with hydrated silica (obtained in three different ways), which was purified with the greatest care. We have been able to confirm our previous observations that hydrated silica adsorbs acids and that electro-osmotic experiments show that anions are preferentially adsorbed, but we have also found that the samples of silica we used before contained alkali, and gave a much higher value for the amount of acid adsorbed. The adsorption of oxalic acid can be very easily demonstrated in view of the simplicity with which it can be volumetrically estimated. 10 gm. of air-dried hydrated silica obtained from the hydrolysis of pure silicon tetrachloride can retain, even after repeated washings, oxalic acid equivalent to 10 c.c. of N/100 permanganate solution.

It has been suggested by the writer (Trans. Far. Soc., vol. 18, part 3, p. 316) that the increase in P_H of the drainage water from Dartmoor may be attributed to the adsorption of acids by the siliceous beds over which the water passes. It is quite easy to demonstrate in the laboratory that a solution of hydrochloric acid, after filtration through a Gooch crucible of fused silica containing air-dried hydrated silica (from silicon tetrachloride), immediately shows an increase in P_H, amounting to more than one unit, indicating a diminution in concentration of more than 90 per cent. (*e.g.* from 3·4 to 4·6).

It has also been stated by Joseph and Hancock that interaction between silica and salt solution is of a chemical nature, as the residue gives an alkaline reaction on removal of the salt. It appears to us that this is not the only possible way of accounting for the production of the alkali (cf. "Adsorption by Sugar Charcoal," Bartell and Miller, J. Amer. Chem. Soc., 44, 1922, 1866; 45, 1923, 1106; 46, 1923, 1130).

Attention may be directed to the fact that the concentration of the acid liberated by a potassium chloride solution of definite concentration depends on the relative amounts of silica and solution, as also on its previous history. It would appear from the observations of Joseph and Hancock (*loc. cit.* p. 2023) that whereas a sample which has been previously treated with hydrochloric acid gives an extract having a P_H value equal to 3·96, samples which have not been treated with acids give extracts having P_H value equal to 5·33 (or 5·55) under identical conditions. The variation in concentration of the hydrogen ions of more than twenty times is extremely difficult to explain in terms of a chemical reaction. We would also like to mention the observations of Jordis and Kanter (*Z. anorg. Chem.*, 35, 20, 1903), who, from the difficulty in removing the last traces of hydrochloric acid from silica, concluded that silica forms traces of a complex acid similar to hydrofluosilicic acid.

Further experiments with precipitates like barium sulphate show perfect analogy with the reactions we have observed with silicic acid. In these instances, possibility of a chemical interaction between an acid and a neutral salt is very remote. In this connexion an interesting observation may be recorded, which to the writer's knowledge has not been recorded before. If barium sulphate is precipitated from the interaction of solutions of potassium sulphate (P_H = 6·8) and barium chloride (P_H = 6·6), the liquid shows either an alkaline or an acid reaction according as potassium sulphate or barium chloride is in excess. The acidity or alkalinity may be as high as that indicated by P_H values of 2 and 11 respectively. This reaction appears to offer a clue to the elucidation of the nature of "hydrolytic" adsorption.

J. N. MUKHERJEE.
Physical Chemistry Laboratory,
University College of Science and Technology,
Calcutta, India, November 27.

Helium and Airships.

IN a recent article on the British dirigible programme (NATURE, December 6, p. 842) it is stated "The United States naturally hold for themselves the only supplies of helium. . . ." Of course, it must be admitted that the United States authorities, ever since 1918, have pressed with vigour the investigation of their resources of helium, its production and use. At the present time the two large dirigibles, the *Shenandoah* and the *Los Angeles*, are inflated with helium. Processes of repurifying the gas in them have been devised and applied. A more efficient and cheaper method of production than the present Linde process has been worked out by the U.S. Bureau of Mines, and much valuable scientific data have been accumulated.

It should not be forgotten, however, that Prof. J. C. McLennan's investigation in 1916–1918 (see NATURE, August 12, 1920, p. 747) showed that helium could also be produced in Canada, and an experimental extraction plant was successfully operated in Calgary, Alberta, for a few months until financial support was no longer forthcoming. Since that time, the Canadian Department of Mines, in the course of a general investigation of natural gas in Canada, has confirmed and brought up-to-date the facts concerning the helium resources of Canada. Although few gases have been found with so high a helium content as the richest American natural gases, it is believed that commercial sources are available. To prove this, the re-establishment of an experimental helium extraction plant in Canada is essential. In this plant the best process for treating the different types of Canadian natural gas could be determined, and the actual cost of commercial production could be found. The helium produced, until such time as it was required by the authorities, would be of great value to supply to the many university and industrial research laboratories throughout the Empire which are needing it for experimental purpose.

In connexion with a later paragraph of the same article, referring to the useful life of German airships and the interest with which the progress of the *Los Angeles* (ZR3) and the new British craft will be observed, no reference is made to the great success already obtained with the helium-filled *Shenandoah*, which has now been in commission since the summer of 1923. In this period it has made many long voyages, including one transcontinental trip of more than 9000 miles. Although torn from its mooring mast with the framework damaged and two gas bags ripped, during a severe storm in January 1924, it eventually returned to its hangar. A hydrogen-filled ship subjected to the same conditions would probably have been destroyed. R. T. ELWORTHY.

Mines Branch, Dept. of Mines,
Ottawa, Ont., Canada.

Molecular Dimensions of Celluloid.

MAY I amplify and comment upon Mr. Garnett's letter in NATURE of January 10, page 51? I have often been impressed, more particularly during the last few months in collecting material for a small book on cellulose ester solutions, with the want of precision shown by physicists in defining the material used in experiments on nitrocellulose and its technical derivatives. Two eminent examples will suffice. My friend Prof. Coker entitled a most important paper, which he published in collaboration with Mr. Chakko, "The Stress-Strain Properties of Nitrocellulose and the Law of its Optical Behaviour,"