and with considerable brightness, chiefly from half-past eight to ten o'clock.

During the phenomenon several falling stars were observed, and a magnificent bolide in the Great Bear at 8h. 30m., but this was probably accidental.

This evening, in the expectation that the aurora borea'is might reappear, I began to observe the sky as soon as twilight was over, and I perceived a faint glow, a kind of phosphorescence, diffused over the whole sky, but without any decided appearance of boreal light.

While waiting for more imposing phenomena, I directed the spectroscope towards the zodiacal light, to ascertain whether its spectrum could be observed at Rome, as it had been observed on the Red Sea on the evening of the 11th, and the morning of the 12th January last.

Angström, in 1867, found the spectrum of the zodiacal light to be monochromatic, consisting of a single green line, to which he assigned approximately the position 1259 on Kirchhoff's scale, the same that he had determined for the green line of the aurora borealis; and I myself, on the days above mentioned, was able to perceive in the zodiacal light, not only this green line, but near it and towards the blue, a band or zone of apparently continuous spectrum.

This evening at seven o'clock, I was able to discern the same spectrum in the light above mentioned; and on directing the spectroscope to other points, I found that this spectrum showed itself in all parts of the heavens from the horizon to the zenith, more or less defined in different parts, but everywhere as bright as in the zodiacal light. The observatory assistant, Dr. di Legge, likewise observed this spectrum distinctly, in various parts of the heavens.

This fact, which corroborates an analogous observation made by Angström in 1867, appears to me of the greatest importance, inasmuch as it demonstrates the identity of the zodiacal light with that of the aurora, and thereby tends to establish the identity of their origin, and to unite into one these two mysterious phenomena.

L. RESPIGHI

Observatory of the Royal University of Campidoglio,
Feb. 5, 1872.

PHYSIOLOGY

Note on Recurrent Vision*

IN the course of some experiments with a new double plate Holtz machine, belonging to the college, I have come upon a very curious phenomenon, which I do not remember ever to have seen noticed. The machine gives easily intense Leyden jar sparks from seven to nine inches in length, and of most dazzling brilliance. When, in a darkened room, the eye is screened from the direct light of the spark, the illumination produced is sufficient to render everything in the apartment perfectly visible; and what is remarkable, every conspicuous object is seen *twice* at least, with an interval of a trifle less than one quarter of a second—the first time vividly, the second time faintly; often it is seen a third, and sometimes, but only with great difficulty, even a fourth time. The appearance is precisely as if the object had been suddenly illuminated by a light at first bright, but rapidly fading to extinction, and as if, while the illumination lasted, the observer were winking as fast as possible.

I see it best by setting up in front of the machine, at a distance of eight or ten feet, a white screen having upon it a black cross, with arms about three feet long and one foot wide, made of strips of cambric. That the phenomenon is really subjective, and not due to a succession of sparks, is easily shown by swinging the screen from side to side. The black cross, at all the periods of visibility, occupies the same place, and is apparently stationary. The same is true of a stroboscopic disc in rapid revolution; it is seen several times by each spark, but each time in the same position. There is no apparent multiplication of a moving object of any sort.

The interval between the successive instants of visibility was measured roughly as follows:—A tuning fork, making 92½ vibrations per second, was adjusted, so as to record its motion upon the smoked surface of a revolving cylinder, and an electro-magnet was so arranged as to record any motion of its armature upon the trace of the fork: a key connected with this magnet was in the hands of the observer. An assistant turned the machine slowly, so as to produce a spark once in two or three seconds, while the observer manipulated the key.

In my own case the mean of a dozen experiments gave $0^{s}\cdot22$ as the interval between the first and second seeing of the cross upon the screen; separate results varying from $0^{s}\cdot17$ to $0^{s}\cdot30$. Another observer found $0^{s}\cdot24$ as a result of a similar series.

Whatever the true explanation may turn out to be, the phenomenon at least suggests the idea of a *reflection of the nervous impulse* at the nerve extremities—as if the intense impression upon the retina, after being the first time propagated to the brain, were there reflected, returned to the retina, and from the retina travelling again to the brain renewed the sensation. I have ventured to call the phenomenon "Recurrent vision."

It may be seen, with some difficulty, by the help of an induction coil and Leyden jar; or even by simply charging a Leyden jar with an old-fashioned electrical machine, and discharging it in a darkened room. The spark must be, at least, an inch in length.

Hanover, February 9

* From the *American Journal of Science and Art* for April. By Prof. C. A. Young, of Dartmouth College.

SCIENTIFIC SERIALS

Annales de Chimie et de Physique, July and August, 1871. This number contains the second portion of a very lengthy memoir by M. Berthelot on explosive agents in general; this half of the communication deals with dynamite, gun cotton, picric acid and potassic picrate. At the end of the memoir a general table is given which shows the amount of heat generated and the volume of gas formed by one kilogram of substance; the product of these two numbers will of course give the relative effects produced by each compound; the numbers given show that if nitroglycerine produces an amount of force equal to 94, picric acid equals 54, gun cotton 50, potassic picrate 34, whilst gunpowder has only an explosive force equal to 14. M. Janssen contributes a very valuable paper on the atmospheric lines in the solar spectrum. He finds that the bands observed by Brewster and Gladstone can be resolved into fine lines comparable to the solar lines properly so called, and that the atmospheric lines are more numerous than the solar lines in the red, orange, and yellow portions of the spectrum. The atmospheric lines are always visible in the solar spectrum, some lines it is true almost disappear when the sun is very high, but they are those which are never very intense; the author finds that the intensity of the atmospheric lines observed at the horizon is about fifteen times as great as when observed in the meridian. M. Janssen has also examined the spectrum of the moon and stars, and more particularly of Sirius and α in Orion; he has not succeeded in observing any new lines whatever in the spectrum of the moon, proving that our satellite cannot have any appreciable atmosphere. M. Raoult has found that a solution of cane sugar sealed up in vacuo and exposed to light for five months is partially changed into glucose. Amongst the other original memoirs there is a very long one by Dr. de Coppet on the temperature of congelation in saline solutions. There are also a considerable number of abstracts of papers from foreign journals, making up altogether a very bulky number.

THE *Journal of the Quekett Microscopical Club*, No. 18, April 1872, contains the following three communications:—"Observations on the Polyzoa, by A. H. H. Lattey, M.R.C.P." This paper is chiefly devoted to the preparation of the Polyzoa for the microscope, so as to exhibit them in permanence with the tentacles expanded.—"On the so-called 'nerve' of the Tooth," by T. C. White, Hon. Sec. The principal elements met with in a microscopical examination of what is popularly termed the "nerve" of the tooth, are here indicated, and suggestions are given to assist in the more complete examination of tooth-structure.—"On the Internal Structure of the *Pulex irritans*," by W. H. Furlonge. This is a second communication on the structure of the flea which has been submitted to the club by its author. The first was occupied chiefly in the examination of external organs, the present is devoted to internal structure, commencing with the alimentary and digestive system, then follow remarks on the respiratory system, and finally observations on the reproductive system. The embryology is left untouched, to form the subject of a third and concluding paper, which will then embrace the life history of one of the commonest, but not the least interesting, of British insects. The club announced its list of excursions for the season com-