I examined carefully, some weeks ago, some extensive heaps of sand and gravel raised on the premises of the Water-works Company on the right across the Hammersmith Suspension-bridge, but found no worked flints. The gravel here may be of more recent deposition.

With regard to the Neolithic implements of Acton, I am interested to hear that Mr. Worthington Smith is familiar with them, and that there are specimens in the Pitt-Rivers Collection. My letter nevertheless will have done good in making their occurrence more generally known.

As regards the quartzite pebble, if more are found on the fields about Acton it will tend to show that they have served the same purpose as those in South-East Devon, and that they have been brought from a region where specimens adapted for missiles would be found in abundance, viz. the south-west coast, as gravel sections and gravel pits were not accessible in Neolithic times, nor would they have proved adequate arsenals. But if the pebble I found at Acton were accidentally derived from the Middlesex gravel (which contains a considerable quantity of Midland Bunter material), it is remarkable that a selection should have been made so well calculated to deceive a Devonshire neolithologist.

July 19 SPENCER GEO. PERCEVAL

Lightning

ABOUT 10 a.m. of the 6th instant two of the labourers on this farm were sitting on the ground (with their backs against a clover haystack and their faces towards the north, having in front of them and on their left a wood) engaged in eating their lunch. It had been raining and thundering for about half an hour, but not heavily, until suddenly—in the words of one of the men—"a flash of lightning came right at us as if it were shot out of a gun." This man had his knife up to his mouth at the time in the act of eating, and he describes his sensation as a feeling of nausea in his throat and chest, and also that both he and his companion felt an actual push against their shoulders, which swayed and shook them to a considerable extent from the direction of the flash. The other man was blinded for about five minutes, and they were both much dazed for some time. Also they both describe having heard a sharp whiz somewhat resembling the quick escape of steam from an escape valve on an engine. For two days after they both suffered from severe headache. A. HALL, JUN.

Filstone Hall, Shoreham, Kent, July 11

THE COMET

IN a paper read to the Paris Academy on the 11th inst., giving further observations on comet *b* 1881, M. Wolf says:—

"The analysis of the light of the comet furnishes data as to the constitution of that body, which it is important to consider before starting any hypothesis as to its nature and mode of evolution.

"I have examined the spectrum of the comet, both with a highly dispersive spectroscope mounted on the Foucault telescope of 0·40 m. aperture, and with a smaller instrument, mounted on the telescope of 1·20m., giving therefore a very large quantity of light. This spectrum is triple: one sees (1) a continuous spectrum, broad, but very pale, visible in all the regions of the comet; (2) a continuous spectrum nearly linear, and very bright, given by the nucleus; (3) the spectrum of three bands, yellow, green, and blue, characteristic of the light of all comets examined hitherto. I have never been able to see the violet band.

"The continuous spectrum of the nucleus indicates the existence of solid or liquid matter, luminous of itself or by reflection. I have suspected in the strip some dark interruptions, especially in the region near D, without being able to determine their position. The presence of these dark lines, demonstrated by Dr. Huggins' photographs, denotes a reflected light, which can be no other than that of the sun.

"The nebulosity which forms the head of the comet gives, besides the continuous pale spectrum, the bright bands of an incandescent compound gas. The researches of M. Hasselberg tend to assimilate these bands to those of a carburet of hydrogen, probably acetylene. Besides these bands one sees throughout the strip formed by the light of the nucleus other protuberances very short, and paler, which seem to indicate, in the hotter and more luminous parts of the comet, an incandescent atmosphere of more complex constitution.

"When the slit of the spectroscope is passed over the comet, starting from the head, one finds the three bands all round the nucleus, at nearly the same distance from all the sides. They disappear in the tail properly so-called, the very pale spectrum of which seems to be continuous. Thus only the nebulosity surrounding the nucleus contains incandescent gases. The light of the tail comes to us from a pulverulent matter, luminous, or simply illuminated. Such are the data of spectroscopy.

"The polariscopic examination of the comet's light completes these first results. I used, as polariscope, a quartz plate perpendicular to the axis, giving the sensible tint, and a double-refracting prism, placed between a collimator and an observing telescope, in place of the prism of a direct-vision spectroscope. The two images of the nucleus and the nebulosity surrounding it are projected, well separate, on the common part of the field formed by the background of the sky; this is the process indicated long ago by M. Prazmowski for eliminating atmospheric polarisation. Under these conditions the nucleus and the nebulosity appear both distinctly polarised in the median plane of the tail, consequently in the plane passing through the sun. Here then, at least in all parts of the nebulosity round the nucleus, we have reflected light coming from the sun, and a non-gaseous matter possessed of reflecting power. I have had this important result verified by my assistant, M. Guénaire, and by several students in the Observatory.

"This process, so sensitive, evidently cannot serve for the tail, which occupies the whole field of vision, and does not moreover present very distinct limits. I have vainly tried other polariscopes—Savart's, for example. It would be very difficult besides to separate here the real polarisation of the tail from that of the atmosphere.

"In proportion as the light of the comet is diminished, the spectrum of the nucleus becomes paler; its colours, well pronounced on the earlier days, are no longer seen except on the side of the red; the bright bands retain their brightness. The green band is always distinctly limited in the less refrangible part. It will be interesting to know whether the comet, reduced to telescopic brightness, will at the same time have its light reduced to that of an atmosphere purely gaseous.

"On June 29, at 5h. 49m. sidereal time, during my polariscopic observations, a small star was found in the nebulosity, at a very short distance from the nucleus. Its image had not undergone any change, either of brightness or of form."

At the same *séance* M. Thollon communicated a note of spectroscopic observations of the comet as follows:—

"These observations were made with a direct-vision spectroscope which MM. Henry of the Observatory were good enough to lend me. The dispersion is that of an ordinary prism. A micrometer eye-piece, with point, giving 1-200th of a millimetre, enables one to make measurements of very high precision.

"In the night of June 24 I made my first observations and measurements. The nucleus presented then a very brilliant continuous spectrum, on which no trace of bands could be distinguished. On the violet side it extended beyond the line G. The parts next the nucleus likewise gave a continuous spectrum, on which the bands were still invisible; they only appeared a little further on and faintly. In the continuous spectrum I have thought I perceived several times a very complicated system of dark lines, and occasionally I believed I saw in the spectrum

bright parts having the aspect of short lines, not occupying the whole width of the spectrum. This was perhaps merely a result of fatigue of the eyes ; these phenomena were only produced during the first two nights.

"It appeared to me important to follow the modifications the spectrum might undergo as the comet went away from the sun. These modifications were produced with perfect distinctness. In the spectrum of the nucleus the violet radiations were extinguished first. About June 30 the most refrangible part, commencing with the green band ($\lambda = 516$), had sensibly lost its brightness and became invisible in the region G, while the yellow and red appeared to me as bright as on the first day. The bands, masked at first by the brightness of the continuous spectrum, became each day more visible in the neighbourhood of the nucleus, and during the night of July 1 they were perfectly distinguished on the nucleus itself.

"The measurements successively made of the bands of the comet and of those of the alcohol flame led me to conclude the identity of the two spectra. The green band however, the most brilliant, seemed a little more refracted in the comet than in the flame. To submit this matter to a decisive test, a total reflection-prism was adjusted on the slit so as to cover half of it. On placing the two spectra together I observed that they were strikingly similar when they had the same brightness, but that the green band appeared indeed more refracted in the comet when the spectrum of the flame was more brilliant. The comparison made directly between the two spectra, and the perfect coincidence of the bands, dispense with the necessity of giving numbers furnished by my micrometric measurements. They would not add anything to the certainty of the result.

"As to the violet band, it has not been possible for me to see it in a certain manner, even using a very small dispersion and a very small ocular enlargement. There is not in this fact anything surprising, if we take account of atmospheric absorption and of variations of brightness undergone by the violet band, when the experimental conditions are varied. We know that in the ordinary flame of alcohol it is very brilliant ; but if this flame be cooled by means of several folds of metallic sheeting, it becomes very weak and tends to disappear, while the other bands sensibly retain their habitual aspect.

"Continuing my observations till the present, I have found the continuous spectrum of the nucleus diminish progressively in brightness and extent, especially on the violet side. At present it has the aspect of a thin luminous thread, hardly passing beyond the line F. The bands, on the other hand, seem to have retained their intensity in the head of the comet. In the tail, and to a distance from the nucleus equal to twice or thrice the diameter of the head, they are still seen, but very faintly. Further on one sees only a continuous spectrum due perhaps to the light of the moon diffused by the haze, pretty thick during the last nights of observation.

"It seems to result from this that the cometary mass is formed in part of an incandescent gas, characterised by the spectrum of bands, and in part of solid or liquid matter, likewise incandescent, but in a state of extreme division, emitting a white light which belongs to it, and capable of reflecting in a certain proportion the light it receives from the sun. All the spectroscopic observations hitherto made on comets indicate the existence of carbon in the gases producing the band-spectrum. Dr. Huggins has given this conclusion a striking demonstration by showing, with photography, the existence of two bands of carbon in the ultra-violet spectrum of the comet.

"I have the honour to submit to the Academy three drawings representing (1) the spectrum of the alcohol flame, (2) the spectrum of the comet during the night of June 24, and (3) the same spectrum on July 1."

WIDTH OF MR. RUTHERFURD'S RULINGS

BY the direction of C. P. Patterson, the Superintendent of the U.S. Coast and Geodetic Survey, I have long been engaged in the precise measurement of a wave-length of light, in order to obtain a check upon the secular molecular changes of metallic bars used as standards of length. In advance of the publication of this work it may be useful to say I have found that the closest-ruled diffraction-plates by Mr. Lewis Rutherfurd have a mean width of ruling which varies in different specimens from 68078 to 68082 lines to the decimetre, at 70° F. There is a solar spectral line, well suited for precise observation, whose minimum deviation with one of Mr. Rutherfurd's plates in the spectrum of the second order with the closest ruled plates is 45° 01′ 56″ at 70° F. I would propose that this line be adopted as a standard of reference by such observers of wave-lengths as desire to escape the arduous operation of measuring the mean width of their rulings ; for by means of the measures which are shortly to be published it will be possible to deduce from the minimum deviation of this line produced by any given gitter, the mean width of that gitter, and consequently the wave-length of any other line whose deviation has been observed with it. The accuracy of this method will greatly exceed that of assuming Ångström's measures to be correct. The wave-length of the line in question (still subject to some corrections which may be considerable) is 5624825. Ångström gives 562336. C. S. PEIRCE

CITY AND GUILDS OF LONDON INSTITUTE

IT would seem as if at last, after long years of waiting, there were some hope that the views which for the last quarter of a century have been so persistently advocated touching technical education, were about to bring forth more fruit in London.

In season and out of season, since the note was first sounded by the late Prince Consort, one far-seeing advocate after another, and among these we must specially name Mr. Samuelson, Mr. Mundella, and Sir Henry Cole, have cried in the wilderness touching the need of more scientific instruction. At last it does seem as if there is an awakening, as if a part of the idea was realised in the Institute, the foundation-stone of which was laid at South Kensington on Monday by the Prince of Wales. No doubt in the building which has been begun a national school of science, theoretical and applied, worthy of a country like ours, may grow up. Mr. Mundella will rejoice that at last he has an opportunity of carrying out with something like adequacy the views on education of which he has been so long a strenuous advocate. We hope next week to give a detailed description and illustration of the new building ; and meanwhile will content ourselves with briefly referring to what took place on Monday.

The company present to receive the Prince of Wales was large and distinguished, including many eminent men of science. The Lord Chancellor, as Chairman of the Institute, addressed the Prince, expressing the gratification of the Council that His Royal Highness had consented to become president. The Lord Chancellor then traced the growth of the Institute and the efforts of the City Guilds to improve the technical education of the country.

"Since July of last year," the Lord Chancellor said, "the date of the incorporation of the Institute, its work has satisfactorily increased, and the Council have a lively and grateful recollection of the assistance and encouragement afforded to them by His Royal Highness, Prince Leopold, Duke of Albany, who in May last laid the foundation-stone of the Finsbury Technical College, a college that has been established by this Institute, and