

we are actively pursuing. Successful photographs have already been taken of several strains of influenza virus, Newcastle disease virus, fowl plague virus and mumps virus, adsorbed on fowl cell membranes. A detailed account of our work will be presented elsewhere.

Just to hand is a paper by Heinmets' reporting successful photographs of influenza virus adsorbed on agglutinated and laked human red cells.

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Aug. 9.

¹ Hirst, G. K., *Science*, **64**, 22 (1941).

² Hirst, G. K., *J. Exp. Med.*, **78**, 99 (1943).

³ Burnet, F. M., *Lancet*, **i**, 7 (1948).

⁴ Wolpers, C., *Naturwiss.*, **29**, 416 (1941).

⁵ Dawson, I. M., and MacFarlane, A. S. (unpublished).

⁶ Dounce, A. L., and Lan, T. H., *Science*, **97**, 584 (1943).

⁷ Heinmets, F., *J. Bact.*, **55**, 823 (1948).

Inorganic Chromatography on Cellulose

WE have read with interest the letter of M. Lederer on the paper chromatography of the noble metals¹, especially as it appeared so soon after our own communication² on inorganic chromatography. We have been engaged in a general study of this subject for the past two years³, and our results will be published in detail separately. In view, however, of Dr. Lederer's letter and the general interest which has been aroused by our preliminary communications^{3,4}, we give below some supplementary information which may be of value.

Separations involving the movement of solvent up a paper strip in a manner similar to that described by Lederer have been tried by us at various times, but, in general, we prefer the downward movement as providing quicker and rather more precise separations. The noble metals have also attracted our attention, and we have separated gold, platinum and palladium from each other and from iridium or rhodium. The solvent employed by us has been methyl *n*-propylketone containing 30 per cent (v/v) of concentrated hydrochloric acid. Gold moves with the solvent front, followed by platinum and then palladium, all three being in sharp bands. Rhodium and iridium move much more slowly and keep together under these conditions. As an interesting comparison with Lederer's work, the above solvent mixture only gives one liquid phase on the paper, although methyl *n*-propylketone containing between 5 and 25 per cent (v/v) of concentrated hydrochloric acid gives two phases. If ketone containing about 20 per cent acid is used in this separation, then the gold appears in the ketone phase while the palladium is found in the aqueous phase. The platinum is curiously split between the two phases, a sharp narrow band appearing in the aqueous part and a diffuse band in the ketone phase.

We have also separated the metals which are usually grouped together for analytical purposes as the copper and tin groups (IIa and IIb), using solutions of the chlorides. A good solvent for Group IIa is ethyl *isopropylketone* containing 10 per cent concentrated hydrochloric acid (v/v). The order of the bands on the paper is: lead (least movement), copper, bismuth, cadmium and mercury. For the IIb group (trivalent arsenic and antimony, divalent tin) the

solvent used is dry ethyl acetate previously shaken with 2 per cent hydrochloric acid (v/v). In this case the original spot is not dried off and the atmosphere surrounding the paper strip is maintained at 100 per cent relative humidity. Arsenic moves but little, while antimony forms a sharp band below the arsenic; tin appears in a narrow band farther down the paper.

We have also extended the scale of the technique by employing columns of cellulose pulp, which have been used to study separations of inorganic salts both from an analytical and a preparative aspect. In many cases it has been found advantageous to activate the cellulose in order to increase its adsorptive properties, and this may be accomplished by boiling with dilute nitric acid for a short time. As examples of the analytical use of columns there may be mentioned the separation and estimation of nickel and cobalt in minerals and steels. The preparative use of the technique may be illustrated by the separation of scandium from a large number of metals, including those of the rare earths. With the salts as nitrates and using ether containing 12½ per cent (w/v) nitric acid as solvent, the scandium is readily washed through the column. Zirconium also tends to come through, but may be held back by adding tartaric acid to the original solution. Scandia obtained in this way is highly pure. Adsorbents other than cellulose are under study; but the latter has proved a generally convenient material.

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¹ Lederer, *Nature*, **162**, 776 (1948).

² Arden, Burstall, Davies, Lewis and Linstead, *Nature*, **162**, 691 (1948).

³ Annual Report of the Chemical Research Laboratory for 1947 (in the press).

⁴ Linstead, communication to the Discussion on New Techniques, Chemical Society, November 25, 1948.

Relationship Between Structure of Nitrogenous Compounds and their Sensitivity to X-Rays

IN previous investigations, the dependence of sensitivity to X-radiation on molecular structure has been examined for various compounds¹. One of our more recent, unpublished, results is the deamination of amino-acids by X-radiation, which has been reported independently by Stein and Weiss². On the basis of our experimental results, however, some difficulties exist concerning the mechanism of the reaction. Weiss³ has put forward the hypothesis that the reaction of ionizing radiations is due to the formation of radicals formed by the splitting of water molecules. This simple mechanism should give an ionic yield of not more than unity if one OH radical is involved in the deamination of one mono-amino-mono-carboxylic acid molecule, and this appears to be the yield reported by these authors. We have, however, found that the ionic yield of the deamination of glycine rises gradually with its concentration to a value of three for 0.2 gm./ml. (see graph). This ionic yield exceeding unity means, when interpreted in terms of radicals,