

completely. It is rather hard for the "explanation" of magnetism.

The kinetic energy of molecules is the natural source of the radiation, but the connection between them and the electrification is very obscure, and how the electrons get knocked off is harder still, and what they are is hardest of all. Larmor thinks they run through the ether like knots on a string. If they do, as they may, *how* do they do it? Connections are wanted.

OLIVER HEAVISIDE.

Leonid Meteors, 1902. A Forecast.

THE historical interest which attaches to the Leonid star showers naturally renders the near approach of mid-November a subject of paramount importance to meteor observers. Nor is expectation lessened on the present occasion by the moderate though somewhat unexpected brilliance of the Leonid display witnessed last year in America on the morning of November 15. The question must naturally occur to many, will there be a revival of the phenomenon in the November of 1902, and if so, will it make its appearance in a less or a more intensified form than in the previous year? Generally speaking, the prospects of a star shower on the night of November 15 this year are very good. An analysis made by the writer of the conditions under which last year's shower appeared, and also of those connected with the more brilliant meteoric spectacles of the past, shows that the event of November 15, 1901, is likely to be much surpassed by the meteoric phenomenon of 1902. The display falls due on the night of November 15 on the present occasion, and not on that of November 14 as was the case last year and was duly predicted by the writer (*Daily Chronicle*, November 14), though the maximum occurred somewhat later on that night than had been expected. The first phase of the shower will take place, however, at an hour not very well suited for its observation in western Europe, the time of its maximum being November 15d. 10h. 45m. G.M.T., when the radiant will be not much more than just above the horizon. Meteors from a radiant in full activity as it emerges above the horizon afford an interesting spectacle, however, and though their numbers must in consequence be seriously diminished, they somewhat atone for their paucity by often long, and rapid flights across the heavens. This first appearance of the shower will of course be best observed in places situated at least a few hours to the east of Greenwich, though it ought not to escape observation in our less favoured localities. This early display promises to vie in brilliancy with that observed on the western slopes of the Pacific in 1901, if atmospheric conditions turn out favourable in those places best suited for its observation on the night of November 15, and in all places where the radiant will be above the horizon at the time of its maximum it ought to render shooting stars pretty abundant during the early hours of that night.

The second maximum of the Leonid display has been calculated to take place on November 15d. 18h. 45m., and promises to be the richest display of the night, though the time of its highest brilliancy will scarcely enable observers to obtain the most satisfactory view of it on this side of the Atlantic, as the increasing twilight between six and seven o'clock in the morning must somewhat impede observation. Along the eastern coast of America, on the other hand, the shower is likely to prove an attractive spectacle to observers, and its full strength can better and more accurately be subjected to calculation than with us, as its maximum will occur there at about two o'clock (local time) on the morning of November 16. Though that hour is rather early for its best observation, as the Leonid radiant is most favourably situated for purposes of meteoric observation in any place at about 4 o'clock in the morning (local time), yet on the present occasion at no other place can a better and more systematic watch be maintained for the anticipated star shower than along the Atlantic side of the American continent. Passengers on vessels crossing the Atlantic will no doubt find themselves specially favoured with opportunities for observing the phenomenon, as has been the case in previous star showers, such as that of 1868. The calculations made with respect to this meteor display go to prove that it will decline rather rapidly after 18h. 45m. on the night of November 15, the maximum showing a tendency to occur rather before than after the time indicated, and on this account shooting stars are very likely to appear in unusual numbers to European observers throughout the night in question. As has been already stated, the shower expected in

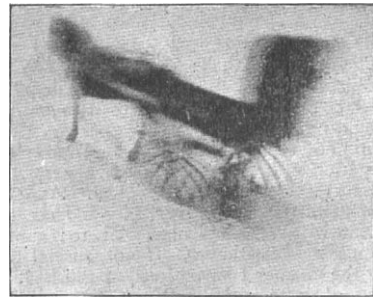
the present year gives considerable promise of surpassing in intensity that of 1901. Indeed, the calculated strength of the former is from ten to fifteen times that of the latter, but the presence of a full moon throughout the night of November 15 has not been taken into account in the determination of the foregoing comparison, and this circumstance must detract considerably from the relative splendour of the meteoric epoch of the present year. The full moon will probably obliterate the close of this year's shower, the end of which has been timed to take place on November 16d. 2h. 30m., and is generally of too weak a character to require any special consideration. It may be added that the foregoing calculations have been based on the assumption that the maximum of the Leonid shower of 1866 occurred at 1h. 15m. on the morning of November 14, G.M.T.

JOHN R. HENRY.

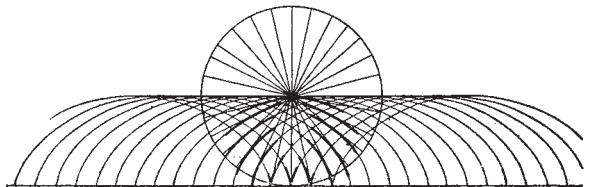
20 Rathmines Road, Dublin, November 3.

Curvature of Wheel Spokes in Photographs.

MANY people must have noticed the curious curved appearance presented in a photograph by the spokes of a moving vehicle. It is well known that the envelope of a diameter of a circle rolling along a straight line is a cycloid of half the dimensions of the cycloid traced by a point on the circumference. The part of the moving spoke which makes the strongest impression on the photographic plate will be where it intersects the consecutive position, so that the photograph really gives us



a small piece of the envelope of each spoke. The effect may be compared to the ordinary caustics of reflection or refraction. The accompanying photograph shows, not only the curvature of the spokes, but also the cusps of the envelopes of the spokes the ends of which have touched the ground during the exposure. In the diagram, the envelopes for a circle with fourteen equidistant diameters are drawn, and the parts of the envelopes which have



been put in strongly indicate the appearance that would be presented in a photograph, supposing that three spokes had touched the ground during the exposure. The spokes on the upper half of the moving wheel leave no impression on the plate, because their points of ultimate intersection lie *outside* the spokes themselves.

R. M. MILNE.

Royal Military Academy, Woolwich, S.E.

The Turkestan Earthquake of August 22.

INFORMATION received in India leaves no room for doubt that the earthquake of August 22, which left such conspicuous traces on the seismographs of Europe, had its origin in Central Asia. The representative of the Indian Government at Kashgar reports that there was a severe earthquake there at 8 a.m. on August 22, which lasted one-and-half minutes. Repeated

shocks were felt throughout the day, and shocks are reported on every day up to August 30. At 10 p.m. on September 2, a very sharp and severe shock was felt. It is said, though this has probably no direct connection with the earthquake, that the disturbance was followed by extreme heat, which lasted, at any rate, to the end of the month.

At Kashgar a good number of walls, made of sun-dried bricks, were knocked down, but masonry buildings do not seem to have suffered; sixteen deaths are said to have occurred through falling of houses. In the Artush district, to the north of Kashgar, the damage was much greater; nearly all the houses—presumably built of sun-dried brick—are said to have collapsed, and 667 deaths are known, besides more than 1000 persons severely injured. In Russian territory north of the Tian Shan range the shock appears to have been less violent, and it is reported that the damage done at Narin and Atbashi was not great. In the opposite direction the shock was felt at Yarkand, whence three shocks are reported to have been felt between 9 and 10 a.m. Some damage was done to the city wall and some private buildings; two children were killed by walls falling on them.

These particulars are sufficient to show that the earthquake was one of the first order of magnitude. Yarkand and Narin, at both of which it was destructive, are about 240 miles apart in a straight line, but are not sufficient to determine with certainty the position of the epicentre. This was evidently either to the east-north-east of Kashgar or more probably to the west-north-west among the mountains of the Alai Tian Shan range. It may consequently be taken that this earthquake, which will probably never be the subject of a detailed study, originated in about lat. 40° N., long. 74° E. of Greenwich.

Calcutta.

R. D. OLDHAM.

Lectures on Anthropology and Ethnology.

THE letter of "Anthropotamist" in your issue of October 30 ought to meet with general approval.

In mentioning the educational institutions at which anthropology and ethnology are taught, your correspondent has entirely omitted London.

May I point out that courses of lectures in these subjects have been established at this college for the past two years, and have been attended by upwards of thirty students? Of these, two have previously contributed papers to the *Philosophical Transactions* and *Biometrika* dealing with questions of physical anthropology, while a third is the author of a volume treating of one phase of ethnology. It may be fairly claimed that to this college belongs the credit of being a pioneer in the systematic teaching of this subject in London.

H. W. MARETT TIMS.

Bedford College for Women (University of London),
November 2.

THE ROYAL SOCIETY'S CATALOGUE OF SCIENTIFIC PAPERS.

THE following memorandum has been issued by the treasurer of the Royal Society:—

The Royal Society has been engaged continuously during the past forty years in cataloguing the various scientific papers which have been issued in all parts of the world since the beginning of the last century. The original scheme of the Catalogue of Scientific Papers provided that the papers should be catalogued only under the names of their respective authors arranged alphabetically. This "Authors' Catalogue" has now been carried down to the end of 1883, and comprises twelve quarto volumes.

More recently it has been decided to prepare also a subject index of the same papers, that is to say, a catalogue in which the papers are indexed according to the subject-matter of which they treat. Considerable progress has been made with this subject index, though nothing has as yet been published.

The expense of this work has been very large; since, although a great amount of gratuitous labour has been readily given by Fellows of the Society, it has been necessary to employ a considerable permanent salaried

staff upon the preparation of the copy for the press. At first the printing and publication were undertaken by H.M. Stationery Office, the Treasury having determined that the Catalogue should be printed at the public expense. In coming to this conclusion, the Lords of the Treasury stated that they had regard "to the importance of the work with reference to the promotion of scientific knowledge generally, to the high authority of the source from whence it came, and to the labour gratuitously given by members of the Royal Society for its production." This arrangement, however, came to an end after the publication of the first eight volumes. The Treasury, in 1889, informed the Society that the Catalogue could no longer be printed and published by the Stationery Office. The unsold volumes were, however, handed over to the Society, and Parliament voted a sum of 1000*l.* to assist the Society in continuing the printing and publication. The four subsequent volumes have been printed and published by the Cambridge University Press, which has received subsidies from the Society for this purpose and receives the sums arising from sales.

The total sum expended by the Society upon the Catalogue down to the end of June last has been 14,790*l.* 5*s.* 5*d.* Towards this expenditure a donation of 2000*l.* was made by Dr. Ludwig Mond in 1892. Sums amounting to 524*l.* 11*s.* 9*d.* have been received as the proceeds of sales of the volumes handed over to the Royal Society by the Stationery Office, and, as already stated, 1000*l.* has been received from the Treasury. The Council has also hitherto devoted the income of the Handley fund (which they have power to apply as they may deem best for the advancement of science) towards defraying the cost of producing the Catalogue. The total sum received from this source has been 2394*l.* 11*s.* 10*d.* A sum of 341*l.* 11*s.*, arising from money invested until actually required, has also been available for the same purpose. These pecuniary aids amount in all to 6260*l.* 14*s.* 7*d.* As will be seen, they have not been nearly sufficient to meet the whole cost, and the Society has been compelled to make up the balance of 8529*l.* 10*s.* 10*d.* out of its general income.

As it became obvious that to continue permanently to prepare and publish catalogues of the ever-increasing stream of scientific literature was wholly beyond the means of the Society, the Council took steps to obtain international cooperation in this great work. Such cooperation has happily been secured, and the cataloguing of the scientific literature of the present century is now in the hands of an international council. The Royal Society has, however, incurred large special responsibilities in connection with the matter, having undertaken, *inter alia*, to act as the publishers of the Catalogue, and also to advance the capital required to start the enterprise.

The International Catalogue is concerned only with the scientific literature appearing after the commencement of the present century. The Royal Society's Catalogue, as already stated, is at present carried down to the end of the year 1883 only, and the subject index for that period is but partially dealt with. The foreign delegates, assembled to consider the establishment of the international council, expressed their sense of the great importance of the Royal Society's Catalogue and of the obligations which men of science in all countries were under to the Society for having undertaken it. They also expressed the hope that the Society would complete the Catalogue up to the close of the last century, so as to bring it into line with the International Catalogue.

In order to complete the Catalogue, it will be necessary to prepare and publish a catalogue of authors for the seventeen years 1883-1900, and to complete and publish the subject index for the whole of the past century. The Council of the Royal Society are satisfied that this work must be done, and have not felt justified