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 electromagnet 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-

mencing April 6, and terminating October 5. There are fifteen excursions, of which fourteen are announced for Saturday afternoons, one whole day excursion, and one day excursion ending with the excursionists' annual dinner. The annual *soirée* of the club was held at University College on Friday evening, March 22, and was attended by about 1,200 persons.

*Journal of the Chemical Society*, February. — Dr. Armstrong contributes a paper "On the nitration products of the dichlorophenolsulphonic acids," being a continuation of his researches published in recent numbers of this journal. The next communication is on Eulyte and Dyslyte, by H. Bassett, being a re-examination of these bodies, which were briefly described by Baup in 1851. The third and last original communication is by Dr. Howard, "On Quinicine and Cinchonicine and their salts." Some time since the author gave an account of an amorphous alkaloid from cinchona bark, the properties of which distinguished it from those already described. Further investigations, however, have shown that it is probably identical with quinicine, first obtained by Pasteur by the action of heat on quinine. The author finds that the quinicine obtained from quinine, and that obtained from quinoidine, are identical in their properties. Several salts of cinchonicine have been prepared; there is considerable resemblance between them and the quinicine salts, although the former are somewhat more soluble. The same identity is observed between the cinchonicines obtained from cinchonine and from cinchonidine as was observed in the case of quinicine. The action of these alkaloids on polarised light confirms the identity already mentioned. Thus, the quinicines prepared, either from quinine (which possesses a strong left-handed rotation), or from quinidine (which has a right-handed rotation), exhibit a feeble right-handed rotation, which, in each case, is almost identical. The abstracts of papers in foreign journals occupy seventy-pages, and, as usual, are of great interest.

*Verhandlungen der k. k. geologischen Reichanstalt zu Wien.* Nos. 3 and 4. The articles in these numbers are for the most part of local interest; but we notice a short sketch of the geological structure of East Greenland by F. Toula—some of the fruits of the last German expedition—which will be read with interest. Literary and other notices, as usual, occupy considerable space in the proceedings.

THE *Geological Magazine* for April 1872 (No. 94) opens with an excellent article from the pen of Mr. W. Davies, of the British Museum, on the rostral prolongations of the singular Liassic Fish, described by Agassiz under the name of *Squaloraia polyspondyla*. The two projecting processes from the snout of this fish were regarded by Dr. Riley and Prof. Agassiz as forming a single rostrum; but Mr. Davies argues with justice that the upper one is really a cephalic spine analogous to that met with in a similar situation in the male Chimæridæ, and that it was employed, as by them, in conjunction with the elongated rostrum, for securely clasping the female. Mr. Davies refers to other points in the anatomy of this curious fish, which he illustrates with a large plate.—Prof. Dyer commences the description of some remains of coniferous plants from the lithographic stone of Solenhofen; the form here described is named by him *Araucarites Haberleinii*.—From Mr. Searles Wood, jun. we have a paper on the climate of the post-glacial period, and a reply to Mr. James Geikie's Correlation of the Scotch and English Glacial beds, whilst the last-mentioned author contributes a fifth paper on Changes of Climate during the Glacial epoch.—Some points in the Geology of the East Lothian coast, form the subject of a paper by Messrs. G. W. and F. M. Balfour, in which they describe the peculiar relations existing between the porphyrite of Whitberry Point and the adjacent sedimentary (sandstone) rocks, the latter being found to dip on all sides towards the mass of porphyrite. The authors suppose the porphyrite to have been erupted through a small orifice, and to have caused the depression of the sedimentary beds by pressure.

THE original articles in the March number of the *American Naturalist* are not so numerous as usual. Prof. J. D. Biscoe commences with a description of the breathing-pores or stomates of leaves.—Prof. H. W. Parker describes the meteorological phenomena witnessed in the western prairies, including the very common occurrence of parhelia in mock suns.—Dr. R. H. Ward has some remarks on uniformity of nomenclature in regard to microscopical objectives and oculars, of considerable interest to microscopists.—The most important article is "On the Stone Age in New Jersey," by Dr. Chas. C. Abbott, illustrated with a number of woodcuts of the rude implements and utensils found throughout that State, the relics of its original Indian inhabitants.

## SOCIETIES AND ACADEMIES

### LONDON

Geological Society, April 10.—"Notice of some of the Secondary Effects of the Earthquake of the 10th January, 1869, in Cachar." Communicated by Dr. Oldham, of Calcutta, with remarks by Mr. Robert Mallet, C.E., F.R.S. This earthquake was a severe one, being strongly felt in Calcutta, distant from the meizoseismic area about 200 miles, and far into the plain of Bengal. The effects were examined on the spot a few weeks after the shock by Dr. Oldham, who anticipates being able to fix the position and depth of the centre of impulse by following the same methods as those first employed by Mr. Mallet with respect to the great Neapolitan earthquake of 1857. These results have not yet been received; but Dr. Oldham has forwarded an extremely interesting letter on the circumstances of production of very large earth-fissures, and of the welling up of water from these, derived from the water-bearing ooze-bed, upon which reposed the deep-clay beds in which the fissures were formed. Dr. Oldham rightly views all these fissures, which were all nearly parallel to and not far distant from the steep river banks, as "secondary effects," and not due to fractures produced by the direct passage of the wave of shock. He also shows that the welling up or overflowing of the water in the fissures was a secondary effect also, and negatives the notion entertained on the spot of mud-volcanoes, &c., having originated at those fissures. The chief aim of Mr. Mallet's remarks was to point out the importance to geologists of rightly comprehending the dynamics of production of these phenomena, and to show that the older notions of geologists as to earthquake-fissures are untenable. He explained clearly, aided by diagrams, the train of forces by which the elastic wave of shock, on passing out of the deep-clay beds where these have a *free side* forming the steep river banks, dislodges certain portions and throws them off towards that free side—and that this is but a case of the general law in accordance with which such elastic waves behave towards more or less incoherent deposits reposing on inclined or on level beds, under various conditions. Mr. Mallet also explained the dynamic conditions under which the water from water-bearing beds, such as that of ooze beneath the Cachar clay beds, becomes elevated in the fissures formed, and gave approximate expressions for the minimum height to which the water can rise in relation to the velocity of the elastic wave particle. The paper concluded with some explanatory remarks upon the continual noises, like the irregular fire of distant artillery, heard long after the shock had passed, and when the country had become perfectly quiescent. The noble collection of photographs which were made by Dr. Oldham, and forwarded to Mr. Mallet, illustrative of the physical features of the huge earth-fissures and other effects of this earthquake, were exhibited to the Fellows present, and are well worthy of attentive study. Sir Henry James inquired whether there was any trace of fissuring in the lower beds beneath the slimy ooze. Mr. Scott wished to ascertain the author's opinion as to the possibility of predicting earthquakes on meteorological grounds, as had been done by M. Boulard, several of whose prophecies were said to have been fulfilled. Mr. D. Forbes gave some details of the earthquake of Mendoza, a town situated on a vast alluvial plain at the foot of the Andes, in which the phenomena remarkably coincided with those detailed by Dr. Oldham. In that case he found that the rumours as to fire and smoke having been emitted from fissures were entirely without foundation, the presumed smoke having been nothing but dust. The earthquake was felt over a distance of 1,200 miles; and wherever the firm rock came to the surface there was no trace of fissure, though portions of the rock were overthrown. But in the plain, consisting of 30 or 40 feet of alluvial soil, the whole ground was in places fissured, and in some districts the surface completely furrowed, and even the turf turned over. He had witnessed numerous earthquakes, and in some cases had been in deep mines during their occurrence, when the sound only could be heard, and he could testify to their effects being confined to the surface. The direction of the fissures was invariably at right angles to the line of shock. In South America all the earth-