

The Zirconia Oxy-hydrogen Light

I HAVE been interested in the brief note you gave upon Prof. Linnemann's zirconia light, and as I have for several years been endeavouring to obtain the alleged advantages of this earth as a luminant, and with very different comparative results, if you will allow me briefly to state these, it may possibly be of service. Zirconia has been stated by Du Motay to be the "most luminous" as well as most refractory of earths, and if it indeed be so, its advantages would be very great. I have made many fruitless attempts to procure one of Du Motay's own pencils as prepared and sold many years ago, but none seem now obtainable; if any reader possesses, and can lend me, one for trial (all the better if he can share in or witness it), I shall be exceedingly obliged, in the interests of improved optical projection.

With the assistance of Mr. Chadwick, of Manchester, Mr. H. G. Madan, of Eton College, and a third gentleman, of Leeds, my own experiments have been made with small cylinders about 9 millimetres diameter, compressed from three different samples of zirconia. The incandescent surface was the flat end of such a cylinder.

The first sample was sold as "pure" by Hopkin and Williams, and many cylinders were tried of it. It was very largely contaminated with soda, which might in time have volatilised; but a more hopeless impurity was the large quantity of silica, which quickly fused into a thick yellow glaze. The light was most inferior, but the reddish tinge presently noticed was not conspicuous in this sample, which was worthless as an illuminant.

The second sample was prepared by my Leeds colleague, largely by blow-pipe processes. It stood the flame much better, and contained far less soda, which rapidly lessened under the flame. It contained, however, considerable silica, which could be observed through dark glasses to seethe and melt into ridges. When this took place, the light rapidly diminished, and was never near that of a lime cylinder, though at one time respectable. Also, fissures appeared in the face. But the peculiar physical properties of the earth were conspicuous, and chiefly its extraordinary *non-conducting* power. With a powerful jet (capable of yielding 700 candle-power on a lime cylinder) playing upon the small surface described, the full incandescence barely reached the edge of the disk, and the bright portion only extended about $\frac{2}{3}$ millimetres up the cylinder, bounded by a definite line. At this line a crack all round began to appear, which gradually deepened, until at length the incandescent layer separated and fell off. The glow was of a most pronounced *reddish* character.

The third sample was procured by Mr. Madan from Herr Schuchardt, of Görlitz; it is stated to be prepared "especially" for the oxy-hydrogen light, and is sold at the rate of 18 marks for 10 grammes, of which about half is required to form a cylinder. This sample shrank enormously when heated, both in powder and when first compressed—showing that it was very largely hydrated—and had to be re-crushed and compressed again before anything could be done with it. It was much more free from silica, and half an hour of a powerful jet only produced a slight glaze or polish on the face. The *reddish* glow was very prominent in it also. The most serious fault, or difficulty, was that the circular crack formed and deepened much more rapidly than in the preceding, and the layer separated in less than half an hour. I fear this unequal shrinkage and its effects will alone be a great obstacle, unless—which I much regret we did not test experimentally—the thin layer itself, as detached, should prove sufficient, held in a platinum loop. Possibly it might crack no further.

But the light was again *poor* compared with a good lime. Mr. Madan had the plug crushed and re-made, and tested the light photometrically in his own laboratory at Eton. Compared with a good quarry lime, the zirconia taken as unity was only 1 : 2·88, with the same jet. That is a very startling difference. It is true that the incandescent surfaces are probably in about the same proportion, so that the brilliancy *per unit of surface* may be about the same. But then the incandescent surface of the zirconia cannot be increased, owing to the non-conducting properties already alluded to; so that the fact remains, so far as illumination is concerned, that we can only get with zirconia, or with such samples as I was able to obtain, about *one-third* of the light we can get from a good lime.

This result is so different from that stated by Prof. Linnemann, and years ago by Du Motay, that some explanation seems necessary. I think it lies in the fact that Continental operators do

not use nearly such powerful jets as are often used in England, where we obtain 600 to 700 candle-power. Several Continental jets have come into my hands, none of which would give a good light, as a first-class "magic-lantern" lecturer understands it, *i.e.* sufficient to illuminate a disk 25 feet in diameter. Prof. Linnemann's own jet, of which I have seen the drawings, though it has the useful property of condensing the heat into a very small spot, is only a form of the "blow-through," as usually called; and when he remarks upon the "unsteadiness" of the mixing jet, he shows that he is not practically acquainted with it in a good form. Again, I was given by Mr. W. G. Lettsom some time ago a sample of an "improved" composition sold in Germany instead of limes, and stated to be "much better" for oxy-hydrogen purposes; my jets simply burnt holes clean through it (a prism of about 18 mm. diameter) in less than a minute. Now it is noticeable that with a blow-through jet, of about 200 candle-power, the zirconia does compare much more favourably, and is about as bright as the lime.

I write this, however, with a last hope of getting "more light" on the subject. If we could only get the whole light of a good lime-cylinder into the small disk (which is all that can be heated) of zirconia, the advantage would be very great: the parallel or other beam from the lantern from such a radiant is *as sharp* as from an arc light, and every Professor knows what that means. 700 candle-power without trouble—who does not long for it? It will be observed that each of the three samples described behaved differently, and it is in this fact lies my chief hope of any success yet; otherwise it is the decided opinion of all who have shared in these experiments, that the vaunted zirconia light is a sheer delusion. If any reader of these columns knows of purer samples to be procured commercially (I know Draper's process, but am no practical chemist, and have neither time nor means to prepare samples myself); or can tell me if the peculiar *red glow* noticed is characteristic of the earth itself or of some impurity; or has tested lanthana or any other of the more refractory earths; or can in any way assist me in what is, in its way, a matter of some importance to the science lecture-room, I shall feel much obliged for any communication from him, either here, or to

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The Production of Newton's Rings by Plane Soap-Films

LORD RAYLEIGH, in his recent lecture at the Royal Institution on "The Colours of Thin Plates," introduced Sir D. Brewster's experiment, in which circular rings instead of the usual straight bands are produced in a vertical soap-film by causing a jet of air to impinge very obliquely upon the film near its edge. The particles are thus thrown into a vortex-motion, and the centrifugal tendency causes the film to become *thinner* at the centre than at the edge, so as to produce very fair rings of colour.

Perhaps it may be worth mentioning that the same effect may be produced with greater regularity and less risk to the film, by giving the ring to which it is attached a rapid movement of rotation in its own plane. A shallow brass cup, about 8 or 9 cm. in diameter, the edge of which is turned inwards and rounded so as to give it the following section, is mounted on a horizontal spindle so that it can be turned rapidly in a vertical plane (any ordinary smooth-running multiplying-wheel arrangement will answer, but a small electromotor is by far the most convenient). The edge of the cup is just dipped below the surface of the soap-solution, and then the socket at the back is fitted on the spindle and rotation commenced. At first the straight horizontal bands of colour maintain their form and position, for the reason which Lord Rayleigh well explained; but, as the speed increases, the adhesion of the film to the edge of the cup, and the cohesion of its particles, cause it to take up gradually the motion of the cup; and, as the mass accumulates at the circumference, very perfect circular rings are formed, which can be projected with brilliancy on a screen by the lime-light.

H. G. MADAN

Eton College

Barnard's Second Comet

THERE would appear to be some danger that the observation of the above comet may be relinquished rather prematurely, as



it is still sufficiently bright for observation when viewed with our larger telescopes; and, as far as I am aware, there are no published ephemerides later than March 27. To remedy this want, I subjoin places calculated from the elements of Dr. Palisa for Greenwich mean midnight for the period during which the moon will be absent.

		R.A.		Decl.		Log
		h. m. s.		°		
April 13	...	2 52 34	...	+36 54.6	...	0.0183
" 15	...	2 51 2	...	+37 3.2	...	0.0222
" 17	...	2 49 36	...	+37 12.3	...	0.0265
" 19	...	2 48 12	...	+37 20.6	...	0.0311
" 21	...	2 46 52	...	+37 28.6	...	0.0360
" 23	...	2 45 35	...	+37 36.4	...	0.0412

JOHN I. PLUMMER

Orwell Park Observatory, April 11

Sunspots

IN the summary in regard to solar activity in 1886, published in NATURE for March 10, p. 445, it is stated that, during the period from October 31 to December 12, "on six days only out of the forty-two could there be discovered on the sun any trace even of a spot, and on those days only one tiny spot could be seen." As observed in this locality, there were formed, in the midst of the faculae which came into view on November 14, one spot on November 15 and two spots on November 16; all having disappeared on November 18, when observation again became possible. On December 8 the first of a group of spots which made a complete transit across the sun's surface appeared. On December 9 this group consisted of three spots, which persisted until the 13th at least, gradually increasing in size. A period of sunspot minimum is best adapted in certain regards to the study of the relations of solar outbursts to magnetic and auroral phenomena; hence precision at such times, in reference to details of the character here indicated, is not unimportant.

Lyons, N.Y., March 30

M. A. VEEDER

Ozone

My attention has been drawn to a letter in your issue of January 13 (p. 248), respecting the production of ozonised air for respiration in pulmonary complaints. I beg to inform "W. H." that there is at present no convenient electrical apparatus devised for use in a room, that would electrify the air with sufficient power to be of much service. A simple plan for obtaining ozone in small quantities is to mix very gradually three parts of strong sulphuric acid with two parts of permanganate of potash in a jam-pot, and place the vessel under the bed. Ozone will be given off from this mixture for some weeks.

I should be glad to hear the experiences of "W. H." inhaling ozonised air "just sensible to the smell," as I am of opinion that this strength of ozone is rather too great.

Your correspondent is misled in supposing that the Engadine hotels possess appliances for ozonising the air of corridors, &c. It is only the Maloja Kursaal which has adopted my device for this purpose. The electric current used is taken off from one of the dynamos used for lighting. A short description of the plan is given in the third edition of my "Alpine Winter," p. 84.

Upper Engadine

A. TUCKER WISE

Electrical Discharges in the Doldrums

I QUITE agree with the Hon. Ralph Abercromby as to the continuous electrical discharges in the doldrums; so is there a continuous discharge of rain. I do not, however, agree with him in thinking that the electrical discharges are in any way directly connected with earth-currents. I should say they are due to electrical discharges on the top of the shower clouds, unaccompanied by thunder. It would be interesting to know if travellers in the centres of Africa and South America have observed this phenomenon there.

DAVID WILSON-BARKER

Green Light at Sunrise and Sunset

MR. R. T. OMOND, of the Ben Nevis Observatory, in NATURE of February 24, p. 391, asks whether the cause of the

green colour at sunset at sea is the sun shining *through* the water? This cannot be the cause, for I have many times observed this colour at sunrise behind the mountains Madonie or Copo Zaferano, which, from the Observatory, appear higher on the sea horizon than the sun's disk. That is to say, the phenomenon occurs when, for the observer, the sun is entirely above the marine horizon, and no part of the disk can shine through the water.

A. RICCO

Palermo Observatory

[This is a well known and obvious effect of atmospheric refraction.—ED.]

A Sparrow chasing Pigeons

"E. A. C." inquires in NATURE of last week (p. 536), whether any of your readers have observed the sparrow chasing pigeons. This habit of the sparrow is very common; I have myself often observed it, and I apprehend that few who keep pigeons have not frequently seen such attacks. The pugnacity of the sparrow did not appear to me to be the result of any previous quarrel with the pigeon, as I never saw the former attack the latter except on the wing, and always from underneath.

Chirbury, Beckenham, Kent, April 12 J. JENNER WEIR

A Question for Chemists

Is it known that a mixture of glycerine and permanganate of potassium will take fire spontaneously immediately after being mixed? If so, I should be glad of any reference to the fact.

Bradford

WM. WEST

THE PARIS ASTRONOMICAL CONGRESS

THE International Congress called together by the French Government to take steps to obtain a photographic chart of the heavens was opened on Saturday at the Observatory of Paris, and, from the information which has reached us so far, it would seem that its labours are likely to have a result of the highest importance for the science of this and succeeding centuries. The following Directors of Observatories are already in Paris, or are expected: if half of them really come, there will be such a meeting of astronomers as has rarely been seen:—

Baillaud, Toulouse Observatory
Bakhuyzen, Leiden
Beuf, La Plata
Christie, Greenwich
Cruis, Rio de Janeiro
Donner, Helsingfors
Dunér, Lund
Folie, Brussels
Gill, Cape Town
Gylden, Stockholm
Krueger, Kiel
Oom, Lisbon

Perry, Stonyhurst
Peters, Clinton (U.S.A.)
Pujazon, San Fernando
Rayet, Bordeaux
Russell, Sydney
Schoenfeld, Bonn
Struve, Pulkowa
Tacchini, Rome
Thiele, Copenhagen
Trépied, Algiers
Vogel, Potsdam
Weiss, Vienna

Besides these Directors of Observatories, and of course all the astronomical members of the Institute, there are other astronomers, such as Messrs. Common and Roberts from our own country, and Messrs. Lohse (from Germany), Winterhalter (from Washington), and Hasselberg (from Pulkowa), whose presence is most important.

The French Government, the Academy of Sciences (with Dr. Janssen as President), and Admiral Mouchez (the Director of the National Observatory of Paris), seem to have done all in their power to facilitate the labours, and even to provide for the comfort, of the various delegates and others representing the various nationalities; and at the opening ceremony the manner in which the Institute and Government are doing all they can was evidenced by the fact that the address which was delivered by M. Bertrand, the eminent mathematician, on behalf of