A YORKSHIRE AEROLITE.

FOLLOWING my recent description of the "Yorkshire Gypsey-Springs," I may say that the great Yorkshire aerolite fell a century ago at the village of Wold Newton, where these springs first rise to light. Wold Newton is ten miles west from Bridlington Quay, no village on the Yorkshire Wolds having so much to interest the students of archæology and natural phenomena. Here, at Wold Cottage, lived Edward Topham, the retired "Tip-top Adjutant," who, in 1787, established *The World*, and whose epilogue, spoken by Lee Lewis in the character of Molière's "Old Woman," created him a star in the dramatic firmament. Two fields south-westerly from Wold Cottage, and protected on the north side by a plantation, you come to a flue-like column of bricks, which used to receive its washing with white lime every year. A yellow slab in the middle bears the following inscription :—

HERE,
on this spot, December 13th, 1795,
fell from the atmosphere
AN EXTRAORDINARY STONE.
In breadth 28 inches,
In length 30 inches,
and
whose weight was 56 pounds.
This column
was erected by
Edward Topham,
1799.

Thus, it is scarcely more than a century since this meteoric stone fell. The day was Sunday, the time about three o'clock in the afternoon, the weather misty, thunder and lightning being at a distance. Suddenly there came a noise like an explosion. George Sawden, a carpenter, was passing within sixty yards of the spot where the aerolite fell; and so much nearer was John Shipley, a farm servant, that he was struck by some soft earth thrown up by the stone when it plunged into the earth. While it was still passing in a north-easterly direction from the sea-coast, a number of persons at Reighton, who, while "turniping" their sheep in the fields, saw it moving down the clouds, made hasty steps for the top of their church-tower to see where it fell, while others spread the tale that it was a cannon-ball shot by a ship-load of French giants who were supposed to have landed to invade the island. Two sons of the Vicar of Wold Newton heard the same body whizz over their heads, and they were among the first on the spot where it fell. It excavated a place 19 inches deep and of something more than 3 feet in diameter, embedding itself so fast in the chalk rock that considerable force was required to dislodge it. A piece split off was, sixty years ago, in the possession of the Rev. Francis Wrangham, F.R.S., Vicar of Hunmanby. It had a black, vitrified surface, and exhibited marks of having been exposed to the action of fire. The inside was white and of a granulated but very compact texture, its composition having no resemblance to any natural stone of the terrestrial sphere. Sent originally to Sowerby's Museum, London, now the aerolite occupies a conspicuous position in the British Museum. It is about the size of a man's head.

HARWOOD BRIERLEY.

PRIZE SUBJECTS OF THE PARIS ACADEMY OF SCIENCES.

AT the recent annual meeting of the Paris Academy of Sciences, the following prizes were announced for the year 1896. In Mathematics the subjects proposed are: the Grand prize for an important improvement in the algebraic theory of groups of substitutions between n letters; the Bordin prize (3000 fr.) for an important advance in the theory of geodesic lines; the Francœur prize (1000 fr.) and the Poncelet prize (2000 fr.) will be awarded for discoveries useful in pure and applied mathematics. In Mechanics, the extraordinary prize of 6000 fr. will be given as a reward for an invention tending to increase the efficiency of the French naval forces, the Montyon for the improvement or invention of instruments useful to the progress of agriculture or the mechanical arts, and the Plumey prize (2500 fr.) for improvements in steam engines or any invention contributing to the progress of steam navigation.

In Astronomy, the Lalande prize (540 fr.) will be awarded to any one (in France or elsewhere) who shall have made the most interesting observation, or have published the most useful work bearing on astronomy; the conditions for the Valz prize (460 fr.) are similar. The subject announced for the Damoiseau prize (1500 fr.) is to connect together by the theory of disturbances the various appearances of Halley's comet, going back as far as 1456 (Toscanelli), taking account of the attraction of Neptune, and also to calculate exactly the next return in 1910. The Janssen prize (a gold medal) is offered for an important result in Physical Astronomy; a Montyon prize (500 fr.) for studies in French statistics, and the Jecker prize (10,000 fr.) for researches in organic chemistry. In Mineralogy and Geology, the subjects for the Vaillant prize (4000 fr.) are to study the physical and chemical causes which determine the existence of rotatory power in transparent substances, especially from an experimental point of view, and to improve, theoretically or practically, methods relating to geodesy or topography; the Fontannes prize (2000 fr.) is offered for contributions to palæontology.

In Botany, there will be awarded the Demazières prize (1600 fr.) for the best contribution, to our knowledge of the Cryptogamia, the Barbier prize (2000 fr.) for a botanical discovery having special reference to medicine, two Montagne prizes (1000 fr. and 500 fr.) for work bearing on the anatomy, physiology, development, or description of the lower Cryptogams, and the Thore prize (200 fr.) for the best memoir on European cellular Cryptogams. In Anatomy and Zoology, the Savigny prize (975 fr.) is given to aid young travellers, who, not receiving Government assistance, specially occupy themselves with the Syrian and Egyptian invertebrates. One or more Montyon prizes will be awarded for discoveries in Medicine and Surgery, the Bréant prize (100,000 fr.) for a specific cure for Asiatic cholera. Other prizes offered in Medicine are the Godard prize (1000 fr.) for the best memoir on the anatomy, physiology, and pathology of the genito-urinary organs, the Serres prize (7500 fr.) for the best work on general embryology applied to physiology and medicine, the Bellion prize (1400 fr.) for work of especial value to the public health, the Mège prize (10,000 fr.) for an essay on the causes which have helped or retarded the progress of medicine, and the Lallemand prize (1800 fr.) for researches on the nervous system. In Physiology, besides a Montyon prize (750 fr.), there is offered the Philipeaux prize (890 fr.) for experimental physiology, and the Pourat prize (1800 fr.).

In Physical Geography, the subject announced for the Gay prize (2500 fr.) is a study of the French lakes from a chemical, physical, and geological point of view. Besides the Arago medal, which is only occasionally awarded for discoveries of special value, the following general prizes are offered for 1896. The Montyon prize (unhealthy trades) for a means of rendering less dangerous an unhealthy trade, the Trémont prize (1100 fr.) the Gegner prize (4000 fr.), the Delalande-Guérineau prize (1000 fr.), the Jean Reynard prize (10,000 fr.), the Jérome Ponti prize (3500 fr.), the Tchihatchef prize (3000 fr.) for the exploration of imperfectly known regions of Asia, the Houllevigue prize (5000 fr.), the Cahours prize (3000 fr.) for the encouragement of young men already known as having done interesting work, especially in chemistry, the Saintour prize (3000 fr.), the Laplace prize of books, and the Rivot prize (2500 fr.).

In the case of the prizes bearing the names of La Caze, Delesse, Desmazières, Lalande, and Leconte (in 1898), it is specially stated that they are awarded entirely without preference of nationality, and of the remainder only two or three are restricted to French subjects. All memoirs for this year must be sent in to the Academy before June 1.

AMATEUR CLOUD PHOTOGRAPHY.[1]

THE blue colour of the sky has as much action on an ordinary sensitive plate as the white colour of light clouds (cirrus and cirro-cumulus); it is therefore necessary to diminish the action of the blue background of the sky. For this purpose a yellow screen is placed so as to intercept the rays; the light coming from the sky contains very few yellow and green rays, and is thus extinguished to a great extent; but, on the other hand, the great proportion of yellow and green rays which exists in the white light of the clouds passes the screen and makes an impression on the plate, if it has been made more sensitive to the action of yellow and green rays than the ordinary plates.

There are, therefore, three points to be considered: (1) the coloured screen; (2) the sensitive plate; (3) the method of development of the images.

(1) *The Coloured Screens.*—Coloured screens formed of films of

[1] By M. Angot. (Translated from *Cosmos*, November 23, 1895.)

gelatine or collodion must be rejected, because their tint changes very quickly in the light, and they easily lose their transparency. Either yellow glass must be used, or cells containing a suitable liquid.

Yellow glasses make the most convenient screens of all; but the difficulty is to find suitable glasses which are always the same, and of sufficiently graduated shade. Some are excellent, others not worth anything. Before recommending the use of coloured glasses exclusively, some experiments ought to be made with the help of a glass maker, in order to ascertain what ought to be the exact composition of the glass so that it may be reproduced with the exact tone at any time. It is unnecessary to add that the glass must be homogeneous and polished with quite parallel surfaces; only glass ought to be used which is coloured in mass, and not white covered with a superficial layer of enamel.

The surest method, in the case of not being able to get glass of which the composition is known, would be to use liquid screens, as I do. They are made with two parallel square glasses cemented together on three sides by square glass rods also with parallel sides, and with a thickness of six or seven millimetres, and length of side seven to eight centimetres, one side remaining open. If one does not wish to go to the trouble of making them, these cells can be obtained from instrument-makers. Needless to say that before cementing, the glasses must be carefully cleaned with a solution of carbonate of soda, then with water, and lastly by being well rubbed with a piece of cotton-wool dipped in alcohol; with these precautions, no air is to be feared along the sides of the cells. Before introducing the liquid, care must be taken to dip the open end of the cell in a bath of resin (a mixture of yellow wax and resin of equal parts). For ultimately closing the cell, it suffices to fasten on the edges, thus covered with resin, a little plate of glass cut to a suitable size, and which must be heated on a plate of copper to prevent its breaking. If found desirable the aperture may be still more securely closed with sealing-wax. Thus cells are obtained hermetically sealed, which can be used at every inclination without the liquid spilling and without air getting along the joints.

The easiest way of fixing these cells in position is to pierce a circular hole in the centre of a flat piece of cork, the size of the sunshade of the lens of the camera. The plate is fitted into the sunshade and held by india-rubber. The screen is thus in front of the lens, and it can be easily replaced by others more or less dark.

For the liquid, I have had to reject all solutions of organic colours, such as aurentia, primuline, chrysoidine, for they alter in the light. The simplest one is to use the bichromate of potash. A saturated solution is prepared at ordinary temperature, to which is added, after straining, a few drops of hydrochloric acid. This saturated solution, introduced into one of the previously described cells, constitutes screen (1), which should be used when the clouds are very light, and the sky of a pale blue. A solution of half the strength forms screen (2), which may be used for well-lighted detached cirrus on a really blue sky; lastly, screen (3), consisting of one part of the saturated solution to three of water, should be reserved for very luminous clouds as cumulus and cumulo-nimbus.

It is certainly more convenient and more simple to use coloured glasses as screens; but while there is a doubt as to finding suitable glass, we can always be certain when using bichromate cells of straightway obtaining excellent screens, always precisely the same. The ones I possess have been in use two years, and no precautions have been taken to preserve them.

(2) *Sensitive Plates.*—Special plates must be used for yellow light. The way of preparing these plates by means of ordinary plates is already well known; I did this at first. But I am certain that the necessity of preparing the plates is the principal obstacle which stops people taking photographs of clouds, who are really desirous of doing so. However, prepared plates are to be had in the trade, and they serve the purpose admirably.

Among the types of plates called orthocromatic or isochromatic, two have given me excellent results: Lumière's orthochromatic plates, sensitive to yellow and green light, and Edward's orthochromatic plates.

There is, therefore, no necessity to prepare plates, as they are to be had ready-made, and, at least in most cases, quite as good as those one could prepare personally. It has been said that the sensitiveness of these plates alters very soon, so much so that they are useless at the end of a few months. With regard to this, I can but quote the following fact. In February 1893, I received from the firm of Lumière, three boxes of orthochromatic plates, of which the date of manufacture is unknown to me. These three boxes were simply placed in a cupboard of my bureau without any other precautions. The first box of twelve plates was used in the course of 1893; the second, only opened at the beginning of 1894, and used between the months of March and November; lastly, the third box was opened only in November 1894, and the two first plates gave negatives which did not differ at all from those obtained from similar plates twenty months before.

Other similar boxes opened, then forgotten, for some months in a cupboard, have always given me excellent results.

I intend to continue these studies; but it seems to me now established, that if the sensitiveness of these plates diminishes with time, this diminution is small enough to permit of the plates being used after more than eighteen months. Under these conditions nothing can be said against their use.

Focussing is done without any difficulty on a distant object, for instance on a house in bright light. If the horizon is not far enough distant, an object can be taken comparatively near (at least twenty-five or thirty metres), then in order that the position shall correspond with infinity, move the ground-glass towards the lens a distance $\frac{f}{k-1}$, f being the focal distance of the lens, and k the number of times that the distance of the object which has been focussed contains the focal length of the lens. For instance, if an object twenty metres distant has been focussed with a lens, of which the focal length is twenty-five centimetres, then we get $k = \frac{2000}{25} = 80$. In order that the clouds may be in focus, the ground-glass must be brought a distance of $\frac{25}{79} = 0{\cdot}32$ c.m., about 3 millimetres, nearer the lens. Of course the focus must be got with the coloured screen, and the position thus found must be marked on the base of the camera, in order that the position of the frame may be known.

(3) *Development.*—No mode of development must be rejected *à priori*; even developers called *automatic*, which can be bought ready prepared, and which have been very much run down, for they are by far the most convenient, and often give excellent results.

If the negative that we wish to develop contains only clouds of more or less the same intensity, the automatic developers may be used without any risk. I have used baths of hydroquinone, Lumière's developer (of paramidophenol), &c., with success. It is advantageous to use baths which have already been used, and consequently containing a good proportion of bromide; a greater contrast is then obtained between the clouds and sky, and the development can be carried further without fear of fogging.

If, on the contrary, the negative consists of clouds of very unequal luminous intensity, as, for instance, delicate cirrus and strongly lighted cumulus, the negative would not turn out well with automatic developers containing much bromide; the image of the cumulus would appear, and be over-developed before that of the cirrus had begun to show itself. In this case either a new bath must be used, very diluted, without bromide, and the development is then very slow, or else (which is preferable) use pyrogallic acid, in employing the method recommended by M. Londe. In this case the development must be commenced with a very small quantity of pyrogallic acid, a little bromide, and relatively enough carbonate of soda, in such a way as to make all the parts of the image appear at first, without much intensity; then the necessary intensity will be obtained little by little, by the successive additions of pyrogallic acid. It is in this case only, where the intensity of the clouds is very different, that I think it advantageous to recommend progressive development instead of pyrogallic acid. In most ordinary cases, however, the automatic developers, which are more rapid, and more convenient to use, act very well.

In fact it is always as well to continue the development till the image is sufficiently dense, without intensifying, which is almost always possible. Negatives ought only very exceptionally to be intensified; to my mind, the intensification is always bad, it spoils the detail; a renewed or feeble negative is never worth as much as one that was made sufficiently dense in the first instance.

If I have gone into all these details, it is only to show that photography of clouds is a very easy operation, and within the reach of all amateurs. And let me just add, that with the darkest screen (saturated bichromate) and Prazmowski's lens, with a focus of 160 millimetres, and diaphragm of $\frac{1}{30}$, I obtain negatives with a maximum exposure of six seconds for cirrus, with an ordinary amount of light with a Zeiss' object-glass, a diaphragm of $\frac{1}{15}$ and very bright cirrus, having an exposure of $\frac{1}{50}$ of a second, has sometimes been more than sufficient, even too much.

It would be very interesting if amateurs in photography, so numerous at the present time, would try to photograph clouds which strike them as having interesting shapes, noting with care the hour when they were taken, and also the direction in which the clouds appeared.

SCIENCE IN THE MAGAZINES.

ONE of the most interesting contributions to this month's magazines is an illustrated account in the *Century* by Mr. Borchgrevink, of his voyage in the *Antarctic*, prefaced by a note by Mr. A. W. Greely. The article will give an impulse to the movement in favour of an expedition to explore the Antarctic continent. Referring to Mr. Borchgrevink's account, Mr. Greely says: "From a scientific standpoint the interest depends entirely upon the discovery by Borchgrevink, on Possession Island and Cape Adare, Victoria Land, of a cryptogamous growth, probably an unidentified lichen. The importance of this discovery rests in the fact that hitherto no land vegetation of any kind or description had been found within the confines of the Antarctic circle. The strained deduction has been drawn that the climatic conditions of the Antarctic zone must have changed since the voyage of Ross, who discovered no vegetation. It should be borne in mind, however, that the great botanist, Sir Joseph Hooker, who served with Ross, was unfortunately prevented from landing with his commander; otherwise it may not be doubted that low forms of vegetable life which escaped the attention of Ross would have been noted by Hooker. In a practical way it emphasises the possibility of much more extended exploration in the Antarctic Ocean, through the agency of the steam-power of to-day, than was practicable for the greatest of Antarctic navigators—Cook, Balleny, Weddell, Wilkes, and Ross—under sail alone in the past." Ethnologists will be interested in the studies of Indian life given by Alice C. Fletcher in the *Century*, under the title "Tribal Life among the Omahas."

An illustrated description of the magnificent new building of the Boston Public Library, contributed by Mr. T. R. Sullivan to *Scribner*, shows how very thoroughly the American people are working for the advancement of learning. The building will hold a million and a quarter volumes, and everything has been done to make it beautiful, while all that modern contrivance can offer has been utilised to secure comfort. "The reference reading-room of the library," we read, "and its seven thousand volumes are free to all who care to take them down, without the intervention of an attendant. At the southern end, always open for consultation, is the card-catalogue of all the books contained in the building; any one of these will be furnished and brought from the main library to the designated table at a few moments' notice. There is room for hundreds of readers to sit here from early morning to a late hour of the night in undisturbed pursuit of knowledge. Those who have tried to work in the overcrowded libraries of Europe, hampered by annoying restrictions and wearisome delays, will fully comprehend the blessing which such freedom brings." In the same magazine there is an article on "Water-ways, from the Ocean to the Lakes," by Mr. T. C. Clarke, dealing chiefly with the great canal from Lake Erie to the Hudson River. In the editorial notes, reference is made to recent gains in the speed of travel. It appears that the distance between Buffalo and Chicago—512 miles—has been covered at a rate of over sixty-five miles per hour, stops excluded. The distance between New York and Washington is now done in about five hours, but a railway exists (on paper) the trains of which are to shoot over this distance of 240 miles in two hours! The track is to be elevated above the ground on a single line of upright piers, and the trains are to be driven by electricity, each car carrying its own motor machinery. The most distinctive mechanical feature of the enterprise is the so-called "bicycle" arrangement, by which a single line of wheels run on single rail. The train is to be kept upright by an auxiliary rail on each side, which will not, however, come into play except in rounding curves.

In the *Popular Science Monthly* Prof. G. F. Wright discusses the "New Evidence of Glacial Man in Ohio," afforded by a small chipped chest implement found by a trustworthy observer close to Brilliant Station on the Ohio River. He concludes that the discovery "must go far to close the question of man's antiquity on the Western continent, and to dispel the doubts upon the subject which, for one reason or another, have heretofore existed." Prof. James Sully continues, in the same magazine, his "Studies of Childhood," and among the other articles are "The Anatomy of Speed Skating," by Mr. R. Tait McKenzie; a criticism by Mr. Le Sueur of Prof. Forbes' article on the work of the Cataract Construction Company, published in *Blackwood's Magazine* for September 1895; "Health Experiments in the French Army," by Mr. Stoddard Dewey; and "Prehistoric Engineering at Lake Copais," by Mr. J. D. Champlin.

Mr. W. H. Mallock continues in the *Contemporary* his essay on "Physics and Sociology." He holds that the struggle which causes social progress is a struggle of the few against the few, and is fundamentally different from the Darwinian struggle for existence. In his words: "Within the limits of the minority, composed of the exceptionally gifted, whether their gifts are those of scientific knowledge, or knowledge of men's characters and wants, or of a power to direct men, there does undoubtedly take place a struggle strictly analogous to that with which Darwinian science has familiarised us, the result being, as Mr. Spencer's celebrated formula expresses it, the survival of the fittest. Only it is not a struggle for existence, if the word existence is taken to mean life; it is a struggle for existence in a position of rule or domination. It is, moreover, not a struggle with the majority of the community, but with the minority only. The fittest, the survivors, the winners, instead of depriving the majority of the means of subsistence, on the contrary, increase those means, and their unsuccessful rivals are defeated, not by being deprived of the means of living, but only of the profits and privileges that come from directing others. That there is a subsidiary struggle amongst the majority, a struggle to obtain work, not to direct work, is true, as has been said already; but, as has been said also, this is not the struggle which primarily either causes the advance of civilisation or maintains such advances as have been made. It contributes to these results, and how far and in what way it does so will require to be discussed hereafter; but it is not the principal, it is not the primary cause of them. The primary cause is the struggle which causes the survival, not of the largest number of men of average capacity, but of the largest number of men of exceptional capacity—the largest number of great men." Thus, according to the argument, the *domination* of the fittest is the true counterpart in the social world of the *survival* of the fittest in the physiological world. The *Contemporary* also contains a short paper by Mr. Herbert Spencer, on the development of the architect, the paper being the ninth of a series on "Professional Institutions." The view is taken that "the earliest architecture bequeathed by ancient nations was an outcome of ancestor-worship."

In *Science Progress*, Dr. H. E. Armstrong describes "The Plan of Research in Education," and makes a powerful plea for scientific teaching and scientific research, both on account of education and industrial progress. Prof. F. O. Bower discusses recent work on mosses and ferns, with special reference to Prof. Campbell's volume on the subject; Mr. J. W. Rodger continues his statement of "The New Theory of Solutions"; Mr. Philip Lake describes "The Geology of Egypt"; and Mr. G. T. Holloway traces "The Evolution of the Thermometer."

A brief mention will suffice for the remaining articles in the magazines received by us. *Good Words* has a short illustrated paper on sponges, by the Rev. T. Bird, and one on "A School of Mackerel," by Mr. Edward Step. The *Strand Magazine* has several splendid reproductions from photographs of frost patterns on window-panes, obtained by Mr. James Leadbeater. The *Phonographic Quarterly Review* always contains two or three scientific articles. The current number has in it "In a Canadian Forest," by General Sir Charles Wilson, K.C.B., F.R.S. "St. Bartholomew and his Hospital," by Dr. W. R. Gowers, F.R.S., and several other articles of interest to scientific phonographers. The *Fortnightly* has an article on "The Climate of South Africa," by Dr. R. Roose; and among the information articles in