

the accuracy of Mr. Stanley's report, nor the trustworthiness of Emin's observation; but we should like to have more details." But as Emin himself allows that he would never have credited the fact alleged had he not witnessed it personally, we may, perhaps, without discourtesy, refuse to accept so bald a statement of "this extraordinary spectacle." Of what were the torches constructed? How do these "Simians" practise "the art of making fire"? Having once acquired the art, do they use it only for the purpose of making "torches to light the way"?

Speaking for myself, and not without some knowledge of the intelligence of a chimpanzee, I confess that, until at least these "details" are supplied, I do "doubt the trustworthiness of Emin's observation," and I shall be satisfied to suppose that, owing to a shortsightedness of which we have heard so much, the Pasha has mistaken a band of native children for his "large tribe of chimpanzees."

GEORGE J. ROMANES.

July 6.

Dr. Koenig's Theory of Beats.

I MADE an experiment, some years ago, which would seem to support and illustrate Dr. Koenig's theory of beats, as set forth by Prof. Silvanus Thompson in his lecture before the Physical Society, and reported in your issue of June 19. Taking two tuning-forks, each of which gave the middle C (256 vibrations), I weighted one of them so as to make it give one beat a second when sounded with the other. Then, sounding this fork, so weighted, with another giving the fifth above, G (384 vibrations), I heard distinctly three beats a second. I could only account for these beats by assuming that the weighted fork C produced a feeble twelfth, and that the fork G produced a feeble octave. These two overtones would, if present, give three beats a second, $256 \times 3 = 768$, and $384 \times 2 = 768$. But I could not show by any independent evidence that these overtones are really present when the tuning-forks are sounded; and, in fact, the general opinion is against such an assumption.

If, however, Dr. Koenig's theory be accepted, the beats are easily accounted for. According to his view, as stated by Prof. Thompson, these forks when sounded together would yield two sets of beats, called, respectively, *superior* and *inferior*; and each set of beats would blend into a musical tone. Thus we should get—

Inferior beat	384 - 256 = 129
Superior beat	510 - 384 = 126

These primary beats, or beat-tones as they may be called, of 129 and 126 vibrations would act as independent tones, and produce secondary beats of three in the second.

I hope Prof. Thompson's paper will be published in full, that we may all have an opportunity of considering the details of Dr. Koenig's reasoning; but, in the meantime, I thought the experiment I have described would be interesting to your readers, as it is very easily made. Perhaps I should add that the experiment succeeds equally whether the forks are mounted on resonance-boxes or not; and therefore the effect cannot be ascribed to the boxes.

GERALD MOLLOY.

Catholic University, Dublin, June 22.

The "Night-shining Clouds."

I HAVE not yet seen, in any English publication, mention of the important results of the more recent researches of Herr O. Jesse and his coadjutors on these clouds. By taking simultaneous photographs from two or more widely separated places, the height of the clouds has been determined with great exactness. On July 2, 1889, this was found to be somewhat over 80 kilometres. The operations have evidently been conducted with great care, and the results may therefore be fully trusted. The question is therefore set at rest as to whether the clouds are self-luminous, for it is evident that at such a height their brightness is fully accounted for by the sun shining upon them. In 1886, Herr Jesse had, upon this supposition, ascertained their brightness to be from 49 to 54 kilometres, and that the lower the sun descended the smaller was the illumination needed to show them as the atmosphere darkened, so that the calculated height increased with the sun's depression below the horizon. Some people were incredulous about the great height at that time attributed; but the photographs give them a yet greater elevation, which places them quite out of the category of any ordinary clouds. Those who have not seen the photographs may query as to the possibility of identifying the

same points in the two photographs compared, and may think that even synchronous photographs might show very different details by being taken from two distant stations; but, on the contrary, in those examples I have seen, the two photographs are so exactly alike that it is very difficult to discover any difference whatever between them, though taken at Nauen and Steglitz, 35 kilometres apart, which consideration of itself shows the enormous height of the clouds. In some of the photographs the stars α and β Aurigæ are distinctly visible.

The letter by "M. E." (p. 198) evidently describes an apparition of these clouds on the night of the 17th ult., when, as I am informed, they were also seen from Sunderland; but I have not myself seen them either this year or last, though they have been seen both years in Germany—more especially after midnight. They generally are seen in June and July, the earliest recorded date being May 26, and the latest August 11.

Sunderland, July 8.

T. W. BACKHOUSE.

IN a letter which you published some time ago on "night-shining clouds," there was a request for notes of their occurrence. It may, therefore, interest some of your readers to know that they were well seen here on the evening of the 4th inst. They appeared rather suddenly shortly before 10 p.m., covering the sky from N. to N.E., and from the horizon for about 15° up. They were not in regular strata, but scattered in all directions, like cirrus after a storm. About midnight they were still visible, but more to the left, some being west of north. The first time I saw these clouds was on June 18, 1886, soon after midnight, when they were about N.W., and 20° from the horizon, and since then they have often been seen; but never, so far as I know, with the storm-tossed appearance they presented last week.

CECIL SHAW.

Belfast, July 7.

A VERY fine display of luminous night-clouds was visible here during the night of the 4th inst., the luminosity extending to an altitude of 30° above the northern horizon, ending above in definite cirrous streamers, or cloud wisps. It will be seen by the Ben Nevis June Summary that these clouds were noted on the 29th ult. In NATURE of the 3rd inst. (p. 222), the writer's communication on this subject was misprinted Kensington instead of Kingstown (Co. Dublin). The present dates from Scotland.

Aberdeen, July 7.

D. J. ROWAN.

An Electrical Effect.

IT may be of value to remind teachers of an effect not generally known, which is produced by varying the ordinary mode of performing the experiment of putting pieces of zinc and silver in the mouth and touching them, to obtain the acid taste which accompanies the completion of the electric circuit.

If the piece of zinc be placed under the tongue, and a florin vertically between the upper lip and the top row of teeth, and the two metals be brought in contact, a faint flash is seen in both eyes when the eyes are open.

If the eyes are shut the sensation of light is not felt, so that the effect is probably due to a muscular twitching.

It is necessary to use a large silver coin, and not a shilling, and to push it well home behind the upper lip.

The experiment so made seems to be a handy and simple illustration of the meaning of subjective phenomena.

Clifton College, July 7.

EDWARD B. COOK.

THE PHOTOGRAPHIC IMAGE.¹

THE history of a discovery which has been developed to such a remarkable degree of perfection as photography has naturally been a fruitful source of discussion among those who interest themselves in tracing the progress of science. It is only my presence in this lecture theatre, in which the first public discourse on photography was given by Thomas Wedgwood at the beginning of the century, that justifies my treading once again a path which has already been so thoroughly well beaten. If any further justification for trespassing upon the ground of the historian is needed, it will be found in the circumstance that in the autumn of last year there was held a celebration

¹ Friday Evening Lecture delivered at the Royal Institution by Prof. Raphael Meldola, F.R.S., on May 16, 1890.