mass at a given epoch. Consider the state of affairs when the radius has become $\frac{1}{2}\rho$. Gravitational forces (per unit mass) will be quadrupled and, therefore, the pressure between two contiguous portions of given mass will be quadrupled, but the area separating these portions will be quartered so that the pressure per unit area (p) will be 16 times as great. The volume v of each portion will be $\frac{1}{8}$ as great, so that pv will be twice as great. But absolute temperature is proportional to pv, therefore, the absolute temperature will have been doubled when the radius is halved. That is,

$$T = \frac{\text{constant}}{\rho}$$

"This remarkable formula," according to Dr. See, "expresses one of the most fundamental of all the laws of Nature." In simple truth it is an interesting and suggestive formula, and it may throw light upon some of the knotty questions of celestial physics.

Dr. See, in his *Atlantic Monthly* article, says among other things : "It is somewhat remarkable that, while the law of gravitation causes bodies to describe conic sections, the law of temperature for every gaseous body is represented by a rectangular hyperbola referred to its asymptotes, and thus by a particular curve of the same species." Now, it would have been quite as well, or even better, for Dr. See to have said frankly ŭm-ta-ra-ra-bum-te-a, or words to that effect ; for, *seriously, the object of popular scientific writing is to develop proper and significant associations, and the bane of popular science is verbal sense which by association becomes absolute nonsense.*

IN the *Astronomical Journal* for April 8th Dr. C. M. Woodward calls attention to some of the manifest inaccuracies of Dr. See's derivation of the temperature formula. He points out that the gaseous globe cannot be assumed to have a bounding surface of definite radius ρ; he calls attention to the fact that the gravitational force at a point does not determine the pressure, but the pressure gradient at the point; and he claims that the hydrostatic pressure at a point varies inversely with ρ^2, not with ρ^4, as indicated in the above derivation of the temperature formula. In the above derivation, however, the pressure is said to increase 16 times, not at the same point in space, but at a point one-half as far from the center.

The objections raised by Dr. Woodward seem to be removed as follows : Consider the gaseous mass at the epoch t. Assume that during the contraction the radius coordinate of every particle decreases in the same proportion (this is what is meant in the above discussion by the invariance of the density function.) Consider the gaseous mass at a subsequent epoch t' when the radius coordinate of every particle has been reduced to one-half its initial value. The density at a distance $\frac{1}{2}r$ from the center at epoch t' is eight times as great as at distance r from the center at epoch t, and the gravitational force is four times as great. Therefore, the weight per unit volume is thirty-two times as great, and this weight per unit volume is the pressure gradient. In integrating the pressure gradients at epoch t and t', respectively, imagine the paths of integration to be broken up into homologous elements. The elements at epoch t' are then half as long as at epoch t, and, therefore, the integral at epoch t' from infinity to $\frac{1}{2}r$ is sixteen times as great as the integral at epoch t from infinity to r. Therefore, the pressure at homologous points is increased sixteen times when the mass of gas has contracted to half its initial dimensions, as stated in the above derivation.

W. S. FRANKLIN.

NOTES ON INORGANIC CHEMISTRY.

AN attempt is described in the *Chemiker Zeitung*, by Johann Walter, to concentrate solutions by means of a centrifugal apparatus. But while even very light and finely divided precipitates are rapidly separated by centrifugal force, an examination of different portions of a solution, taken while the machine was in rapid motion, showed that the composition was constant. The same was found true in the case of gaseous mixtures, no tendency being found for the denser constituent to collect in the most rapidly rotating portion of the vessel. This affords an interesting experimental confirmation of what might have been theoretically expected from the laws of gases and of solutions.

THE heat of formation of anhydrous oxid of calcium has lately been redetermined by Henri Moissan from the action of water on crystallized metallic calcium. The value was found to be $Ca + O = + 145$ cal. This value is greater than that for the oxids of potassium (+ 98.2) and sodium (+ 100.9), from which it appears that calcium can replace these metals in their oxids. It is also slightly greater than that of the oxid of lithium (+ 141.2). Corresponding to this, metallic lithium was obtained by heating the oxid with metallic calcium at a red heat. The heat of formation of magnesium oxid as found by Thomsen is + 143.4, but the previous observations of Winkler were confirmed, that at a low red heat calcium is freed from its oxid by magnesium. It is suggested, therefore, that the observation of Thomsen is erroneous, owing to impurities present in the metal used.

It is interesting to find a paper from a Spanish chemist in a recent *Comptes Rendus.* J. R. Mourelo, of Madrid, describes the preparation of phosphorescent strontium sulfid from the carbonate. Finely powdered strontianite and sulfur were heated in boats in a porcelain tube while a current of nitrogen was passing. In no case was a crystalline sulfid obtained. If the strontium carbonate was pure, especially free from alkalies, the sulfid was not phosphorescent. If the temperature was too high (above a bright red heat), or if the nitrogen current was too rapid, the same was the case. The best results were obtained by using a strontianite which contained 96.12% strontium carbonate, 2.03% calcium carbonate and traces of water, manganese and iron. Particularly are the traces of manganese necessary if the strontium sulfid is to be highly phosphorescent.

A study of aluminum has been made by P. Degener as to its use for culinary utensils, and published in the *Hygienische Rundschau.* While aluminum is but slightly acted on by weak acids when they are pure, in the presence of sodium chlorid it is rapidly attacked, as, for example, by sulfur dioxid, acetic acid, and even by alum. The inference is that some considerable danger attends the use of aluminum vessels in the preparation of many kinds of food. Whether, as a matter of fact, the amount which would be dissolved would do injury in the system remains a mooted question. While many experiments seem to indicate that aluminum salts have a somewhat detrimental effect upon digestion, yet it is well known that the inhibition of large quantities of alum water is often found very beneficial to health, and many alum springs enjoy a high reputation.

J. L. H.

THE NAPLES ZOOLOGICAL STATION.

We have recently received from Professor Anton Dohrn, the Director of the Zoological Station at Naples, a complete list of the American biologists who have worked at various times at the Naples Zoological Station. It is probable that the future demands upon the Naples tables will be quite as great as the present and the past, and the three tables, or rather two and one-half tables, which are now supported by subscriptions from this country, should be continued. Professor Dohrn has never raised any technical question of rights, but has always welcomed every American investigator. The least we can do in return is to extend to his institution the strongest support.

The Americans who have worked in the Zoological Station, the Tables they have occupied and the periods during which they were in attendance are as follows:

Zoological Station.		
Professor Whitman, Boston..	12 11 81	2 5 82
Miss O'Neill, H.	11 3 98	22 4 98
Austria.		
Dr. H. K. Corning	6 4 92	10 5 92
Baden.		
Mr. H. B. Ward, Troy	7 3 90	8 4 90
Bavaria.		
Dr. B. Sharpe	19 3 83	26 5 83
Dr. B. Dean, Columbia	27 4 92	3 6 92
British Association.		
Dr. N. Cobb, Spencer, Mass..	11 11 88	27 1 89
Cambridge.		
Miss E. A. Nunn	22 11 82	1 5 83
Hamburg		
Dr. W. W. Norman, Ind.	5 10 89	21 3 90
Williams College.		
Prof. E. B. Wilson, Baltimore.	30 3 83	20 10 83
Prof. S. F. Clarke, Williamstown	8 1 84	1 5 92