nomenon—a system in which the constituents, acting as fluxes, influence the course of diffusion interaction, and transition. The itacolumite matrix is therefore indicative of the physical conditions prevailing during the formation of the mineral. Deviations from these conditions may be readily seen, as in the South Carolina deposits, where beds of itacolumite pass into stratified and even massive quartzite (Tuomey. *Report on the geology of South Carolina.* Columbia, 1848. Pp. 9, 78). The assumption that certain matrices are due to secondary depositions is doubtful in view of the fact that the metamorphism of the mineral associations closely follows that of the itacolumite itself.

Thus, while silicic acid gels give rise to minerals of the hydrated silica type (flint, opal, agate, etc.) and may be viewed as a transition of a secondary to a tertiary polymer of silicic acid, and while a silica-rich magma may lead eventually to the separation of massive quartzite, the formation of itacolumite is probably brought about by the action of various acidic substances on the basic fluxes, the fluxes serving as solvents of silica or in combination with it, the reaction taking place under conditions inherent to periodicity.

In the course of recent work (A. C. and M. Copisarow. *Nature, Lond.*, 1942, 149, 413; 1946, 157, 768; *J. Amer. chem. Soc.*, 1945, 67, 1915; *Science*, 1946, 104, 286), periodic formations of amorphous silica and silicic acid gel were obtained by the interaction of waterglass with acids. These rhythmic structures show a close analogy with itacolumite. Extending these experiments, therefore, to temperatures *above* the transition of amorphous silica to quartz, the conditions essential to the formation of itacolumite should be attained. In this case, the interband or embedding material would consist of the reaction product between the flux and the acidic or saline reagent.

ALCON C. COPISAROW

Geology Department,
Imperial College of Science and Technology, London

Effect of the Protein Content of the Diet on the Glomerular Filtration Rate of Young and Adult Rats

Inulin clearances in rats have been estimated by several authors. Their results, however, do not seem to agree with reference to (a) the relation between the rate of glomerular filtration and that of urine flow and (b) the mean value of the glomerular filtration rate. Some workers (S. E. Dicker and H. Heller. *J. Physiol.*, 1945, 103, 449; 104, 31; S. M. Friedman, J. R. Poley, and C. Friedman. *Amer. J. Physiol.*, 1947, 150, 340; R. W. Lippman. *Amer. J. Physiol.*, 1947, 151, 211) found that the glomerular filtration was independent of the urine flow, resembling in this respect adult man and the dog; others (E. Braun Menendez and H. Chiodi. *Rev. Soc. Arg. Biol.*, 1946, 22, 314; M. Friedman. *Amer. J. Physiol.*, 1947, 148, 387) claimed that the rate of glomerular filtration varied directly with the urine flow, as in rabbits.

Work on other species as well as on rats suggests at least two factors which may have operated in producing these confusing results. The rate of glomerular filtration is independent of that of urine flow in adult human beings, but correlated with the urine flow in infants (H. L. Barnett. *Proc. Soc. exp. Biol. Med.*, 1940, 44, 654; R. F. A. Dean and R. A. McCance. *J. Physiol.*, 1947, 106, 431). Also, there is a strong indication that nutritional factors influence the rate of glomerular filtration in animals (J. A. Shannon. *Amer. Rev. Physiol.*, 1942, 4, 309; S. E. Dicker and H. Heller. *J. Physiol.*, 1945, 103, 449; 104, 31; S. E. Dicker. *Brit. J. Pharmacol.*, 1946, 1, 194; S. E. Dicker, H. Heller, and T. F. Hewer. *Brit. J. exp. Path.*, 1946, 27, 158).

The influence of age and diet on the glomerular filtration rate of rats was therefore investigated. Inulin clearances were estimated (a) in adolescent rats with body weights ranging from 101 to 150 gm and (b) in adult rats (weights, 275–320 gm) fed on a diet containing varying amounts (7, 14, 18, and 25%) of casein.

TABLE 1

	Plasma proteins (gm/100 ml)	Glomerular filtration rate (ml/100 gm/min)	r	b
Young rats (101.0–150 gm)	5.23	Correlated with urine flow	+0.778 ±0.073	+10.02
Adult rats (265.0–325.0 gm) 7% casein	5.84		+0.462 ±0.172	+ 6.39
Adult rats (270.0–345.0 gm) 14% casein	6.44		+0.415 ±0.166	+ 3.32
Adult rats (265.0–350.0 gm) 18% casein	6.83	0.43 ±0.009	−0.243 ±0.200	− 1.21
Adult rats (260.0–330.0 gm) 24% casein	7.33	0.76 ±0.035	−0.206 ±0.220	− 0.90

r = correlation coefficient between glomerular filtration rate and urine flow, b = regression coefficient. Values are means and standard error.

The results of the inulin clearance estimations in these series (Table 1) show clearly that, in adolescent rats as well as in adult rats fed on a diet low in casein, the rate of glomerular filtration was correlated with that of the urine flow, but that, in adult rats fed on a diet containing at least 18% casein, the rate of glomerular filtration was independent of the urine flow. It can also be seen that raising the amount of casein in the food, and thus the plasma protein level, produced an increase in the rate of glomerular filtration (Table 1).

It can thus be concluded that the disagreement between the authors interested in the kidney functions of the rat is only apparent. If the animal material is standardized, viz., due consideration is paid to the age and diet of the rats used, uniform results can be expected.

S. E. DICKER

Department of Pharmacology,
University of Bristol, England