of an oil-soluble base—positivity being associated with basophilic staining and negativity with acidophilic staining.

From the standpoint of physical chemistry this finding must be expected, since *phase boundary potentials* are located at the junction between any of these water-immiscible layers and the aqueous solutions in contact with them. These potential differences must be differentiated in the direction actually observed on account of a soap content of the oleic acid layer; which leads to an excess of Na ions in that layer. On the other hand the presence of amine has no such action. The amine, on the contrary, combines with any oil-soluble acid constituents which may be present, *e. g.*, oleic acid from saponification of olive oil—and thus tends to diminish the concentration of the Na+ ions in the olive oil. Consequently the cell arrangement, mentioned above, is really a concentration cell in regard to Na+ ions:

	Na+ in water	Na+ in oil	Na+ in oil	Na+ in water
+	about 0.1 molecular	high (Na oleat)	low (amine)	about 0.1 molecular —

According to well known laws, this system must have an e.m.f. in the direction observed.†

4595

Composition of Bone IX. Equilibration of Serum with $CaHPO_4$.

M. J. SHEAR AND BENJAMIN KRAMER.

From the Pediatric Research Laboratory, The Jewish Hospital of Brooklyn, N. Y.

Because of the complications introduced by the presence of proteins in serum, we studied first the solubility equilibria in protein-free solutions. We[1] found that, at the pH of serum, solutions with the inorganic composition of ricketic serum are markedly undersaturated with respect to $CaHPO_4$. Solutions with the calcium and phosphorus content of normal blood serum are slightly undersaturated; it is only solutions which have Ca x P products greater than about 50 which are supersaturated with respect to $CaHPO_4$.

Since part of the calcium in serum is bound to protein, it was

† The writer wishes to express his appreciation to Dr. G. W. Crile of the Cleveland Clinic Foundation for his kind interest in this work.

[1] Shear, M. J., Washburn, M., and Kramer, B., *J. Biol. Chem.*, 1929, lxxxiii, 697.

predicated that ricketic serum is undersaturated with respect to $CaHPO_4$; normal serum should be slightly undersaturated with respect to this substance.

This theory was tested by shaking blood sera for one hour at 38° with crystalline $CaHPO_4$. As a result of the equilibration, the phosphorus increased in all cases; in some cases both calcium and phosphorus increased. In every case equilibration produced an increase in the Ca x P product and in the [Ca] x [HPO_4''] product. In the sera as drawn, the Ca x P products ranged from 35 to 85, and the [Ca] x [HPO_4''] products ranged from 2.4×10^{-6} to 5.7×10^{-6}. The final Ca x P products ranged from 74 to 88; the final [Ca] x [HPO_4''] products ranged from 5.3×10^{-6} to 6.5×10^{-6}.

The sera used were obtained from a young calf, young lambs and from human beings. All of them were found to be undersaturated with respect to $CaHPO_4$. In inorganic solutions of the same ionic strength, [Ca^{++}] x [HPO_4''] had been found to be 3.4×10^{-6} at equilibrium. The equilibrium values of [Ca]x[HPO_4''] in sera are greater than this, as was expected since, in serum, [Ca] is greater than [Ca^{++}]. The values obtained may therefore be utilized in calculating the amount of "bound" calcium and ionized calcium in serum.

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Irreversible Character of the Late Changes after Hepatectomy.

PHILIP D. MC MASTER AND D. R. DRURY.

From the Rockefeller Institute, New York City.

We have endeavored to learn whether rabbits manifesting the symptoms characteristic of the advanced stage of liver insufficiency[1,2] can be clinically improved by the circulation of their blood through the livers of healthy animals or by cross transfusion with normal rabbits.

"Liver transfusion." In an initial series of 14 experiments, rabbits, hepatectomized under ether and with cannulae placed in the left carotid artery and left jugular vein, were given sufficient glucose to maintain the blood sugar level well above normal. Fourteen to 24 hours later, when the characteristic signs of advanced hepatic insufficiency in the rabbit[1,2] had appeared, the portal vein and vena

[1] Drury, D. R., *J. Exp. Med.*, 1929, xlix, 759.

[2] McMaster, Philip D., and Drury, D. R., *J. Exp. Med.*, 1929, xlix, 745.