between their specific heats at constant volume and at constant pressure, both are monatomic gases. These properties undoubtedly place them in the same chemical class, and differentiate them from all known elements.

Although opinion is divided on the precise significance of the ratio of specific heats, 1·66, it appears to be most probable that in all cases, as in that of mercury, this ratio points to the monatomicity of the molecule. If we assume this provisionally, it follows that the atomic weight of helium is identical with its molecular weight. The molecular weight is twice the density, for the molecular weights of gases are compared with the atomic weight of hydrogen, taken as unity; hence the atomic weight of helium on this assumption is $2 \cdot 13 \times 2 = 4 \cdot 26$. But again we assume, in making this calculation, that helium is a single element, and not a mixture of elements. Before discussing this question, it appears advisable to inquire whether there is any evidence which would corroborate the deduction that it is a monatomic element. This evidence must be sought for in the properties of argon, for those of helium have not as yet been sufficiently investigated.

We know from countless examples among compounds of hydrogen and carbon that increase in molecular weight is accompanied by rise of boiling point; and it may be stated as a proved fact that a polymeride has always a higher boiling point than the simpler molecule of which the polymeride is formed. Among the substances germain to this inquiry, ozone and oxygen may be cited; the complex molecule of ozone is shown by the higher temperature at which it boils. It might be concluded with certainty, therefore, that A_2, could it exist, should have a higher boiling point than A_1.

Next, it is generally the case that the boiling point of an element, provided it has not a complex molecule like that of sulphur and phosphorus, is lower, the lower its molecular weight. There are the well-known instances of chlorine, bromine, and iodine; but if it be objected that these all belong to the same group, we may cite the cases of hydrogen, $-243.5°$; nitrogen, $-194.4°$; and oxygen, $-182·7°$; and we may add chlorine, $-102°$. If argon possessed the atomic weight 20 and the molecular weight 40, it is probable that its boiling point would lie above that of chlorine, instead of, as is actually the fact, at $-187°$—below that of oxygen. But, it may be objected, the boiling point is determined, not by the molecular weight, but by the density. It may be urged that the density of argon is 20, and that its molecules, like those of oxygen and nitrogen, are diatomic, in spite of the argument to the contrary from the ratio of specific heats. The answer to this objection is obvious; if this were so, its boiling point should lie above, and not below that of oxygen.

These considerations cannot, of course, be accepted as evidence, but merely as corroborative of the conclusion as regards the monatomicity of argon. If they apply to argon, they apply with equal force to helium; and if they are accepted, it follows that the atomic weight of helium is 4·26.

It is again necessary to consider the character of argon in attempting to answer the next question: Are argon and helium single elements or mixtures of elements? But before discussing it, let us consider another question: How does argon happen to occur in the air and helium only in minerals? Why is helium not present in air? A satisfactory answer to this question is, we think, contained in a paper by Dr. Johnstone Stoney (*Chem. News*, 1895, lxxi. 67). He there shows that were hydrogen to be present in air (and it might be present, in spite of the oxygen with which it could be mixed, for a small quantity would surely escape combination), it would, in virtue of the velocity of its own proper molecular motion, remove itself from our planet, and emigrate to a celestial body possessing sufficient gravitational attraction to hold it fast. Dr. Stoney suggests this explanation to account for the absence of an atmosphere and of water vapour on the moon, and for the presence of an atmosphere of hydrogen on the sun. It would also account for the absence of helium in our atmosphere, and for the presence of the chromospheric line D_3. Of course if an element can form compounds, or if it is absorbed by solids, as helium appears to be, it will, like hydrogen and helium, be found on the earth.

The inertness of these gases would favour their existence in the free state. And argon exists in the atmosphere, precisely because it forms no compounds. Similarly nitrogen is a constituent of air, because in the first place those elements with which it combines directly are comparatively rare, and also because such compounds are mostly decomposed by water; and the excess of nitrogen therefore occurs in the free state. Similarly, the occurrence of free oxygen is due to the fact that some remains over, after all or almost all the readily oxidised substances have already united with oxygen. If there exist gases similar to argon in inertness, they too may be looked for in air.

Now if argon possess the atomic weight 40, there is no place for it in the periodic table of the elements. And up to now there is no exception to this orderly arrangement, if the doubtful case of tellurium be excluded. Rayleigh and Ramsay have shown that the high density of argon can hardly be accounted for by supposing that molecules of A_2 are mixed with molecules of A_1; and excluding as untenable the supposition that argon is a compound, the only remaining suggestion is that it is a mixture. No attempts have as yet been made to test the correctness of this idea; but experiments have already been started which, it is hoped, will throw light on this question.

The density of argon is too high; to fill its place in the periodic table, between chlorine and potassium, its density should be about 19 and its atomic weight 38. We might expect the presence of another element with a density of 41 and an atomic weight of 82, to follow bromine, as argon follows chlorine; and this element would probably also be a gas, since its density would be only a little higher than that of chlorine.

But here we meet with a difficulty. There are certain lines in the spectrum of helium coincident with lines in the argon spectrum. There can be only one explanation, excluding the extremely improbable hypothesis, which is not verified in any instance, that two elements may give spectra containing identical lines. That explanation is, of course, that each contains some common ingredient; and there appears to be a place for one with density 10 and atomic weight 20, to follow fluorine in the periodic table. The density of helium is, however, so low, that there does not appear room for any large quantity of a heavier gas; and to fit the periodic table, the density of argon should be diminished by removal of a heavier admixture, rather than increased by removal of a lighter one.

Such are the problems which now confront us. Until more experiments have thrown further light on the subject, we regard it as labour lost to discuss the relations of these curious elements to others which find their proper place in the periodic table.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

SIR JULIAN GOLDSMID has been elected Vice-Chancellor of the University of London, in succession to Sir James Paget, who has resigned.

THE new *Directory* of the Department of Science and Art, which has just come to hand, contains the regulations for Organised Science Schools, previously referred to in these columns. Among other matter new to the *Directory*, and announcements of changes, we notice that a new method of according the National Scholarships is in contemplation. The change will not take effect until the Session 1896–97, and due intimation of its nature will be given. The syllabus of Practical Plane and Solid Geometry has been recast in the elementary stage, in the direction already noted, and new syllabuses are given for Inorganic Chemistry, theoretical and practical, Geology, and Physiography. It is not clear, however, whether the questions to be set for the examinations next May will be based upon the new or the old syllabuses.

AT the ordinary quarterly meeting of the Royal College of Physicians of London, held on Thursday last, Sir Russell Reynolds, F.R.S., in the chair, the following gentlemen were elected officers of the College:—Censors, Sir William H. Broadbent, Dr. P. H. Pye-Smith, Dr. T. Tillyer Whipham, Dr. William Cayley; treasurer, Sir Dyce Duckworth; emeritus registrar, Sir Henry Pitman; registrar, Dr. Edward Liveing; librarian, Dr. William Munk; examiners—chemistry and chemical physics, Mr. Charles E. Groves, F.R.S., Mr. W. R. Dunstan, Mr. J. Millar Thomson, Dr. Samuel Ricleal, Dr. R. Taylor Plimpton; materia medica and pharmacy, Dr. T. Lauder Brunton, F.R.S., Dr. Daniel J. Leech, Dr. Sidney P. Phillips, Dr. Frederick Willcocks, Dr. Francis G. Penrose;

elementary biology, Mr. F. Gymer Parsons, Mr. P. Chalmers Mitchell; elementary physiology, Dr. H. Lewis Jones; physiology, Dr. Vincent D. Harris, Dr. Thomas Oliver, Dr. Frederick W. Mott; anatomy, Mr. Charles Stonham, Prof. G. Dancer Thane; medical anatomy and principles and practice of medicine, Dr. Philip J. Hensley, Dr. J. Burney Yeo, Dr. G. Vivian Poore, Dr. J. Mitchell Bruce, Dr. Frederick Taylor, Dr. Stephen Mackenzie, Dr. William Ewart, Dr. Seymour J. Sharkey, Dr. J. Kingston Fowler, Dr. Robert Saundby; midwifery, Dr. J. Baptiste Potter, Dr. J. Watt Black, Dr. Peter Horrocks, Dr. Walter S. A. Griffith; surgical anatomy and principles and practice of surgery, Mr. John Langton, Mr. J. N. C. Davies-Colley; public health, Dr. Charles H. Ralfe, Dr. William Pasteur; Murchison Scholarship, Dr. F. Charlwood Turner, Dr. Samuel H. West.

WE gave last week the names of the Research Scholars appointed for 1895, by Her Majesty's Commissioners for the Exhibition of 1851. We are now informed that the following scholars, appointed in 1894, have forwarded satisfactory reports of their work during the first year of their scholarships, which have accordingly been renewed for a second year.

Name of Scholar.	Nominating Institution.	Place of Study.
J. C. Beattie	University of Edinburgh	University of Vienna.
J. R. E. Murray ...	University of Glasgow ...	University of Glasgow.
W. B. Davidson ...	University of Aberdeen...	University of Würzburg.
R. C. Clinker... ...	University College, Bristol	University College, Bristol.
F. Dent	Yorkshire College, Leeds	University of Munich.
A. J. Ewart	University College, Liverpool	University of Leipzig.
D. K. Morris... ...	University College, London	University College, London.
J. Frith	Owens College, Manchester	Owens College.
R. Beattie	Durham College of Science	Durham College of Science.
W. B. Burnie... ...	University College, Nottingham	Central Technical College.
J. A. McClelland ...	Queen's College, Galway	Owens College.
F. B. Kenrick ...	University of Toronto ...	University of Leipzig.
F. J. A. McKittrick	Dalhousie University, Halifax, Nova Scotia...	Cornell University.

Note.—Such of the above Scholars as remained at the nominating Institution for the first year will now proceed to another Institution in England or abroad.

The following scholars, appointed in 1893, have been selected for exceptional renewal for a third year :—

Name of Scholar.	Nominating Institution.	Place of Study.
H. W. Bolam... ...	University of Edinburgh	University of Leipzig.
J. W. Walker... ...	University of St. Andrews	Universities of Leipzig and St. Andrews.
J. E. Myers	Yorkshire College, Leeds	University of Strassburg
E. C. C. Baly... ...	University College, London	University College, London.

SCIENTIFIC SERIALS.

American Meteorological Journal, July.—The geographical distribution of the maximum and minimum hourly wind velocities . . . for January and July, for the United States, by Dr. F. Waldo. This discussion is based on the Signal Service and Weather Bureau observations, and the subject is treated in various ways, and illustrated by wind charts. We select from these (1) the hour of maximum wind and (2) the maximum hourly wind, in miles per hour. There is no great regularity in the time of occurrence of the strongest wind; in January it occurs on the Atlantic coast from 2h. to 4h. a.m., and on the North Pacific coast it is retarded to 6h. a.m. On the Gulf of Mexico it takes place about noon, while at inland stations it occurs generally about 2h. p.m. In July, on the Atlantic coast, there is a maximum wind about 2h. p.m. in latitude 45°, but with southward progress it is retarded, until in latitude 30° the hour is changed to 6h. p.m. In the southern part of the Pacific coast, the time of maximum is 1h. p.m., which is much earlier than for the adjacent inland or the northern part of the coast. In general, for the inland north-east the hour is 2h. p.m., and there is a retardation with both western and southern progress. In January the maximum hourly wind reaches a velocity of seventeen miles on the northern parts of the Atlantic and Pacific coasts, decreasing with southward progress, while the inland distribution shows a maximum of ten to thirteen miles per hour over the Great Plains. In July, the maximum hourly wind is eleven to thirteen miles on the Atlantic coast, while on the North Pacific coast there is a very small maximum (eight miles), but this is counterbalanced by the very high velocity of eighteen miles per hour on the central Californian coast. A reference to the wind charts shows the prevailing conditions much better than any verbal description can do.

Bulletin of the American Mathematical Society, No. 9. (June 1895, New York).—Mr. J. de Perott gives a very interesting sketch of Euclidian arithmetic in connection with a notice of the late M. Stieltjes' contribution to the *Annales de la Faculté des Sciences de Toulouse*, vol. iv., entitled "Sur la théorie des nombres." M. Stieltjes had it in contemplation to write an extensive treatise on the theory of numbers, but unhappily his weak health and final untimely death prevented his getting beyond the paper noticed by Mr. de Perott. This paper is devoted to a greatly generalised form of Euclid's work. "It does not insist on the definition of number, nor on the laws which are at the base of the operations we perform on numbers, but passes immediately to the exposition of the chief properties of the least common multiple and the greatest common divisor of numbers. . . . Poinsot was the first, I think, to whom it occurred that the course could be reversed." The results are expressed in a very symmetrical form by the author of the note.—Mr. G. L. Brown writes a short note on Hölder's theorem concerning the constancy of factor-groups, and Prof. F. Morley a like note on the theory of three similar figures. The theory has been recently given in the sixth edition of Casey's "Sequel to Euclid," and also in the second edition of his "Conics." Prof. Morley believes that something is to be said in favour of an appropriate analytic handling of the theory, and gives here some preliminary equations in a convenient form.

Bollettino della Societa Sismologicá Italiana, I., 1895, No. 3.—Microseismograph for continuous registration, by Prof. G. Vicentini (see p. 178.)—New type of seismic photochronograph and its applications, by A. Cancani. A description of an instrument by which the face of a chronometer is photographed at the moment of the shock or of the arrival of long-period pulsations from a distant earthquake.—Review of the principal eruptive phenomena in Sicily and the adjacent islands during the four months January-April, 1895, by S. Archidiacono.—The Viggianello (Basilicata) earthquake of May 28, 1894, by M. Baratta. An account of an interesting tectonic earthquake. The meizoseismal area, which is elliptical and only about 17 km. long, is restricted to the northern slopes of M. Pollino. This group of mountains represents the northern half of a vast ellipsoid of dolomites and limestones, traversed by great fractures, which, if produced, pass through Rotonda and Viggianello, the towns most damaged by the shock.—Notices of Italian earthquakes (February-April, 1895).

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, July 22.—M. Marey in the chair.—Researches on the composition of grapes from the principal French vines, by MM. Aimé Girard and L. Lindet.—On the osmotic phenomena produced between ether and methyl alcohol across different diaphragms, by M. F. M. Raoult. It is found that with ether and methyl alcohol on the respective sides of a diaphragm of pig's bladder, the methyl alcohol passes by osmosis to the ether side. The bladder membrane appears to be impermeable to ether; even with mixtures the transference is always of methyl alcohol towards the side where it is of less concentration. Exactly the reverse occurs with a vulcanised caoutchouc membrane, which is impermeable to methyl alcohol, but permeable to ether. The experiments show: (1) that osmosis between two determined liquids may not only vary much in energy, but even change its sense with the nature of the diaphragm; (2) that the osmotic movement of substances