

of hydrogen. For in the best case the weight of the globe was 600 times the weight of the hydrogen contained in it. The great advantage, however, to be gained from this method is the absence of any error introduced by mercury vapour, for it would have no effect on the weight of the hydrogen, and the volume and pressure of the residual mercury vapour are far too small to influence results. Dr. Morley has given especial attention to this method, and has brought it to a very great pitch of accuracy.

The palladium was placed in a tube which could be connected with the apparatus by a ground-glass joint. When the palladium was charged with hydrogen the tube was weighed. Connection being now made, a fusible metal plug, which took the place of a stop-cock, was melted, and the hydrogen passed into the globes. The tube was afterwards weighed, the difference giving the weight of hydrogen, usually about 3·7 grammes. This was found sufficient to fill three globes.

The mean of eight results in one series is

$$D = \cdot 089886 \pm \cdot 0000049.$$

The mean of four results in a second series is

$$D = \cdot 089880 \pm \cdot 0000088.$$

The mean of eleven results with a new apparatus,

$$D = \cdot 089866 \pm \cdot 0000034.$$

Dr. Morley gives as his final result for the weight of one litre of hydrogen under standard conditions,

$$\cdot 089873 \pm \cdot 0000027 \text{ gr.}$$

The third part of the paper deals with the determination of the volumetric composition of water. The electrolytic gas was produced in a voltmeter, whose loss of weight gave the weight of gas used. This gas was admitted into globes of known volume, plunged in ice, where its pressure was measured. From these it was transferred to an eudiometer and exploded. The weight of gas usually dealt with was about 23 grammes. The explosion of the gases was carried on in a eudiometer, where all but 1/100th or 1/1000th part of the gas could be exploded out of contact with mercury. In all Dr. Morley's results he found excess of hydrogen, due to secondary reactions in the voltmeter.

The mean value determined by ten experiments of the ratio of the excess of hydrogen to the whole combined volume of hydrogen and oxygen is '000293. This value $\times 3 = \cdot 00088$ gives a correction to be applied to the ratio of hydrogen and oxygen, in order to obtain the ratio of volumes of hydrogen and oxygen that would combine without residue.

The mean of the ten experiments gives the value of the density of the electrolytic gas as

$$= \cdot 535510 \pm \cdot 000010.$$

In calculating the ratio of combining volumes, Dr. Morley takes into account the deviation of the mixed gases from the density computed by Boyle's law, and also the values of the constant a in Van der Waals's equation. He obtains the ratio of mixture to be 2'000357, which, corrected for known excess of hydrogen, gives ratio of combining volumes to be

$$2 \cdot 00269.$$

The fourth and last portion of the experimental portion of the paper deals with the syntheses of water from weighed quantities of oxygen and hydrogen. The hydrogen was weighed, absorbed by palladium, the oxygen weighed in a globe, and the two were combined together in a combustion apparatus, whose gain in weight gave the weight of water produced. The quantity of hydrogen used was about 42 or 43 litres; the measured residue of uncombined gas varied from 1/100th to 1/10,000th of quantity concerned. The combustion apparatus was plunged in water during the union of the two gases, in order to keep it cool. This process took about one and a half hours, and was carried on as far as possible. The remaining gas in the various parts of the apparatus was pumped out and analysed, the combustion apparatus being kept in a freezing mixture, to keep as low as possible the vapour pressure of the water. The rest of the process needs no description.

As regards two possible sources of error which have been suggested, Dr. Morley proved conclusively that his hydrogen from palladium contained no water, and that his phosphorus pentoxide absorbed no oxygen.

As the mean of twelve experiments, Dr. Morley gives the atomic weight of oxygen to be very nearly

$$15 \cdot 879.$$

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In collating all the results of his experiments, Dr. Morley gives the following values :

Weight of one litre of oxygen	1'42900
Weight of one litre of hydrogen	0'089873
Atomic weight of oxygen (chemical method) ...	15'879
Molecular weight of water (chemical method) ...	15'879
Atomic weight of oxygen (physical method) ...	15'879

The probable accuracy of Dr. Morley's work appears to be exceedingly high, for he has in several cases spent especial trouble and time in eliminating hitherto constant sources of error. The extremely ingenious forms of apparatus he used for his many determinations are especially worthy of remark; and these, together with the extraordinary care bestowed in their use, combine to make the whole rank among the finest investigations of modern science.

E. C. C. BALY.

SCIENCE IN THE MAGAZINES.

THE relation of complexion to disease is discussed by Dr. John Beddoe, F.R.S., in the course of a paper in *Science Progress*. Baxter's great work on the medical statistics of the Civil War contains evidence as to the greater liability of blonds to certain classes of disease (in America at least). It follows from this that the blonds in America have less chance than the brunets of contributing their due proportion to the next generation, and therefore the blonds ought to diminish relatively, and the brunets to increase.

As bearing upon this, it appears that of accepted soldiers from among the white natives of the United States, 66 per cent. were light and 34 dark complexioned, but the proportion for English, Irish, and Germans is 70 to 30. Thus, Dr. Beddoe points out, the men of American birth yielded a larger proportion of brunets than those of any of the nations that had contributed to their ancestry, which is nearly equivalent to saying that the Americans are more generally dark complexioned than their ancestors were. Statistics as to the colours of school children of Germany, Austria, Switzerland, and Belgium, and of adults in Italy and the British Isles, seem to furnish sufficient evidence that in a great part of Europe the citizens are darker than the peasantry. Why the blond type should be more susceptible than the brown to the malign influences of urban life is a difficult question to decide.

Other articles in *Science Progress* are:—"Prehistoric Man in the Eastern Mediterranean," by Mr. J. L. Myres; "The Graptolites," by Mr. J. E. Marr; "Insular Floras," by Mr. W. B. Hemsley; and "Recent Discoveries in Avian Palaeontology," by Mr. C. W. Andrews.

There are several articles in the *Contemporary* to which attention may be directed here. Mr. Phil Robinson describes "The First Nest of a Rookery," in a pleasantly-written paper, but the interpretations of his observations are made too much from the humanistic point of view. Dr. Lennox Browne attacks "The Antitoxin Treatment of Diphtheria," his criticism being based mainly upon the Report of the Metropolitan Asylums Board, summarised in these columns in April last (vol. liii. p. 524). He claims that the mortality of cases treated by antitoxin at the London hospitals in 1895 is but a trifle lower than that of the previous year, and is in excess of what has been obtained in individual hospitals of the series whence the Report is issued; and, also, that this improvement has not been due to the serum treatment, but rather to increased vigilance and nursing care. Some "Girls' Technical Schools on the Continent" are described by Marion Mulhall. The article shows how the technical instruction of girls now takes a front rank in the cares and duties of many municipal authorities in Holland, Belgium, Germany and Austria.

Sir W. M. Conway describes in *Scribner* his walk of "A Thousand Miles through the Alps," and concludes his narrative with a comparison between Switzerland and the Tyrol from a traveller's point of view, much to the advantage of the latter. He says, and there are many ready to corroborate his statements, "Whereas travel in Switzerland is exploited by hotel-keepers and organised in their interests, the Tyrol is, through the agency of the powerful German and Austrian Alpine Club, organised by travellers themselves in their own interests. In Switzerland, traps are laid for the tourist's francs; in the Tyrol, every effort is made to spare his pocket." The Tyrol is far ahead of Switzerland in climber's food, in mountain huts,

and in all other facilities for mountaineering away from crowds of tourists. "In fine," concludes Sir Martin Conway, "no part of the Alps now forms a better training-ground for the youthful would-be mountaineer, none a less vulgarised holiday resort for the man of moderate physical capabilities, simple tastes, or restricted means, than the region comprised in the Austrian and Bavarian Tyrol."

In *Scribner* there is also an article on scientific taxidermy, under the title "A Lost Art," by Mr. J. Carter Beard. The reform in taxidermic methods is said to have begun fifteen years ago. As instances of successful work are cited Mr. W. T. Hornaday's "Fight in the Tree-Tops," illustrating a characteristic episode in the lives of orang-utans, whose habits he had studied in their native forests, and whose skins and skeletons he had himself collected; Mr. Hornaday's group of flamingoes, and groups of bison, in the U.S. National Museum, and New York Museum of Natural History; a group of Rocky Mountain goats, by Prof. L. L. Dyche; a young camel, by Mr. Rowley, in the latter Museum, and the rehabilitation of "Chico," a large ape, done for the same museum by the same taxidermist. Nothing is said of any of the specimens in our own Natural History Museum.

The *Geographical Journal* contains the address delivered by Sir Clements Markham at the recent anniversary meeting of the Royal Geographical Society. There are also contributions on "The Pamirs and the Source of the Oxus," by the Right Hon. George N. Curzon; "Admiralty Surveys during the Year 1895"; "The Indian Surveys 1894-95," by Mr. C. E. D. Black; and "Geography at the Universities." In the *Contemporary*, Mr. A. E. Pease has a short article on the political geography of "Africa North of the Equator." The *Century* contains "Glimpses of Venezuela and Guiana," by Mr. W. N. King; a short paper on Eskimo life, entitled "An Arctic Studio (77° 44' N. lat.)," by F. W. Stokes; and "Impressions of South Africa," by Mr. James Bryce.

A passing mention must suffice for the remaining articles of scientific interest in the magazines and reviews received. Under the title "Stray Thoughts on South Africa," Olive Schreiner contributes to the *Fortnightly* some facts as to the crossing of races in South Africa and the results of the mixture of blood; Prof. Max Müller's paper on "Coincidences," read before the Royal Society of Literature in May last, appears in the same review. Dr. Louis Robinson discusses, in the *National*, some aspects of "The Science of Change of Air," and offers a few sensible and seasonable suggestions on the subject. Mr. F. E. Hewitt has in the *Westminster Review* a historical study entitled "How the First Priests, the long-haired Shamans, and their successors, the Tonsured Barber-Surgeons, measured Time." To *Longman's Magazine* Mr. Grant Allen contributes a popular paper on "Lobsters at Home." Mr. James Buckland describes in the *English Illustrated Magazine* the remarkable mode of nidification of the hornbills, and makes a conjecture why the male bird plasters up the nest and keeps the female a prisoner until the eggs are hatched. Finally, *Chambers's Journal* contains its usual complement of instructive articles, among the subjects being Mr. Carey Lea's work on modifications of silver, and artificial perfumes of flowers.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—An examination in natural science (chemistry and physics) will be held on Wednesday, October 7, for the purpose of filling up a Bristol scholarship (open *pro hac vice*) of the annual value of £100 and tenable (under the usual conditions) for five years; the successful candidate to commence residence immediately upon election.

DR. T. M. LEGG has been appointed Professor of Hygiene in Bedford College, London.

THE widow of the late Dr. Arthur Jackson, of Sheffield, has presented £5000 to the Sheffield School of Medicine to endow a chair of Anatomy, to be named after her late husband.

THE Council of University College, London, have instituted a new Professorship of Pathological Chemistry, and have appointed Dr. Vaughan Harley to the professorship.

THE Cornell University has issued, in the form of a slender brochure, its programme of courses of instruction in physics for

the session 1896-97. The Department of Physics occupies a large building known as Franklin Hall, and the equipment is valued at 50,000 dols. Prof. E. L. Nichols has the services of an efficient staff, consisting of three assistant professors and seven instructors. The curriculum includes elementary courses for senior and junior students, advanced work both for undergraduates and graduates, and courses given in the summer school from July 6 to August 16. Among other encouragements for research, one university fellowship and one graduate scholarship in physics are awarded each year. With a view to affording still further stimulus for research, the University, three years ago, founded the *Physical Review*, which is the only journal in America devoted exclusively to physics. Such enterprise furnishes an example which our older English universities would do well to emulate.

THE Duke of Bedford has placed at the disposal of the Technical Instruction Committee of the Bedfordshire County Council a farm of 275 acres, 149 of which are arable land and the rest grass. In addition to this his Grace has erected the necessary lecture-rooms, dormitories, and other buildings for the accommodation of twenty students. Twenty boys are granted free scholarships by the County Council, entitling them to two years' board, residence, and instruction in the science and practice of farming. On Tuesday, June 30, the members of the Bedfordshire County Council were able, at the invitation of the Duke, to pay a visit of inspection to the farm, and are able to report that every branch of farm and garden practice is efficiently taught by means of models and specimens in school and of actual work on the farm, in the dairy, poultry-yard, and garden. The institution is modelled on the lines of similar school farms on the continent, which were inspected and reported upon by the Organising Secretary of Technical Instruction some time ago.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 4.—"On the unknown Lines observed in the Spectra of certain Minerals." By J. Norman Lockyer, C.B., F.R.S.

In the first note of the series "On the New Gases obtained from Uraninite," by the distillation method, the author remarked¹ "I have already obtained evidence that the method I have indicated may ultimately provide us with other new gases, the lines of which are also associated with those of the chromosphere."

In a subsequent paper "On the Gases obtained from the Mineral Eliasite," he gave a list of several unknown lines, and suggested that they might indicate the existence of a new gas or gases in that mineral, and added² "Although the evidence in favour of a new gas is already very strong, no final verdict can be given until the spectra of all the known gases, including argon, have been photographed at atmospheric pressure, and the lines tabulated. This part of the inquiry is well in hand."

The inquiry above referred to has now been completed and in the following manner:—

Photographs were taken of the spectra at atmospheric pressure of nitrogen, oxygen chlorine, carbonic anhydride, coal gas, sulphuric anhydride, phosphoretted hydrogen, and argon, these being the gases which, from the experience thus far acquired are likely to be associated with those given off by minerals. In addition to these the lines of mercury, potassium, and platinum, were also photographed. The lines of platinum are always present in the spectra for the reason that the spark is passed between platinum poles, while the lines of mercury or potassium frequently appear according as the gases are collected over mercury or potash.

For the wave-lengths thus obtained no greater accuracy than one indicated by four figures is claimed. It was the author's intention, in the first instance, to give five figures from the more elaborate tables of some of the elements given by other observers, but this had to be abandoned in consequence of the considerable variations found in the tables between the results as given by different observers.

A list is given of sixty lines which have been observed and photographed in the spectrum of the gases from eliasite which do not appear in the spectra of the old gases.

¹ *Roy. Soc. Proc.*, vol. lviii. p. 70.

² *Ibid.*, vol. lix. p. 3.