

of October there would be little or no chance of recovering the comet.

The comet's heliocentric equatorial-coordinates at perihelion are—

$$\alpha \dots - 1^{\circ}11'48'' \quad \delta \dots - 0^{\circ}43'05'' \quad \lambda \dots + 0^{\circ}00'18''.$$

If we combine these with the sun's coordinates, X, Y, Z, in the *Nautical Almanac*, we readily obtain an idea as to the chances of finding the comet, according to different assumed dates of arrival at perihelion. The most advantageous conditions are presented when this falls about the middle of April. If we assume April 11, the R.A. is found to be 208°, N.P.D. 54°, and the intensity of light 11.05, which is four times greater than on the date of the comet's discovery by Tuttle in 1858. As it was then extremely faint, its rediscovery may be a matter of difficulty. We have already one "Tuttle's comet," of short period, and it may perhaps occur to astronomers that the third of 1858 will be aptly named *Schulhof's comet*.

### CHEMICAL NOTES

POTILITZIN has recently (*Ber.*, xvii. 276) made some interesting observations on the hydration and dehydration of cobalt chloride. He shows that, besides the already known hydrate  $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ , there exist two hydrates,  $\text{CoCl}_2 \cdot 2\text{H}_2\text{O}$  and  $\text{CoCl}_2 \cdot \text{H}_2\text{O}$ , the former being rose-red in colour, and the latter dark violet. When the dehydrated salt is heated to about 100°, it parts with water, which is again absorbed on cooling. When an aqueous solution of the ordinary hexhydrated salt is heated, or is mixed with a dehydrating agent, the colour changes from pink to blue or dark violet. Potilitzin shows that this change, which he proves to be due to partial decomposition of the hexhydrated salt, may be brought about without raising temperature by the capillary action of unsized paper or a porous plate of stucco.

TOLLENS has made experiments on the sugar-like substance obtained by the action of alkalis on an aqueous solution of formaldehyde. He oxidises methylic alcohol by air in presence of platinum foil at 54°–55°, and distils; he then treats the crude distillate with baryta water, and so obtains a yellowish precipitate, which, when freed from barium, yields an amorphous syrup that reduces Fehling's solution, and gives results on analysis approximating to the formula  $\text{C}_6\text{H}_{10}\text{O}_5$ . This syrup is optically inactive, and does not undergo fermentation; on treatment with sulphuric acid, it gives formic and lactic acids (*Landw. Versuchs-Stat.*, xxix. 355).

KANNONIKOW (*Ber.*, xvii. p. 157, *abstracts*) attempts to measure the refraction-equivalents of various metals by deducting the refraction-equivalents of salts of these metals with organic acids (determined with aqueous solutions of the salts) from the refraction-equivalents of the acids themselves. So far as his results go, they appear to indicate that the refraction-equivalents vary periodically with variations in the atomic weights of the metals.

MM. NILSON AND PETERSON have prepared pure beryllium chloride by heating the metal in perfectly dry hydrochloric acid gas, and have determined the density of the vapour of this compound. Beryllium chloride can be volatilised without decomposition in an atmosphere of dry nitrogen or carbon dioxide, provided every trace of air is excluded. The density of the gaseous compound for the temperature-interval 686°–812° agrees with that calculated from the formula  $\text{BeCl}_2$  ( $\text{Be} = 9.1$ ). The question as to the value to be assigned to the atomic weight of beryllium, which has been so much discussed of late, appears to be now finally settled in favour of the number deduced by applying the periodic law to the study of the properties of this metal and its compounds (*Ber.* xvii. 987).

CONTINUING the researches of Krämers, Prof. Mendeléeff has shown at a recent meeting of the Russian Chemical Society (*Journal of the Society*, vol. xvi. fasc. 2) that the densities of solutions of salts increase together with the increase of their molecular weights. Thus if we take the series of salts HCl, LiCl, NaCl, KCl, . . .  $\text{BaCl}_2$ ,  $\text{SnCl}_4$ ,  $\text{HgCl}_2$ , and  $\text{Fe}_2\text{Cl}_6$ , the molecular weights of which are respectively 36.5, 42.5, 58.5, 74.5, . . . 208, 259, 271, and 325, the densities of their solutions in 100 parts of water, at 15° to 20°, are: 1.010, 1.014, 1.023, 1.025, . . . 1.098, 1.106, 1.128 (calculated), and 1.134. The densities increase as the molecular weights increase; but if we take, instead of the molecular weights, the weights of their

equivalents, or those of the equivalents of metals, the regularity of increase disappears. Prof. Mendeléeff adds that the above is true, not only with regard to chlorides, but also with regard to the salts of bromine and iodine, and many others. Reserving to himself further to pursue his researches in this way, Prof. Mendeléeff points out the following relation:—If the molecular weight of the dissolved body be  $M$ , and the solution be represented by  $nM + 100 \text{H}_2\text{O}$  (where  $n$  represents the number of molecules), the density,  $D$ , of the solution may be expressed for many bodies by the following equation:— $\left(\frac{n}{D - D_0}\right)^k = A + Bn$ , where  $D_0$  is the density of water, and  $k$  is equal to unity, or very near to it. This equation must be considered, however, only as preliminary, ulterior researches promising to give a more general formula.  $A$  and  $B$  are two constants, which vary with the temperature. Thus, for HCl at 0° (the density of water at 4° being taken = 1),  $A = 94.5$  and  $B = 1.725$ ; at 20°,  $A = 102.2$ , and  $B = 1.80$ ; at 40°  $A = 106.2$ , and  $B = 1.85$ ; at 60°  $A = 105.2$ , and  $B = 2.05$ ; at 80°  $A = 100.6$ , and  $B = 2.25$ ; and at 100°  $A = 94.5$ , and  $B = 2.55$ , the coefficient  $k$  being in all cases equal to unity.

### ON THE NOMENCLATURE, ORIGIN, AND DISTRIBUTION OF DEEP-SEA DEPOSITS<sup>1</sup>

#### Introduction

THE sea is unquestionably the most powerful dynamic agent on the surface of the globe, and its effects are deeply imprinted on the external crust of our planet; but among the sedimentary deposits which are attributed to its action, and among the effects which it has wrought on the surface features of the earth, the attention of geologists has, till within quite recent times, been principally directed to the phenomena which take place in the immediate vicinity of the land. It is incontestable that the action of the sea along coasts and in shallow water has played the largest part in the formation and accumulation of those marine sediments which, so far as we can observe, form the principal strata of the solid crust of the globe; and it has been from an attentive study of the phenomena which take place along the shores of modern seas that we have been able to reconstruct in some degree the conditions under which the marine deposits of ancient times were laid down.

Attention has been paid only in a very limited degree to deposits of the same order, and, for the greater part, of the same origin, which differ from the sands and gravels of the shores and shallow waters only by a lesser size of the grains, and by the fact that they are laid down at a greater distance from the land and in deeper water. And still less attention has been paid to those true deep-sea deposits which are only known through systematic submarine investigations. One might well ask what deposits are now taking place, or have in past ages taken place, at the bottom of the great oceans at points far removed from land, and in regions where the erosive and transporting action of water has little or no influence. Without denying that the action of the tidal waves can, under certain special conditions, exert an erosive and transporting power at great depths in the ocean, especially on submerged peaks and barriers, it is none the less certain that these are exceptional cases, and that the action of waves is almost exclusively confined to the coasts of emerged land. There are in the Pacific immense stretches of thousands of miles where we do not encounter any land, and in the Atlantic we have similar conditions. What takes place in these vast regions where the waves exercise no mechanical action on any solid object? We are about to answer this question by reference to the facts which an examination of deep-sea sediments has furnished.

A study of the sediments recently collected in the deep sea shows that their nature and mode of formation, as well as their geographical and bathymetrical distribution, permit deductions to be made which have a great and increasing importance from a geological point of view. In making known the composition of these deposits and their distribution, the first outlines of a geological map of the bottom of the ocean will be sketched.

This is not the place to give a detailed history of the various contributions to our knowledge of the terrigenous deposits in deep water near land, or of those true deep-sea deposits far removed from land, which may be said to form the special subject of this communication. From the time of the first expeditions under-

<sup>1</sup> A Paper read before the Royal Society of Edinburgh by John Murray and A. Renard. Communicated by John Murray