and gives a bright yellow spot, changing to yellow-brown. This is characteristic of fructose and those oligosaccharides which yield fructose on hydrolysis. Methyl pentoses behave similarly, but give a duller yellow. The pentoses appear rather slowly and give a bright pink-red colour. Aldoses give a light brownish colour. The method gave positive results with the following sugars: *aldohexoses*: mannose, glucose, galactose; *ketoheptoses*: fructose, sorbose; *pentoses*: arabinose, ribose, lyxose, xylose; *methyl pentoses*: rhamnose, fucose; *disaccharides*: maltose, cellobiose, lactose, melibiose, sucrose; *trisaccharides*: raffinose.

The paper is unaffected by the acid even at such a high temperature as 170° and the background colour is very pale.

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C₁₈ Unsaturated Acids of Butterfat

IT has been generally assumed that the C₁₈ unsaturated acids of butterfat comprise mainly oleic acid with some octadecadienoic acid (3-5 per cent of the total fatty acids) and traces of octadecatrienoic acid (cf. Hilditch¹). In this Laboratory the C₁₈ unsaturated acids of New Zealand butterfat have been submitted to alkali isomerization using the technique of Hilditch, Morton and Riley², and it has been found that the octadecatrienoic acid content is of the same order as that of the octadecadienoic acid, as shown in the accompanying table.

COMPOSITION OF THE C₁₈ UNSATURATED ACIDS OF BUTTERFAT
(Results expressed as a percentage of the total C₁₈ unsaturated acids)

Sample	Octadecadienoic		Octadecatrienoic	
	Non-conjugated	Conjugated	Non-conjugated	Conjugated
New Zealand butterfat (churned 28/6/48). (Methyl esters sap. equiv. 295.7, iod. val. 94.0)	1.27	1.31	3.14	Trace
New Zealand butterfat (churned 14/3/49). (Methyl esters sap. equiv. 294.9, iod. val. 97.7)	4.63	0.51	2.83	0.05
English butterfat (Hilditch and Jasperson, ref. 3)	2.0	2.0	0.2	Trace

It is thought that the differences in octadecatrienoic acid content between the New Zealand and English butterfats examined may be due to differences in linolenic acid content of the diet, the English butterfat being possibly from animals which had been stall-fed, whereas the New Zealand butterfat is produced almost entirely from a pasture diet, the main fatty acid constituent being linolenic acid. From time to time investigators³⁻⁵ have indicated the probable presence of traces of linolenic acid in butterfat, and more recently Mattsson⁶, using spectroscopic measurements after alkali isomerization, has inferred the presence of substantial amounts (0.7-2.0 per cent) in Swedish butterfat. By fractional distillation of the methyl esters, Mattsson was able to attribute the observed absorption at 232 m μ and 268 m μ almost