

vertebrates. And on the evidence of cyprinodonts it must be admitted that several of the characters which have been almost universally regarded as stable landmarks in morphological studies should be given comparatively little definite importance. For in this group, ranking only as a *family*, oviparous and ovoviviparous forms have been evolved, together with a broad range in intromittent organs and in embryonic nutriment. So that, for example, we must admit that structures like the 'claspers' of sharks are of but little moment in separating the phylum of the elasmobranchs from that of the Dipnoan or of the Teleostome. In the morphological portion of his work Mr. Garman has directed especial attention to varietal changes, notably in the case of *Fundulus heteroclitus*, and to structural variation as shown principally in teeth, digestive tract, urinogenital system and vertebral column. Under the latter head he attributes the decrease in the number of vertebræ of fishes in general, in and toward the torrid zone, to the 'lessening of the comparative activity of the species,' due to an enlarged food supply and to a decreased need of nutriment, the decreased number is not, therefore, attributable to the direct action of temperature, as several writers appear to have inferred.

BASHFORD DEAN.

A NEW DETERMINATION OF THE RELATIVE  
DENSITIES OF OXYGEN AND HYDROGEN  
AND OF THE RATIO OF THEIR  
ATOMIC WEIGHTS.

To one familiar with the work of Prof. Morley on this subject it would seem that any one who wishes to add anything to our knowledge of the matter must be an experimenter of unusual ability, and must be willing to expend a very large amount of labor on his determinations. That Julius Thomsen, who has recently published the results of his experiments in this field,\* is an experimenter of unusual ability every one will admit. That the results obtained can carry with them any considerable weight in comparison with those of Prof. Morley is very doubtful. It is, however, of very considerable interest to find that, by the use of

comparatively simple apparatus and by methods differing in almost every detail, he has obtained results which are in fairly close agreement with those of Prof. Morley's elaborate researches.

The method employed for the determination of the ratio of the atomic weights consisted in the determination, first, of the ratio between the weight of a certain amount of aluminium and of the weight of hydrogen evolved by its solution in a strong solution of caustic potash, and, second, of the weight of oxygen required to burn the hydrogen evolved by the solution of a known weight of aluminium.

The density of hydrogen was determined by measuring over water saturated with hydrogen, the gas evolved by the solution of a known weight of aluminium. The density of oxygen was determined in a similar manner, the gas being evolved by the decomposition of potassium chlorate. The volume of gas measured was approximately one and one-half liters, while Prof. Morley measured a volume of hydrogen amounting to *forty-two* liters. The results obtained were:

|                                                    |                     |
|----------------------------------------------------|---------------------|
| Ratio of Atomic Weights                            | 1:15.8690±0.0022    |
| Density of hydrogen at 0°,<br>760 mm. and 45° Lat. | 0.089947 ±0.000012  |
| Density of oxygen " "                              | 1.42906             |
| Prof. Morley's values were:                        |                     |
| Ratio of Atomic Weights                            | 1:15.879 ±0.00032   |
| Density of hydrogen at 0°,<br>760 mm. and 45° Lat. | 0.089873 ±0.0000027 |
| Density of oxygen " "                              | 1.42900 ±0.000034   |

In discussing the result of his determination of the ratio of the atomic weights, Prof. Thomsen remarks that, as he has avoided the weighing and measuring of large volumes of gases, it is probable that his result is nearer the truth than that obtained by others, and that the uncertainty does not extend beyond the fourth decimal. He seems to have overlooked the fact that, in his syntheses of water, Prof. Morley weighed his hydrogen absorbed in palladium, and also weighed the water formed by its combination, and that, while he weighed the oxygen in gaseous form, the sum of the weights of oxygen and hydrogen agreed almost exactly with the weight of the water.

\* Zeit. für Anorg. Chem. 11, 14; and 12, 1.

It is noticeable that Prof. Thomsen's density of hydrogen is higher than that of Prof. Morley, while his ratio for the atomic weights is lower. This seems to indicate that the hydrogen obtained by Prof. Thomsen was contaminated with a trifling amount of some impurity. From the experiments of Prof. Morley it seems probable that hydrogen evolved by the solution of aluminium in potassium hydroxide containing a small amount of the carbonate would contain carbon. As no account is given in the paper of any attempt to exclude the presence of potassium carbonate, or if any experiments to prove the absence of compounds of carbon or of other impurities in the hydrogen used, it is, at least, possible that the difference in the results of the two workers is due to this cause.

To one familiar with the character of such work it is rather a matter of surprise that the difference is not greater.

W. A. NOYES.

*A Dictionary of Chemical Solubilities, Inorganic.*

By ARTHUR MESSINGER COMEY, PH. D.  
8mo. Pp. 515. London and New York,  
Macmillan & Co., 1896.

The attempt is made in this book to give reliable data concerning the solubility of all inorganic substances that had been analyzed before March, 1894.

"The solubility of the substance in water is first given, the data being arranged chronologically in the longer articles. Then follow the specific gravities of the aqueous solutions, and also any data obtainable regarding their boiling points; other physical data concerning solutions are not included. Following this is the solubility of the substance in other solvents—first, the inorganic acids; then alkali and salt solutions, and finally organic substances."

The theories of solution are not discussed, the term 'soluble' being used to indicate that "a solution of some sort has been formed."

The plan of the book is admirable and, so far as our examination has extended, there are no serious omissions. The arrangement of the compounds and the nomenclature adopted are satisfactory and, probably, as good as any that could be employed.

A synchronistic table of periodicals is added

in an appendix as well as some formulas and tables for the conversion of various hydrometer scales into specific gravity.

The work is a worthy successor to the earlier volume of Prof. Storer, and the author deserves the thanks of his colleagues for the time and labor he has put upon it.

L. B. HALL.

SCIENTIFIC JOURNALS.

AMERICAN CHEMICAL JOURNAL, JUNE.

*On the Specific Gravities of Mixtures of Normal Liquids:* By C. E. LINEBARGER. The methods used to determine the molecular masses of liquids, which consist either in converting the liquid into the state of vapor and determining its specific gravity in this condition, or in determining the change in freezing- or boiling-point of a solvent upon the addition of the liquid, do not throw much light on the molecular complexity of the substance in the liquid state. From work in other lines it is probable that in some cases the molecular aggregate is the same in the liquid as in the gaseous condition; but in other cases the complexity increases as the substance passes from the gaseous to the liquid condition. The present paper is a study of the changes in specific gravity which take place when liquids which suffer no change in passage from one state of aggregation to another are mixed. In cases where association or dissociation takes place the number of factors which enter into play is so great that no general conclusions can be drawn. In the determinations pycnometers of a special form were used, and in most cases great precautions were taken to secure pure substances. If two liquids of different chemical composition are mixed, the volume of the resulting liquid will not be equal to the sum of the volumes before they were mixed, but will be greater or less. This is explained by the fact that dilution diminishes the molecular attraction and the internal pressure. The number of molecules in the unit of surface decreases and the volume increases. In this paper the observed and calculated results for a large number of mixtures are given; but the data at command at present is not sufficient to enable one to draw any general conclusions.