'wetted wall' column in which the interface was continuously being renewed. An interfacial resistance was shown to be present ; but the interfacial transfer coefficients reported were greater than those obtained in this work, for example, about 0·015 cm./sec. as compared with final values of about 0·001 cm./sec. This difference might conceivably be due to the rapid renewal of the interface in the wetted wall column, each element of which is replaced in a few seconds, as compared with the increasing age of the interface in the transfer cell.

A study of the extraction of uranyl nitrate from water into a hydrocarbon solution of tributyl phosphate has recently been carried out by Hahn[5]. Neither phase was stirred, so that transfer to the interface was by molecular diffusion. No interfacial barrier could be detected ; but as molecular diffusion is considerably slower than eddy diffusion, a barrier sufficiently large to affect the rate of transfer in stirred systems might be undetectable in Hahn's experiments.

All attempts to provide a theoretical explanation for the fall-off in rate have so far been unsuccessful ; however, it has been shown that the effect is real and not due to surface contamination.

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Relation between the Volume of a Liquid and its Internal Energy

In a recent paper[1], Benninga and Scott have pointed out that an adequate theory of liquids must account for the approximate identity, $EV = $ constant. E is defined as being equal to the difference between the internal energy of the substance in the perfect gas state and in the liquid state at a given temperature, and will be identified with the potential energy between the molecules : V is the molar volume of the liquid. We wish to point out that this relationship can be made a direct consequence of the simplest form of 'hole' theory. Although only the case of spherical molecules of a single species will be considered here, it is intended that a treatment generalized to include the case of mixtures of non-spherical molecules will be published elsewhere in the near future.

Although the molecules in the liquid state do not in general display long-range order, 'short-range' order is known to exist : thus there is a fairly clearly defined distance l between the centres of molecules which are nearest neighbours. The expansion of such a liquid with change of temperature or pressure can be considered from two extreme points of view : either the distance between all the molecules may alter, resulting in a uniform stretching of the whole liquid structure, or the distance l may remain constant and vacant sites may appear in the ring of nearest neighbours surrounding each molecule. The former

theory— uniform stretching—leads, on the basis of a Lennard–Jones 6–12 intermolecular potential, to the law[2] $EV^2 = $ constant. In order to investigate the implications of the second theory, two simplifying assumptions will be made : (*a*) that the vacant sites are randomly distributed throughout the body of the liquid ; (*b*) that the vacant sites (or 'holes') are equal in size to a molecule.

Let there be h such sites and N molecules, and let e be the interaction energy due to each pair of molecules which are nearest neighbours. Longer-range interactions will be neglected. Then

$$E = \tfrac{1}{2}NZe \times \text{ (proportion of nearest neighbour}$$

sites which are occupied by molecules)

$$= \tfrac{1}{2}NZeN/(N + h)$$
$$= \tfrac{1}{2}NZeV'/V$$

where V' is the molar volume of the hole-free lattice, and V is the molar volume of the liquid.

Thus this method of expansion leads to the required relationship $EV = \tfrac{1}{2}NZeV' = $ constant.

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Production of Carrier-free Cobalt-58 by Pile Irradiation of Nickel

In the course of a study of neutron–proton reactions in the Harwell pile, we have irradiated nickel metal both in the ordinary irradiation facilities and in a hollow uranium bar. In this bar the energies of the fast neutrons available approximate to the spectrum of fission-neutron energies.

The yields of cobalt-58 obtained are shown in Table 1 ; the fast-neutron fluxes were measured by counting phosphorus-32 formed in sulphur monitors irradiated at the same time as the nickel, assuming a cross-section of 0·03 barn, as given by Hughes[1], for the reaction sulphur-32 (n,p) phosphorus-32.

We have separated cobalt-58 from irradiated nickel in a carrier-free state, obtaining about 80 per cent yield. The nickel was dissolved in nitric acid, the solution evaporated to dryness, and the residue taken up in 9 N hydrochloric acid. This solution was added to a column of 'De Acidite FF' anion-exchange resin, when the nickel passed through and the cobalt was adsorbed. When all the nickel had been removed

Table 1

Irradiation	Fission neutron flux (neutrons/ cm.²/sec.) ($S(n,p)$ ³²P monitors)	Saturation activity (mc./ gm. Ni)	Cross-section (Ni-58) (millibarns)	Cross-section (Ni metal) (millibarns)
Hollow slug, 9 days Thermal flux, 1·4 × 10¹² (n/cm.²/sec.),	$4·9 \times 10^{11}$	4·4	47	31·5
6·4 days Thermal flux, 1·2 × 10¹² (n/cm.²/sec.),	$2·7 \times 10^{11}$	2·3	45	31
6·4 days Thermal flux, 1·0 × 10¹² (n/cm.²/sec.),	$2·3 \times 10^{11}$	1·9	44	30
6·4 days	$2·0 \times 10^{11}$	1·7	44	30