THURSDAY, OCTOBER 6, 1870

SCIENTIFIC ADMINISTRATION

NO reflecting Englishman can contemplate the great events of the present time without desiring to extract from them such warnings and instruction as may be serviceable to his country in case she should be drawn into war. Accordingly the press teems with discussions on every branch of the military art. We leave these to others. In what respects the constitution, the discipline, the training, and the arming of one army are superior to those of the other, it is scarcely the function of this journal to point out. Taking the broad fact that the Prussian army has, up to the present point, proved itself superior on the whole to that of France, and indeed to any army that has ever existed—a fact that no unprejudiced person will deny—let us ascertain, if we can, whether there may not be recognised some one broad cause to account for so broad a fact.

In this inquiry we have been almost forestalled by the Chancellor of the Exchequer at Elgin. Mr. Lowe recited the lessons which he considered we have to learn from the Prussians. He spoke of their "intelligence," their "organisation and docility," their "extraordinary knowledge, forecast, and diligence." He enumerated nearly all the qualities that command success. But there was one word which that profuse enumeration did not contain—a word which Mr. Lowe no doubt felt unable to utter, and that word is—Science. A Government which refuses aid to astronomers anxious to observe so rare a phenomenon as a total solar eclipse, cannot be expected to vaunt the prowess of science. Mr. Lowe's statement of the causes of Prussian success was therefore incomplete; it was a mere reckoning of the bricks of the building, without a word of its architecture and design.

The Prussians, whatever their other qualities, are emphatically a scientific people, and to that predominating characteristic first and foremost are their recent military triumphs due. We do not mean that because they are great chemists, astronomers, and physicists, therefore are they necessarily great soldiers; so narrow a proposition would hardly be tenable. What we mean is that the spirit of science possesses the entire nation, and shows itself, not only by the encouragement given throughout Germany to physical research, but above all by the scientific method conspicuous in all their arrangements. What does the word Science, used in its wider sense, imply? Simply the employment of means adequate to the attainment of a desired end. Whether that end be the constitution of a government, the organisation of an army or navy, the spread of learning, or the repression of crime, if the means adopted have attained the object, then science has been at work. The method is the same, to whatever purpose applied. The same method is necessary to raise, organise, and equip a battalion, as to perform a chemical experiment. It is this great truth that the Germans, above all other nations, if not alone amongst nations, have thoroughly realised and applied. In all the vast combinations and enterprises with which they have astounded the world, no one has been able to point to a single deficiency in any one essential element. Every post has been adequately filled and every want provided for; from the monarch, the statesman, and the strategist, to the lowest grade in the army—each department complete, each arm of the service, whether cavalry, infantry, or artillery, trained to its own special duties, and efficiently equipped for their performance. This is the method of science, literally the same method which teaches the chemist to prepare his retort, his furnace, and his re-agents, before commencing his experiment.

This, we maintain, is the great lesson, of a material kind, which the war should teach us. Where is our science? At the Admiralty and the War Office, partisan placemen preside over technical administrations. Is that science? Under pressure of the newspapers or of private influence, a ship of war is built by an amateur in spite of the demonstration of our professional adviser that she must be unsafe, and she goes accordingly to the bottom with 500 souls in the first gale of wind. Is that science? One-half of the forces on which we reckon for the defence of the nation is composed of patriotic volunteers, with whom training is optional, and to whom efficient officers and arms are denied. Is that science? The government of London, the greatest metropolis in the world, is parcelled out to scattered knots of ignorant, sordid tradesmen, on whom no ingenuity has ever been able to fix a shadow of responsibility. Is that science? Have we before us the crudest outline of the strategical and military operations with which it is proposed that an invasion of this country should be repelled? Coming political policies always, in England, cast their shadows long before. Have we any indications of a coming military policy? Have we the means of calling together, in a short space of time, properly provided with the necessaries of a campaign, the forces requisite for carrying out a given military policy? Do we know, for instance, how our volunteers, who are reckoned on, man for man, as equivalent to regular troops, are to be employed?

We fear it is a terrible truth that absence of scientific method is as conspicuous with us as its presence is with the Germans. As a nation, we have never realised the necessity for system and completeness in utilising our material resources. The use for the scientifically trained mind has, in our idea, been limited to chemicals and the like.

In courage, energy, intelligence, and wealth, natural and acquired, England need shrink from no comparisons with other nations, but she has yet to awake to the want of that something in her arrangements that shall enable her to turn her enormous advantages to the best account. Science, using the word in its sense of the method applied to things, not to the things themselves, is that something.

OWENS COLLEGE, MANCHESTER

OCCASIONS may sometimes arise, and in fact have already arisen, when it becomes a necessity for a journal like ourselves, devoted exclusively to scientific matters, to direct some attention to what is going on around it in the general world. One of these lately occurred, and caused us to make the remarks we did recently on the apathy displayed by the Government

towards scientific research. This week, in a similar manner, we desire to call the attention of our readers to some proceedings which took place on the 23rd ult. in Manchester. This we do because of the great interest these proceedings have to all scientific men, both on account of the ultimate benefit science generally will attain through them, and also on account of some one or two very remarkable speeches made on the occasion.

The laying of the foundation-stone of the new Owens College building by the Duke of Devonshire, its newly elected president, is an event of national importance. For in it we see clearly—and such is the view held by all the professors and governors of that institution—the beginning of the great Scientific University of the North of England. Owens College was founded some twenty years ago by the munificent bequest of Mr. John Owens, a Manchester merchant of the old school, who left his money to found an endowment for the promotion of learning in his native town of Manchester. He was wise enough to stipulate that his money should not be employed for any building purposes, but solely towards educational purposes, leaving it to his fellow-townsmen to provide the house accommodation. This was done at first on a small scale, but Owens College has been from that time gradually increasing in numbers year by year, until a few years ago it was found absolutely necessary that new buildings should be obtained to meet the constantly augmenting number of students. Subscriptions were immediately set on foot, and in a short time something like 130,000*l.* was raised. With this the present buildings have been undertaken. On Friday week the foundation-stone was laid by the Duke of Devonshire, in the presence of the Bishop of Manchester, Professor Huxley, Professor Tyndall, and all the professors and governors, and the chief notabilities of Manchester. In the address presented to the Duke of Devonshire, it is stated that the projected buildings will provide for 600 day students, and a much larger number of evening students, and will include both chemical and physical laboratories. The architect, Mr. Waterhouse, has provided for the permanent accommodation of the Natural History and Geological Museums, presented by the late Manchester Natural History Society and the Manchester Geological Society, and also for the large library and various lecture and examination rooms.

The Duke of Devonshire, in laying the stone, remarked that he looked upon this day as one very celebrated in the annals of Manchester, and one destined to make Manchester more and more renowned at no distant date, as possessing a college second to none in England, and one which would become the centre of the scientific culture of the north of England. No year passes without some considerable benefactions being made to the college, and as fast as funds accumulate, new professorships in all branches of science are being founded, and the college has already become one of quite national importance.

Professor Huxley and Professor Tyndall also spoke, the former congratulating the town on the great results it has attained without any State aid, this State aid having been refused, and showing the great benefits which could not fail to attend the increased college accommodation in the great manufacturing and mining district all round Manchester; and the latter showing that the past work achieved by the eminent and able professors of the college was a sure guarantee of the work which would be done in the future.

The proceedings wound up with a luncheon in the Town Hall, at which the most remarkable speech of the day was delivered by the Bishop of Manchester, Dr. Frazer. In replying to the toast of the Bishop of Manchester and the clergy of all denominations, he said he had no hesitation in replying to this toast, as Owens College had been founded for educational purposes, without any reference to special religious bodies, and he continued—

"I take a very large, broad, and comprehensive view of what is meant by Truth. I believe that everybody who earnestly seeks to propagate the truth, to preach the truth in the largest sense of the word, is doing good to his fellow men. I never believed that true Science is contrary to true Religion, or that true Religion ought to be afraid of any legitimate consequences of true Science. I know well, and the knowledge makes me speak with some tremulousness, that I am in the presence of those who are considered to be, and who have established their right to be considered to be, the ablest interpreters of the laws and phenomena of the physical and material world. I cordially welcome those gentlemen as teachers and propounders of the truth. If scientific men will only believe that we, the clergy of this kingdom, are not sceptics in disguise, or charlatans trying to palm off upon the world something that has been found to fail; if they will only believe that we want to tread calmly, step after step, where we find our remedies have succeeded, I think they will allow that we are searching after truth, the only truth I care to find—practical truth—truth that will elevate man in the scale of being—and I think they will admit that we are trying to follow out truth by strictly scientific methods. I do not care from what source it comes; I will welcome every means which is calculated to settle the disputed boundaries between Religion and Science, and show that both alike, in their legitimate province, minister to, and help to bind up the great temple of Truth."

The fearlessness with which the Bishop thought it his duty to speak out, would, if followed throughout the whole of England, serve to overthrow that unfortunate antagonism there is at present between Religion and Science, founded on an entire misconception of the aims and the value of the latter as compared to the former.

The further proceedings on this interesting occasion were the delivery of some very instructive speeches by Profs. Huxley and Tyndall, and also by Prof. Henry, of the Smithsonian Institution, Washington, which, however, our space prevents us from further noticing. Certain it is, however, that the proceedings of the opening day are such as every scientific man throughout the kingdom will welcome with pleasure, and we cannot doubt that a report of them will be interesting to our readers. We hope that this occasion will inaugurate a new era for science, and will serve to bind together in the strongest bands those untiring workers in the pursuit of truth, whether they be scientific men or the clergy of all denominations.

The present Government has so far entirely refused to assist Owens College by any grant of money similar to that which a few years ago fell to the share of Glasgow University. The Government alleges that since the Manchester merchants have done so much for the college

they can easily do more, and so complete the good work they have so well commenced. A stranger and more disheartening reason it would be hard to imagine. Our rulers appear to have yet to learn that there is such a thing as principle in the application of public money to the promotion of the real progress of the nation. We look forward to the report of the Science Commission to define the principles on which these grants should rest; and we trust we may then have a Government both capable of understanding what these principles are, and of firmness in carrying them out into practice.

J. P. E.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

Aurora Borealis

THE Aurora Borealis noticed in the *Times* was observed here on Saturday the 24th inst. between 9 and 11 P.M. Another was observed on Sunday the 25th between 2.30 and 3.15 A.M.; and again another on the same day about 8.30 P.M.

I did not see the first, but I did see the two last, and the Aurora of Sunday morning appears to have been the most vivid of the three.

About 2.30 A.M. a strong red glare as of blood appeared above a thick black cloud about 40° eastward of north and 30° elevation. As this faded, the red glare appeared westward of north at the same elevation. The clouds did not extend to the horizon, which was pretty clear, and in half an hour they had passed away.

At 3.15 the sky was clear, and vivid yellowish rays extended nearly to the polar star. The rays had a gradual motion to the eastward. This was well observed by the rays passing in front of the stars of the tail of the Great Bear, which were at that time nearly parallel to the rays. I ceased observing about 3.30.

The Aurora observed at 8.30 P.M. appeared to me very faint in comparison to that at 3.20 A.M. I would hardly have noticed it if a friend had not pointed it out to me.

This same person had observed the Aurora of the 24th, and it was from his observation that I inferred that the Aurora of the morning of the 25th was also much brighter than that of the evening of the 24th.

N. A. STAPLES

Louvain, Sept. 30

Fuel of the Sun

I AM not mathematician enough to form any opinion on the merits of the controversy as to the "fuel of the sun;" that is to say, I am not able to decide whether it is consistent with the conditions of the equilibrium of the solar system that the sun's heat should have been kept up through the ages of geological time by the falling in of meteors. But I wish to state some evidence which proves that meteors are constantly falling in, though it does not touch the question whether this source is sufficient to account for the whole or any large part of the total supply of heat radiated away by the sun.

In the first place, the meteors have been seen. On Sept. 1, 1859, Mr. Carrington and another observer simultaneously observed two meteor-like bodies, of such brightness as to be bright against the sun's disc, suddenly appear, move rapidly across the sun from west to east, and disappear.

The fact that their motion was from west to east is important. If the supply of meteors to the sun is constant and tolerably regular, it is scarcely possible to doubt that the meteors, like the entire solar system, move round the sun from west to east, and occupy a space of the form of a very oblate spheroid, having its equator nearly coincident with the sun's equator.

If this is the case, the meteors ought to fall in greater numbers near the sun's equator than near his poles, making the equator hotter than the poles. Such is the fact. Secchi, without having any theory to support, has ascertained that the sun's equator is sensibly hotter than his poles. The instrument used was an electric thermo-multiplier, and the indications show, not the ratio, but the difference of the heat from the two sources compared.

It can scarcely be doubted that the meteors must enter the sun's atmosphere with a velocity not much less than that of a planet, revolving at the distance at which they enter. We know that the sun's rotatory motion is incomparably less than this, and consequently the meteors, revolving from west to east, ought to make the sun's atmosphere move round his body in the same direction, and with greater velocity in the equatorial regions, where most meteors fall in. This is what is observed. Mr. Carrington, also without any theory to support, has shown that the motion of the solar spots from west to east is most rapid in the latitudes nearest the equator. We cannot compare the motion of the spots with that of the sun's body, as we do not see his body. But the fact that the motion from west to east is most rapid in the equatorial latitudes proves that these motions are not due to any cause like that which produces trade-winds and "counter-trades" of our planet; for, supposing the sun or any planet to rotate from west to east, in any circulation that could be produced in its atmosphere by unequal heating at different latitudes, the relative motions of the atmospheric currents in high and low latitudes would be similar to that of the trade-winds and "counter-trades," and opposite to that which the motions of the spots indicate in the atmosphere of the sun. This will be true at all depths in the atmosphere.

JOSEPH JOHN MURPHY

Suggestions for the Improvement of Meteorological Investigation

THE position of Great Britain at the head of a vast empire encircling the globe, and soon to be at the centre of a network of telegraphs that will feel all the pulses of the world, imposes upon British naturalists and the British Government the duty of leading the way in the important work of meteorological investigation. In the hope of aiding the progress of this work, I venture, through your columns, to call public attention to the following suggestions:—

First:—The increase of the number of meteorological stations on and near the equator is very desirable. For instance, an increase of weather reports from the West Indies and the Atlantic States of North America, especially about latitudes 30° to 32°, would be highly valuable to the people of Great Britain and other portions of Western Europe.

Second:—In meteorological reports, we should recognise both the unity of the atmosphere and its division into areas corresponding with the great divisions of the earth's surface into land and water. As storms are generally confined within these areas, they may be called storm areas, or sections of the atmosphere in which disturbances are very closely connected. For instance, the area within which the greater storms that visit Great Britain begin and end, or circulate with destructive force, is bounded by the equator on the south, and the Rocky Mountains on the west. The northern and eastern boundaries are not yet determined. On September 7, 1869, the first "Northers" of the season visited New Orleans; on September 8th, storms passed over the Northern States; and between September 9th and 23rd, storms passed over Great Britain and Western Europe. Again, on October 1st, 1869, the barometer at Havana indicated the approach of bad weather; on October 2nd, 3rd, and 4th, there were heavy gales and rains at New York; on the night of October 4th, occurred one of the most destructive storms that has ever visited Maine and New Brunswick; on October 6th, there was a heavy gale in England. The destructive gale in England, on October 16th, was preceded by a hurricane in New England on October 11th. These two last-mentioned storms appear to have been closely connected not only with each other, but also with the extraordinary heat which prevailed in England on October 8th, 9th, and 10th, and in France on October 11th. All the storms mentioned, however, are only specimens of the many annual disturbances of the same kind whose connection with the Atlantic Ocean as a centre has been, or may easily be traced. They are referred to here, merely to show that about an eighth of the whole atmosphere constitutes, and may be named, the Atlantic storm area. To make a weather report of much practical value in Great Britain and Western Europe, it should cover the whole of this area. The number of places, however, from which reports are published, need not be so large as at present.

Third:—The records of the atmospheric conditions and changes should be arranged with reference to the latitude and longitude of each station. At present there is no system in tabulating