

POPULAR SCIENCE.

From the Journal of the Franklin Institute, which is under the able management of Professor Henry Morton, we make the following interesting extracts:

Solar Prominences. In a late lecture at the Royal Institution Mr. Lockyer said that generally best for sketching purposes to have the open slit in a radial direction. I have lately placed it at a tangent to the limb, in order to study the general outline of the chromosphere, which in a previous communication I have already briefly alluded to. Mr. Janssen has characterized it as a "niveau fort inegal et tourmenté." My opinion is now that perhaps the mean of these two descriptions is, as usual, nearer the truth, unless the surface changes its character to a large extent from time to time. I find, too, that in different parts the outline varies; here it is undulating and billowy; there it is ragged to a degree, flames, as it were, darting out of the general surface, and forming a ragged, fleecy, interwoven outline, which in places nearly even for some distance, and, like the billowy surface, becomes excessively uneven in the neighborhood of a prominence. According to my present limited experience of these exquisitely beautiful solar appendages, it is generally possible to see the whole of their structure; but sometimes they are of such dimensions along the line of sight that they appear to be much denser than usual, and as there is no longer under these circumstances any background to the central portion, only the details of the margins can be seen with facility to the varying brightness. Moreover, it does not at all follow that the largest prominences are those in which the intensest action, or the most rapid change, is going on—the action as visible to us being generally confined to the region just in or above the chromosphere, the changes arising from violent uprush or rapid dissipation, the uprush and dissipation representing the birth and death of a prominence. As a rule, the attachment to the chromosphere is narrow and is generally higher up the stem, which, so speak, intertwine, and the prominence expands and soars upwards until it is lost in delicate filaments, which are carried away in floating masses.

Since last October, up to the time of trying the method of the open slit, I had obtained evidence of considerable changes in the prominences from day to day. With the open slit it is at once evident that changes on the small scale are continually going on; it was only on the 14th inst. that I observed any change at all comparable with the changes which had previously been observed by Mr. Janssen. About 9 hours 45 minutes on that day, with a tangential slit I observed a fine dense prominence near the sun's equator, on the eastern limb. I tried to sketch it with the slit in this direction; but its border was so indistinct, and the conditions were so unfavorable, that I gave up the attempt in despair. I turned the instrument round 90 degrees, and narrowed the slit, and my attention was at once taken by the fine line; a single look at it taught me that an injection into the chromosphere and intense action were taking place. At 10 hours 50 minutes, when the action was slackening, I opened the slit; I saw at once that the dense appearance had all disappeared, and cloud-like filaments had taken its place. The first sketch, embracing an irregular prominence with long perfectly straight one, which I call A, was finished at 11 hrs. 5 min., the height of the prominence being 1 min. 5 sec., or about 27,000 miles. I left the observatory for a few minutes, and on returning at 11 hrs. 15 min. I saw that the part of the prominence A had entirely disappeared; not even the slightest rack appeared in its place; whether it was entirely dissipated, or whether parts of it had been wafted towards the other parts, I do not know, although I think the latter is more probable. The other one, as the other part had increased.

Radiation of Heat from the Moon. The Earl of Rosse is making a series of experiments by means of a thermo-pile of four elements and a three-foot telescope, to determine, if possible, what proportion of the moon's heat consists of—1. That coming from the interior of the moon, which will not vary with the phase; 2. That which falls from the sun on the moon's surface, and is once reflected regularly and irregularly; 3. That which falls from the sun on the moon's surface is absorbed, raises the temperature of the moon's surface, and is afterwards radiated as heat of low refrangibility. The chief result arrived at up to the present moment is, that the radiating power of the moon being taken as equal to lampblack, and the earth's atmosphere supposed not to affect the result, a deviation of 90 degrees for full moon appears to indicate an elevation of temperature equal to 500 degrees Fahrenheit. The relative amount of solar and lunar radiation was found equal to 88:12.

Action of Sunlight on Mineral Oils. Some curious experiments, recently made by Herr Grotowsky, on the action of sunlight upon mineral oils, show that when the different kinds of petroleum oils are exposed to the influence of sunlight, they absorb oxygen from the air, and convert it into ozone, as has been shown already for many other hydrocarbon oils by Schenbein, Kuhlmann, and Phipson. According to Professor Grotowsky, no chemical combination occurs between the oil and the ozone; the latter remains free, and oxidizes only the substances brought into contact with it. The color of the oils is completely modified when they contain ozone; the altered states that they rapidly undergo. The color of the glass bottles in which the oils are contained are enclosed has a marked influence on the absorption of oxygen. Preserved in iron vessels, or completely out of the rays of daylight, all these oils may be preserved intact; but in white glass jars exposed to light, the white oils become yellow, and the lighter oils become more so in specific gravity 0.905, burn with much difficulty, and attack the corks of the bottles. This is particularly the case with American petroleum.

The Oxhydrogen Light. This scheme has now taken a definite shape in Paris. A company has been formed, the capital necessary has been raised, and application has been made for permission to lay down pipes to carry oxygen and hydrogen over about a fourth of the city. It is not very likely that the permission will be granted, and the promoters will have to confine themselves to supplying individuals with compressed gas, as was originally proposed. By the patented process of M. Tessie du Motay obtains the oxygen and hydrogen which he proposes to distribute over Paris, at a cost so low that the oxyhydrogen light promised much cheaper than common gas light; but ingenious and relatively cheap as they undoubtedly are, it is impossible to believe that the service can be made so inexpensive as to supersede coal gas. The prospectus of the company enlarges upon the cheapness and purity of the light, the complete combustion, and the absence of all deleterious matters in the products of the combination; but is quite silent as to the danger of introducing into a room two gases not possessing any smell, and which, consequently, may escape without observation, and the mixture of which forms an explosive compound of far greater power than any mixture of coal gas and air. To any kind of this kind, continental engineers appear to shut their eyes. A short time ago, a patent was taken out in Belgium for making a mixture of coal gas and air, storing it in gas-holders, and distributing it over the city of Brussels for heating purposes. This scheme, which is given shows in the most complete knowledge of the subject of the manufacture and distribution of gas, but there seemed to be no recognition of the risk, imminent enough, of blowing up the whole concern. A consideration of the kind of the kind projected for Birmingham, and will, no doubt, prevent the Oxhydrogen Light Company from getting permission to lay down their pipes over Paris.

Descending "First Contact" with the Spectro-... One of the most beautiful observations made during the late eclipse was that of Professor C.

A. Young, on the first contact, by means of the spectroscope. Our readers are no doubt familiar with the method developed by Lockyer of viewing solar prominences in the spectroscope without the aid of an eclipse. Professor Young has been giving much attention to this subject, and has fitted up a very efficient instrument for the purpose. During the eclipse of last month, he was stationed at Burlington, Iowa, and shortly before the first contact there was a solar prominence located at the spot where contact must occur. He therefore fixed his spectroscope with the slit radial to the solar edge at this point, so getting a prominence spectrum whose width was determined by the height of the prominence. Closely watching this, he perceived that it began to waver steadily, and at the instant that it became a mere line and disappeared, he recorded the first contact. From the first photograph showing contact made by the Philadelphia party, the same place, Professor A. M. Young, who had charge of that division, calculated the time of actual first contact, and found that it came within two-tenths of a second of the record made by Professor Young.

SPECTRUM OF THE CORONA.—During the totality of the eclipse, Professor Young gave special attention to the observation of the corona with the spectroscope. He found that in place of a subdued solar spectrum which would have been anticipated from the reports of former observations, it yielded a spectrum of bright lines. These lines, which were not seen in the ordinary spectrum, were of the same nature as those measured, and found its position as that indicated by 1474 on Kirchhoff's chart. Two other fainter ones were noticed, but there was no time to measure them. Professor Young writes, by graphical projection, a close correspondence between this principal corona line and the brightest of the aurora lines observed by Professor Winlock, on the 19th of April, and indicated by him as occurring in the position of 1539 on Kirchhoff's chart. Professor Young also considers that the two fainter corona lines observed, but not measured by him, correspond with aurora lines 1280 and 1410 of Huggins's chart, observed by Professor Winlock, on the occasion above noticed. From these observations, Professor Young draws the conjecture that the solar corona is, in fact, a permanent aurora.

THE CORONA NOT POLARIZED.—With the above observations and deductions made by Professor Young, agree exactly those which were made at Mount Pleasant, Iowa, by Professor E. C. Pickers, who with a spectroscope observed no dark lines in the general light from the total phase, and with a polariscope arranged on the plan used by Arago in his study of sky-polarization, found no trace of this condition in the light from the corona.

SOLAR PROMINENCES AS SEEN AND AS PHOTOGRAPHED.—It will be remembered that in De La Rue's photographs in 1860, several prominences were conspicuously depicted which were not seen by any of the observers. This no doubt results from the great difference in actinic force between the light from the corona and prominences, when the latter are viewed with their intensity, the corona appearing intensely bright, but being very feeble in actinic effect.

English View of the Eclipse. The London Spectator says—It is a particularly fortunate circumstance that the great eclipse of August 7 has been witnessed under favorable circumstances, for there will not be another total eclipse of the sun until the end of the year 1871, and then the duration of totality will be exceedingly short. After that there will be no total eclipse till November, 1872, and this eclipse will be of no value at all, so far as observations to be made during totality are concerned, since the totality will not last more than a few seconds. Indeed, the eclipse will be so singularly indistinct that astronomers cannot say for certain whether it will be total or annular. Probably it will begin as an annular eclipse, become total as the shadow sweeps rapidly across the earth's surface, and end as an annular eclipse again; the point of the moon's shadow just reaching the protuberant part of the earth's illuminated hemisphere. Be this as it may, it is certain that there will be no possibility of observing the red prominences.

It is not been for the space of with which, as we learn, the American astronomers have been able to observe the important eclipse of August 7, our solar physicists would have been forced to content themselves for several years with the results of the eclipse-experiments of last year. That would have been more unfortunate because that was the first eclipse during which astronomers had been able to avail themselves of the power of their new ally, the spectroscope. Many questions of extreme importance have arisen from the observations made in India in 1868; and astronomers looked with interest to the eclipse which has just taken place to resolve their difficulties.

The eclipse of August 7 was in many respects inferior to the great eclipse of August 18, 1868. In 1868 the moon's disc overlapped the sun (at the time of central eclipse) by an amount equal to nearly a thirtieth part of the sun's apparent diameter, and thus the totality lasted several minutes. This year the moon's overlap was about a fifth less, and the duration of totality was proportionately reduced. Still the eclipse was an important one, since it is comparatively seldom that even so near an approach is made to the exceptional magnitude of the great Indian eclipse. The recent eclipse, too, was characterized by certain very favorable features. The moon's shadow traversed a region of the earth's surface which was for the most part accessible to practical astronomers. The Americans had no occasion to undertake long and expensive journeys, since the eclipse visited them, so to speak, at their own doors. Some of the principal American observatories lay quite close to the line of central eclipse, others were not so far off, but that large and powerful telescopes could readily be carried to some spot upon the central line. Then, again, the important process of photography was not interfered with, as in India, by the tremendous heat of the climate. Major Tennant mentioned last year that he had had great difficulties to encounter owing to this circumstance. The American astronomers, indeed, who were engaged in the most successful observations of celestial photography, were subject to no such annoyances.

One result of the American observations is very interesting. Last year there was some discrepancy between the positions of the spectra of the prominences, as to the position of those bright lines which indicate the character of the prominence-flames. So important was this discrepancy, that many were disposed to consider that the observations had been disturbed by some error. It was, however, only a matter of a few minutes, and it is now clear that the observations were correct, and that the bright lines of the prominences can be seen without an eclipse, have seen but three lines, two belonging to hydrogen, and the third near to, but not coincident with, the double bright line of the metal sodium. But all doubt was not removed by this circumstance, since it was held to be not only possible, but highly probable that the fainter lines might escape a scrutiny made while the sun is blazing in full splendor: the peculiar character of the spectrum of the sun, and the fact that the brighter lines of the spectrum are so much brighter than the fainter ones, that they are not easily distinguished from the background of the sun's light, is a fact which is well known to all astronomers.

Foreign Items. A pamphlet just published at Pesth, under the title of "The Neutralization of the Austro-Hungarian Monarchy in a Future War," has been much commented on by the press of Vienna and Berlin. The author, who writes under the signature of "A Hussar," but who is known to be a Hungarian military officer of high rank, declares that it is impossible for Prussia to sincerely friendly towards Austria, as it must in due course make an attempt to seize the German provinces of that empire. In the event of a war between Prussia and France, therefore, he thinks that Austria must take the side to which, in which case it will be necessary for Prussia to place 300,000 men on the Bohemian frontier to cover her flank against the corps of observation which Austria would send to that province. In such a struggle, the writer adds, Prussia and Russia would also be engaged, Italy and England against them. The result of the war, he concluded, would be the annihilation of Prussia as a great power, the humiliation of Russia, and the restoration of Poland.

The antagonism between the Slavonic and Italian populations on the coast of the Adriatic has again broken out in some serious disturbances at Trieste. These disturbances created so much alarm among the inhabitants that the local militia, which is entirely composed of Slavonians, were disbanded, and a Franko-German, General Moring, is very popular both with the Italians and the Slavonians, and his experiences in America and as a member of the Frankfurt Parliament have given him strong liberal tendencies, which have caused him to be warmly welcomed by the first citizens of Trieste. If the disturbances are repeated, he will be compelled to place the town in a state of siege.

A contributor to the Daily News gives an interesting account of an unsuccessful attempt made by a correspondent of Victor Hugo, while in transit from the first of the month, was being proceeded with, to convince the great man that "Premiere des quatre" was not a correct rendering of "Firth of Forth," and that the "Firth of Forth" was not the "First of Four Cities." The curious blunder was noted in many quarters when "Les Travailleurs de la Mer" appeared; and we now hear, for the first time, that it had been pointed out to M. Hugo before the work appeared, and that the sublime romancier persisted in maintaining that the "Firth of Forth" was what he had declared it to be, and that the first of the month is inexact. It is to the Bulletin that that error or inexactitude must be referred. For the rest I do not believe that there is an error (*Du reste, je ne crois pas qu'il y ait une erreur*).

An archdeacon and a clergyman or two of lesser note have ventured to attack Darwinism before the members of the British Association at Exeter. As might be expected, whether right or wrong, as a matter of fact, they got the worst of it in argument, Professor Huxley observing that their papers and speeches seemed to him to suggest that Cain was the first doctor of divinity, and that the first of the month was almost at the same time the Pope's organ, the *Civiltà Cattolica*, was discussing the same subject. The following is a brief summary of its argument:—"As the Church teaches that God created man, the liberals will not believe it, and maintain that man is descended from an ape. They have chosen that animal for their progenitor, because Satan, the first conspirator, the first revolutionary, and the first liberal that ever lived, was the ape of the deity. Further, they have observed that, as the ape is notoriously impudent, and that he is above all, prone to theft, he possesses the same qualities as themselves. The liberals are the apes of the Church and of God, and follow in that the example of the devil, their lord and master, and the members of the British Association at Exeter. Does the Pope summon an Ecumenical Council at Rome? The liberals propose at Naples an assembly of free-thinkers. In short, liberalism is only a grand piece of aping."

The Moscow Gazette of August 15 publishes an article which contains some interesting information as to the measures taken by the Russian Government with the object of facilitating the use of railways by the troops in time of war. No railway, it appears, can now be made in Russia unless the company charged with its construction engages to build the carriages for the transport of troops. A sort of railway drill has been established in order to accustom the soldiers to enter and come out of a train with the greatest possible rapidity, and special railway companies are to be organized, the one consisting of men capable of acting in case of need as engineers, stokers, drivers, pointmen, etc. The total number of the soldiers forming these companies will for the present be 1000. The Moscow Gazette thus explains the necessity for these measures:—"No one doubts the great importance of railways in a military point of view, but if the necessary arrangements are not made in time of peace they will not be one-tenth as serviceable as they ought to be. If, for instance, the troops, and especially the artillery and the cavalry, are obliged to proceed from one station to another by railway carriage without losing time, or if the enemy should destroy a portion of the rails, or the employees of the railway (as was the case during the late Polish insurrection) do not display the confidence of the government, and if no means are taken to provide against such contingencies, the best strategic combinations might be paralyzed."

The disturbances which lately took place in consequence of the establishment of a monastery at Munich, a suburb of Berlin, have called the attention of the Prussian press to the laws on religious societies which exist in the various German States. It appears that in Prussia the only authority that decides as to the establishment of a monastery is the bishop of the diocese, the State not interfering unless the monastery is established for the purpose of exercising an influence on public affairs." By article 13 of the Prussian Constitution, monasteries can only acquire the rights possessed by lay associations through special laws made *ad hoc*; no religious order is to be regarded as a corporation unless its foundation has been sanctioned by the State. The numerous monasteries and convents established in Prussia since 1850 have accordingly no corporate existence in the eyes of the law, and their property is not subject to the same rights as that of an individual member of the society. In Bavaria no religious establishment can be founded without the consent of the State (edict of 1818). In Austria, by Article 28 of the Concordat, the "consent of the Government" is required for the establishments, after which they become legally entitled to all the privileges of corporate bodies. According to the Baden law of the 9th of October, 1860, no religious order may be introduced into that country without the permission of the Government, and that permission may be refused if the order is not approved by the State. A similar provision is contained in the Wurtemberg law of the 30th of January, 1862, and it is added that if a society of Jesuits, or any other society of a like kind should desire admission into the country, a special law must be passed for that purpose, and no religious order is to be established unless it possesses sufficient means of subsistence. After establishment it is placed under the supervision of the bishop of the diocese, and is made liable to the civil laws of the country. No member of a religious society is allowed to contribute towards it a certain fixed sum towards the expenses of his order, the Government is to be informed from time to time of the number of the members, and the judicial authorities are to be allowed access to the monastic buildings. In Saxony, on the other hand, the constitution of 1831 forbids the introduction of any new convents or religious orders whatever.

Thomas Stittell, running on the Dent ticket in Mississippi for Secretary of State, is colored.

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