not go without taking the ultramicron in their train. This should happen when the ultramicron does not have too great mass, and in such a case we have what is known as peptization, but if the mass of the ultramicron is too great, the sodium ions are not able to pull it along and consequently the sodium ion is held in the vicinity of the ultramicron and we have what might be termed adsorption. Experimental facts bore out these assumptions, for when the silica gel was treated with a solution of sodium hydroxide until the alkalinity of the solution had entirely disappeared and the analysis run, it was found that part of the sodium was found in the solution with its attending ultramicrons, while the balance was in the proximity of the ultramicrons which had too great mass to migrate. The surface of the unmigratable ultramicrons is so great that the result was a fairly high so-called adsorption.

In the light of this, it was reasonable to suppose that the adsorption of potassium, as shown in Table I, might be due to a replacement of the sodium, but if this were the case, the total adsorption of the sodium and potassium should be equal to the adsorption of the sodium, and what part of this adsorption was potassium would depend on the ratio of the solubilities of sodium and potassium silicates. Furthermore, if some salt like silver nitrate were used which had a more insoluble silicate than the potassium more of the sodium should be replaced but the total adsorption should be the same. A few results are given in Table III to show the general run of experiments.

TABLE III

ADSORPTION OF METALS BY THE HYDROGELS OF SILICON

Solutions Used		Equivalents of Na Ads. per gm. Gel.	Equivalents of M.[1] Ads. per gm. Gel.	Total Equivalents of Metal Ads. per gm. of Gel.
C = 0.02N	C = 0.02N			
NaOH	$NaNO_3$	45×10^{-5}		45×10^{-5}
NaOH	KNO_3	14×10^{-5}	31×10^{-5}	45×10^{-5}
NaOH	$AgNO_3$	12×10^{-5}	33×10^{-5}	45×10^{-5}

Using similar notation to that already used, the reactions might be represented thus:

$$\square HSiO_3Na + KNO_3 \rightleftharpoons \square HSiO_3K + NaNO_3 \quad (1)$$

$$\square HSiO_3Na + AgNO_3 \rightleftharpoons \square HSiO_3Ag + NaNO_3 \quad (2)$$

According to the results given in Table III, equation (2) would be carried nearer completion than equation (1) before equilibrium was established, but the total metal adsorbed in any case is the same.

[1] Metal other than sodium.

These are a few points to show the trend of our results and conclusions in regard to silica gel. We are now investigating alumina and ferric oxide gels in order to find what theories will best apply to these cases, but the work has not yet reached such a state that we wish to draw definite conclusions, but our present work seems to indicate that there are four different types of adsorption from solution; namely, (1) chemical adsorption, which follows the mass law, (2) exchange adsorption, where one ion is adsorbed at the expense of replacing an equivalent amount of a second ion, (3) partition ratio adsorption, where the adsorption obeys Henry's law, and (4) electronic adsorption, where the adsorbed material seems to be held by a secondary valence. There is also what might be called a fifth type which is a combination of two or more of these types. We feel quite sure that we have a combination adsorption in the case of both ferric oxide and alumina gels, but we shall wait until a later date to report more detail on this.

NEIL E. GORDON

UNIVERSITY OF MARYLAND,
CHEMISTRY DEPARTMENT

NORTH CAROLINA ACADEMY OF SCIENCE

THE twenty-second annual meeting of the North Carolina Academy of Science was held at the North Carolina College for Women at Greensboro, May 4 and 5, 1923.

The secretary reported a total membership of 203, an increase of 40 members over the preceding year, and also that some 60 members were now members of the American Association for the Advancement of Science, an increase of 50 per cent. over the previous year.

The following officers were elected for the ensuing year: *President,* C. M. Heck, Department of Physics, State College; *vice-president,* J. P. Givler, Department of Biology, North Carolina College for Women; *secretary-treasurer,* Bert Cunningham, Department of Biology, Trinity College; *executive committee*—A. Henderson, Department of Mathematics, University of North Carolina; H. B. Arbuckle, Chemistry Department, Davidson College; J. W. Nowell, Chemistry Department, Wake Forest College.

The North Carolina Physics Teachers Association, meeting with the Academy, elected officers as follows: *President,* W. T. Wright, North Carolina College for Women; *vice-president,* A. A. Dixon, State College; *secretary-treasurer,* A. L. Hook, Elon College.

The North Carolina Section of the American Chemical Society, meeting at the same time and place, elected the following officers: *President,* J. O. Halverson, Department of Agriculture; *vice-president,* F. C.

Vilbrandt, Department of Chemistry, University of North Carolina; *secretary-treasurer,* L. B. Rhodes, Department of Agriculture.

The following officer was elected for the Mathematics Section: *President,* J. W. Lasley, Jr.

The following papers were presented:

Note on the pure culture of diatoms: BERT CUNNINGHAM.

On the variation of proteins in corn: O. J. THIES, JR. and H. B. ARBUCKLE.

Recent improvements in amoeba culture methods: L. M. BERTHOLF.

Soil treatment to overcome the injurious effects of toxic materials in eastern North Carolina swamp lands (read by B. W. Wells): M. E. SHERWIN.

Dedifferentiation in hydroids and ascidians: H. V. WILSON.

Density of the cell sap of plants in relation to environmental conditions: C. F. KORSTIAN.

The importance of calcium in relation to rickets (by title): J. O. HALVERSON.

Twinning and polyembryony in insects: R. W. LEIBY.

Fossil remains of an ancient mammal in East Central Texas (by title): E. O. RANDOLPH.

The present condition as to ether theories (by title): A. H. PATTERSON.

Some phases of digestion in Cambarus: W. A. WOLFF.

The physics of artificial incubation: C. M. HECK.

The copperhead snake at Raleigh (by title): C. S. BRIMLEY.

Some methods in anatomical technic (by title): W. C. GEORGE.

Contractile vacuoles in amoebae: factors influencing their formation and rate of contraction: M. J. HOGUE.

Strawberry leaf scorch: F. A. WOLF.

Some of the Hepaticae of North Carolina: H. L. BLOMQUIST.

Characteristics of North Carolina rainfall (lantern): R. J. MORTON and T. SAVILLE.

Hydrogen-ion concentration in certain trout and sunfish waters of western North Carolina (by title): R. E. COKER.

The relation of diet to the development and preservation of teeth: F. W. SHERWOOD.

A simple microphotographic apparatus: J. B. BULLITT.

The research program of the Appalachian forest experiment station (read by C. F. Korstian): E. H. FROTHINGHAM.

Savannah and sand ridge plant communities: B. W. WELLS.

Technique of the mimeograph mimeoscope method of publishing temporary illustrated science text-books and laboratory guides for schools and colleges: J. P. GIVLER.

The generic significance of the genitalia of insects (by title): Z. P. METCALF.

Some observations on the righting reaction in starfish: B. NOYES.

Some points in the bud development of a simple ascidian (presented by H. V. Wilson): C. D. BEERS.

The formation of rat spermatozoa agglutinins in the rabbit, with a brief discussion of the problems of tissue immunity (read by Chas. Phillips): W. F. TAYLOR and H. N. GOULD.

Some biological aspects of the cancer problem: CHARLES PHILLIPS.

Oogenesis in some species of the Saprolegnicae: J. N. COUCH.

A new species of Thraustotheca and a related Achyla: W. C. COKER.

Economic status of the forests of the southeastern United States: W. W. ASHE.

Age and structure of the North Carolina Newark (by title): COLLIER COBB.

Transportation problems in relation to our changing environment (by title): COLLIER COBB.

The breeding season of Limnoria at Beaufort, N. C. (by title): R. E. COKER.

On the curvature of manifolds: J. W. LASLEY, Jr.

Aspects of constant curvature: A. HENDERSON.

A discussion of the loss of mass in the formation of helium from hydrogen: J. B. DERIEUX.

Secondary electron emission from iron and tungsten: O. STUHLMAN, Jr.

Tests of results in physics teaching: C. W. EDWARDS.

Drop of potential in transformer oil: N. B. FOSTER.

What happens at absolute zero? A. H. PATTERSON.

An electrolytic interrupter: A. A. DIXON.

A standard form for the solution of problems: J. B. DERIEUX.

A review of the work on isotopes: A. A. DIXON.

The formation of layers in inorganic solutions: F. W. COOKE.

A suggestion in regard to some problems relating to the hydration of the ions: E. E. RANDOLPH.

A peculiar phenomenon of a Bunsen burner: H. B. ARBUCKLE.

Chemical industries in North Carolina: F. C. VILBRANDT.

The chlorination of juglone in hot acetic acid: A. S. WHEELER and J. L. MCEWEN.

The bromination of 2-amino-p-xylene: A. S. WHEELER and E. W. CONSTABLE.

McCrudden's volumetric method for determination of calcium compared with the Schohl and Pedley method: J. O. HALVERSON and L. M. DIXON.

A new ketone reagent: p-bromophenylsemicarbazide: A. S. WHEELER and J. A. BENDER.

The constitution of the dichlorohydroxyethylidene-bis-nitroanilines: A. S. WHEELER and S. C. SMITH.

Problems of the chemist in the textile industry: K. W. FRANKE.

A vacuum gage: M. L. HAMLIN.

A peculiar reaction between dichloroacetic acid and aromatic amines: A. S. WHEELER and S. C. SMITH.

Short addresses were also made by State Superintendent of Public Instruction E. C. Brooks, and by the president of the State Teachers Assembly, Miss Elizabeth Kelly.

BERT CUNNINGHAM,
Secretary