the screw (S) left open to permit of the escape of the gas. As soon as the whole mass of liquid has been reduced to a temperature of − 23° the ebullition ceases, the screw (S) may be replaced, and if a temperature lower than − 23° be required the tube (B) placed in connection with a good air-pump. By this simple means a litre of alcohol can be kept for several hours at temperatures either of − 23° or − 55°, and thus a large number of experiments can be performed for which hitherto the expensive liquid nitrous oxide or solid carbonic acid was required.

M. Camille Vincent has recently constructed a much larger and more perfect and continuous form of freezing-machine, in which, by means of an air-pump and a forcing-pump, the chloride of methyl is evaporated in the freezing-machine, and again condensed in the cylinders. This enlarged form of apparatus will probably compete favourably with the ether- and sulphurous acid freezing-machines now in use, as they can be simply constructed, and as the vapour and liquid employed does not attack metal, is non-poisonous, and as the frigorific effects which it is capable of producing are most energetic.

The second and perhaps more important application of methyl-chloride is to the manufacture of methylated colours.

It is well known that rosaniline or aniline red, $C_{20}H_{19}N_3$, yields compounds possessing a fine blue violet or green colour, when a portion of the hydrogen has been replaced by the radicals, methyl or ethyl, and the larger the proportion of hydrogen replaced, the deeper is the shade of violet produced. Then we have triethyl rosaniline, or Hofmann's[1] violet, $C_{20}H_{16}(C_2H_5)_3N_3$.

By the replacing one or two atoms of the hydrogen of aniline by methyl, and by oxidising the methyl-aniline, Charles Lauth obtained fine violet colours, whilst about the same time Hofmann observed the production of a bright green colouring matter now known as iodine green, formed during the manufacture of the violet, and produced from this latter colour by the action of methyl-iodide.

In order to prepare aniline green from the pure chloride of methyl a solution of methyl-aniline violet in methyl-alcohol is placed in an iron digester, and the liquid rendered alkaline by caustic soda. Having closed the digester, a given quantity of liquid chloride of methyl is added by opening a tap, and the digester thus charged is placed in a water bath, heated by a jet of steam until the temperature reaches 95°, and the indicated pressure amounts to from 4 to 5 atmospheres. As soon as the reaction is complete the hot water is replaced by cold, and the internal pressure reduced by opening the screw-tap of the digester. The product of this reaction, heated and filtered, yields the soluble and colourless base, whose salts are green. To the acidified solution a zinc-salt is added to form a double salt, and the green compound is then precipitated by the addition of common salt. By adding ammonia to a solution of the methyl green salt, a colourless liquid is obtained in which cloth mordanted with tannic acid and tartar-emetic becomes dyed green (R. S. Dale).

If rosaniline be substited for methyl-aniline in the preceding reaction, Hofmann's violet is obtained. The application of methyl-chloride to the preparation of violets and greens is, however, it must be remembered, not due to M. Vincent; it has been practised for some years by various aniline colour makers. M. Vincent's merit is in establishing a cheap method by which perfectly pure chloride of methyl can be obtained, and thus rendering the processes of the manufacture of colours much more certain than it has hitherto been. By the use of this material the aniline can be methylated in simple cast-iron boilers heated by steam, and under a pressure much more moderate than is otherwise required.

In reviewing the new chemical industry of the beet-root vinasses one cannot help being struck by the knowledge and ability which have been so successfully expended by M. Camille Vincent, on the working out of the processes. Here again we have another instance of the utilisation of waste chemical products and of the preparation on a gigantic scale of compounds hitherto known only as chemical rarities. All those interested in the progress of scientific research must congratulate M. Camille Vincent on this most successful issue of his labours.

ILLUMINATION IN SPECTROSCOPY[2]

AFTER having shown how intrinsic brilliancy of the light operated on was the chief visual step to excellence in spectroscopic observations, the author proved that the temperature of the light must be kept constant, or we might be landed in a totally different class of physical phenomena of a most confounding character.

Coming, then, practically to *flame*-spectroscopy, he described the results hitherto obtained by all the leading spectroscopists respecting the peculiar lines and bands, all of them very faint, of the blue-grey blowpipe flame of coal-gas and common air; and then showed how, by merely looking at one and the same flame *end-on*, in place of transversely, according to the usual custom, all the features hitherto chronicled may be seen some five times brighter; while many other details not dreamt of before come into view, and the temperature remains undisturbed.

Next applying the same principle to the electric-spark illumination of gas-vacuum tubes, a still greater proportional improvement was obtained. But not until the author had invented or arranged a new description of such tubes, which rendered the application of the end-on principle possible. Examples of these new tubes, as prepared lately for the author by M. Salleron, 24, rue Payée au Marais, Paris, were exhibited; and several proofs of their superior brightness of illumination were given. The last being that in a narrow and critical region of a rather faint and difficult carbonaceous spectrum, where the Royal Society, London, has published eight lines only, and those dark ones—the new tubes showed thirty-one lines, and all of them bright ones. As yet the author had only been able to get twelve different gases thus prepared; but with such decided improvement of spectroscopic vision in every case, that he hopes so increased a demand may soon flow in upon M. Salleron, as will make it worth his while to prepare similar end-on tubes of all known volatile products; and the result can hardly but prove most favourable to the progress of spectroscopic science.[1]

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

DR. J. H. BALFOUR, Professor of Botany in the Edinburgh University, has resigned his chair, which he has filled since 1845, on account of failing health. The patronage of the Chair of Botany is vested in the curators of the University. Among the candidates for the chair, we learn, are Mr. Carruthers, Prof. Dickson, of Glasgow, Mr. J. Bailey Balfour, and Prof. McNab, of Dublin.

THERE was much fine talk last Wednesday at the Mansion House on the subject of University extension in London, and it was pleasing to see a prince take an apparently genuine interest in the intellectual advancement of the people. We sincerely hope that the movement may lead to a substantial and durable result, though we very much doubt it. What we want most in London is a true university after the German model, not a "Cambridge extension." We are glad that Prince Leopold, in his really able address at the Birkbeck Institution on Tuesday, insisted so strongly on the weak point of the British workman, and that he can only hope to hold his own by the side of the foreign workman by starting with an equally good education.

AT the annual meeting of the trustees of the Birmingham Science College, under the presidency of the founder, Sir Josiah Mason, who celebrated on Monday his eighty-fourth birthday, it was announced that the college building, a handsome Gothic structure in the rear of the Birmingham Town Hall, is rapidly approaching completion, and the formal opening will probably be made on the founder's next birthday. Nearly 150,000*l.* has been expended on the college building and endowment.

SCIENTIFIC SERIALS

American Journal of Science and Arts, February.—We have here two interesting papers on acoustics. Mr. Jacques has inquired into the velocity of loud sounds, measuring the velocity at different short distances from a cannon by means of a series of membranes electrically connected with a chronograph. He finds that the velocity of sound is a function of its intensity, and that experiments in which a cannon is used contain an error, probably due to the bodily motion of the air near the cannon. Immediately in the rear of the cannon the velocity was less than at a distance, but, going from the cannon, the velocity rose to a maximum considerably above the ordinary velocity, and then fell gradually to the rate usually received. When the cannon was pointed

[1] Hofmann, *Proc.* Roy. Soc., xiii. 13 (1863).

[2] Abstract of paper upon "End-on, in Place of Transverse, Illumination in Private Spectroscopy," by Mr. Piazzi Smyth, Past President of R. Sc. Soc. Arts. Edinb., February 10, 1879.

[1] Tubes similar to those referred to are already well-known in England; Dr. Monckhoven has in fact pointed out the value of such tubes, and sent specimens to several observers in England.—ED.