

SCIENCE AND MORALS.

FOR some little time past the intellectual air of Paris has been enlivened by a controversy between men like M. Berthelot, M. Lavisse, M. Anatole France, and M. Gaston Paris, as supporters of the gospel that the disinterested search for truth is a guide to morality, and a reactionary party which has, with surprising dialectics, attempted to sustain a plea of the "failure of science." From the *Times* of Friday last, we learn that on Thursday the reception at the Academy of M. Gaston Paris, the successor of M. Renan as the head of the Collège de France, and one of those who have done most in philological studies to maintain the renown of French science, was the occasion of a signal demonstration against the reactionary, unscientific spirit.

M. Gaston Paris is reported to have said :—

"It will be understood that science, which every day enhances, enlarges, and renders more precise our conception of the world, and which transforms, at the same time more and more effectively, the conditions of our existence by submitting to our laws the matter which was crushing us, inspires an enthusiasm almost religious in those enamoured of it. No one had this cult more deeply rooted in his soul than M. Pasteur. No one claimed more insistently for science the honour and the place to which it has a right, or became more indignant with the stupid misunderstanding which refuses to it the means of action of which it stands in need. In a brief piece of writing, entitled 'Le Budget de la Science,' published in 1868, he adjured his fellow-citizens to take more interest in 'those sacred abodes known under the expressive name of laboratories. Ask that they should be multiplied and adorned. They are the temples of the future. It is there that humanity becomes greater and stronger and better.' He had the joy and the supreme honour to see rise under his invocation, owing to the munificence of the entire nation, the most magnificent of these temples of the future. There he reposes to-day in his glory, and about his tomb has been formed, like an order of the new times, a militant, truly spiritual band which fights under his banner to extend his conquests, and which will remain faithful to the motto which he gave it while working unremittingly—'Pour la science, la patrie, et l'humanité.'"

But, continued M. Gaston Paris, science had more than one method, and he recalled the memorable sitting some twenty years ago when Renan received Pasteur into the Academy, and these two great men exchanged words never to be forgotten, Pasteur proclaiming the grandeur of the experimental method as the only infallible instrument of discovery, and Renan claiming for historic and philosophic criticism the share due to it in the conquest and defence of truth.

M. Gaston Paris went on to say :—

"This science of which Pasteur was the priest and the prophet, this science to which we owe so many marvels, is accused of not having kept certain promises, some of which have been made by representations that it disowns, and others of which can only be realised with time. A special reproach made against it is that it is not yet ready to provide humanity with the moral direction of which it stands in need. Science might reply that it does not extend its empire so far, and that other forces which it does not deny are destined to do in the field of sentiment and action what it does in the field of knowledge. But it can, and rightly, as Pasteur affirmed, lay claim to its large share in this moral direction itself. If, unfortunately, it is not certain that in pointing out in the social instinct the true basis of morals, it assures to this instinct predominance over selfish instincts, it is certain that in drawing tighter the bands that bind men together, in undermining the barriers which still separate them, it renders easier and indicates as nearer at hand the civilisation of the world as a whole. . . ."

"Science, in the circles where it is honoured and comprehended, does not restrict to men of science themselves the moral benefit which it confers. It diffuses in wider circles the love of truth and the habit of seeking it without bias, of recognising it only by unalloyed proofs, and of submitting docilely to it. I think that no loftier or more fruitful virtue can be inculcated in a nation."

THE PHOTOGRAPHIC OBSERVATION OF CLOUDS.

IT is a commonplace to say that the phenomena that present themselves most frequently are also those that are least observed with accuracy and intelligence. The ever-changing aspect of our sky, and the screen of vapour covering that adds charm to landscape and variety to scenery, present numberless opportunities for study and critical examination, but they have long waited for adequate description and representation. It was not till the beginning of this century that any special nomenclature was invented to describe the alterations that take place from hour to hour, and the very slight additions that have been made to this special vocabulary since Luke Howard proposed the three well-known terms of description, show the neglect from which this department of meteorology has suffered. These terms, too, though they have become the common property of all nations, are limited to description, and suggest nothing of the physical causes that determine the appearances he so happily described. Indeed, meteorology in his day was not in a position to push the inquiry with hope of success, and it may even still be urged that the explanations offered to account for some of the recognised types of cloud formation are largely speculative. This neglect of a very charming study has been brought about, not only by the fact that clouds are of ordinary every-day occurrence, and therefore not worth noting, but students of practical meteorology have perhaps too much considered that barometer and thermometer readings are the one thing needful, and have looked to the preparation of a weather chart as a veritable sheet-anchor to maintain and support the position of the science. For hitherto the general character of cloud observation among even painstaking meteorologists has been lamentably insufficient. A rough personal estimate of the percentage of area covered by cloud is frequently all that is given, with very little reference to the distance from the zenith at which these clouds are seen, and consequently neglecting the effects of foreshortening. Altitude, density, direction of motion, character of formation have all been regarded as of small consequence, but it is to be hoped that an epoch of more useful and more exact observation is dawning and possibly we may run into the other extreme, now that attention is being called to the subject, and devote too much time to the consideration of these fleeting appearances, and accumulate more results than can be effectively studied.

It might have been anticipated that artists, who maintain so constantly that they reproduce precisely what they see, would have given us pictures of clouds in some degree approaching to accuracy, and have made the discussion of their forms and characteristics easier for men of science. But as a rule the study of these specialists has scarcely been more exact or painstaking than that of the ordinary public, who, from the causes hinted at, are especially unfitted to apply that wholesome criticism which might have resulted in promoting more accurate representation. We believe there is a case on record in which a painter represented a rainbow with the colours reversed. This was unwise, because a rainbow being a rarer phenomenon than ordinary clouds, it has attracted more attention from the public, and the error was noticed. But faults as egregious too often accompany artistic production of clouds, and pass without censure or remark. Painters may make rain fall from a thin strip of cloud, or from impossible cumulus, and escape without ridicule. But these are freaks it is no longer safe to indulge in.

The artist, too, who paints by sunlight and without the aid of brushes and colours, is often as glaringly incorrect as his more respected and ambitious brother. We have

heard in the past, we know not with what truth, of artfully-placed pieces of cotton-wool on the printing frame, and of other devices, which, by judicious handling, have been made to give an appearance remotely resembling that of natural clouds, and that competent judges have been deceived by these means. A great authority on photographic reproduction has laid it down as a rule that the same "sky" should not be printed on more than one picture; and that such advice should be considered necessary, shows the length to which ingenious fraud has been carried in this matter. And yet it might be thought that if accurate reproduction of cloud-forms was attempted anywhere, it would be found in photographs of landscape. Some of the reasons for its non-appearance, very well known to practical photographers, have recently been discussed in *NATURE* (No. 1367), and valuable suggestions made to overcome these

the camera, scientifically used, that we must look for the best results. Every day sees these results accumulating, and, as a necessary consequence, the introduction of greater uniformity in the classification and nomenclature of cloud observations. Also, greater and more frequent use suggests numerous devices to the expert, by which he may win more trustworthy pictures of the lighter forms.

It is now possible to reproduce very light cirro-cumulus clouds, and though some of the delicacy of the original may be lost in the method of printing, sufficient detail remains to enable one to judge of the success that attends the processes that Prof. Riggenbach, of Basle, and others have successfully advocated. Prof. Riggenbach avails himself of the fact that, while the light from a cloud is only slightly polarised, the light from the blue sky is much more so, especially at points which are 90° from

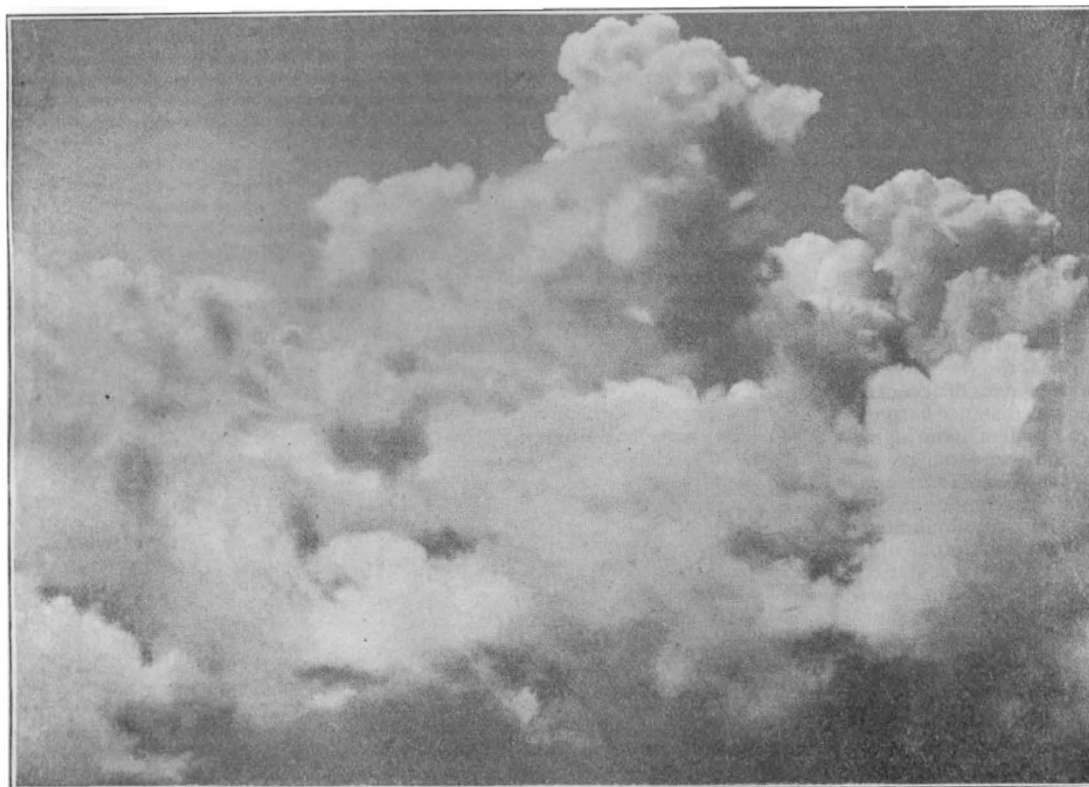


FIG. 1.—Cloud, photographed at an altitude of 2500 m.

difficulties. The photographer does not always wish to reproduce the actual state of the sky at the time his photograph was taken. He thinks he can produce a better artistic effect by employing clouds of his own manufacture; but, apart from this, there is an inherent difficulty in obtaining a satisfactory negative of the lighter forms of cirrus and cirro-cumulus. The blue colour of the sky has practically the same chemical action on the sensitised plate as that exercised by the white colour of these fleecy clouds, and the contrast on which the photographer relies for his effects is wanting. The rules of procedure there given have resulted in some excellent representations, of which specimens will be found in the recently issued *International Cloud Atlas*, a work that may possibly revolutionise our methods of cloud observation.

Although the processes of photography have been sadly abused, it is undoubtedly to the employment of

the sun. By employing a Nicol prism, therefore, the skylight may be darkened to a very considerable extent, while the fleecy filaments of the cloud will come out with greater sharpness and distinctness. A dark mirror may be employed instead of the Nicol prism, and a still simpler means is to use the still surface of a lake as a polarising mirror. When clouds have an altitude of about 37° , and differ in azimuth from the sun by about 90° , they can be photographed in this way with ease and truthfulness. Another method which secures admirable results, though it may not be at the disposal of every one, is to photograph the clouds directly, at a considerable elevation above the sea-level. Here, on the top of a mountain summit, the sky appears much darker than in the plain, caused probably by the absence of scattered light from dust particles, which are more numerous in the lower strata. The observer, too, has the additional advantage of lessening the distance between himself and the cloud

photographed. Our first illustration (Fig. 1) shows the appearance of a cumulus cloud as seen from the top of the Santis Mount at a height of 2500 m. At this elevation a yellow glass placed in front of the lens is all the protection needed. The other picture (Fig. 2) shows that excellent results can be obtained at the sea-level with proper chemical treatment of the negative. These pictures were taken by Prof. Riggenbach, who kindly permits their reproduction, and both appeal to us by their evident fidelity.¹

But it must not for a moment be supposed that the object sought is to secure pretty pictures, or even accurate pictures. In clouds we have portions of the atmosphere which, from natural causes, have become temporarily visible, and as clouds exist at practically all heights above the surface, their study must reveal to us something of the behaviour of the atmosphere at otherwise inaccessible points. Wind and currents of the atmosphere, to say nothing of the vertical displacement of large masses of the air, must betray themselves by the motion of the clouds, if the cloud movements are interpreted correctly; and the connection between wind and "weather" is so intimate, that the possibility of predicting the one depends in a large measure upon our knowledge of the other. The definite knowledge of the height of a cloud, and the means of accurately determining its distance becomes, therefore, a problem of the highest importance in meteorology, and it is one in which, fortunately, photography can render efficient assistance. If two simultaneous instantaneous photographs of the same cloud be secured at stations, distant possibly half a mile apart from each other, the height of the cloud can be determined by trigonometry. This process has been carried out systematically at various observatories. Two observers, a suitable distance apart, and in connection with each other by telephone, select a cloud by arrangement to which each points a camera, and the simultaneous exposure is effected by one of the operators releasing the shutters of both cameras at the same instant. Considerable impetus has been given to inquiries of this nature, not only by the possibility of greater accuracy being secured to the photographs when improved methods have been employed, but by the action of the International Meteorological Congress, who, mainly at the instance of M. Hildebrandsson, have arranged a scheme by which observers in all countries are invited to take part in a common investigation, which has for its aim the determination of the altitudes and the motions of different

kinds of cloud. Theodolites can also be used advantageously in this work. This scheme, which was originally contemplated to be in force for one year from May 1896, will soon be completed, and will add materially to our knowledge of the motions of the clouds, and, by inference, of the motion of the atmosphere. The observation of the behaviour of a kite, when at a considerable elevation it plays in some measure the part of a cloud, can be made, in skilful hands, to reveal the direction of

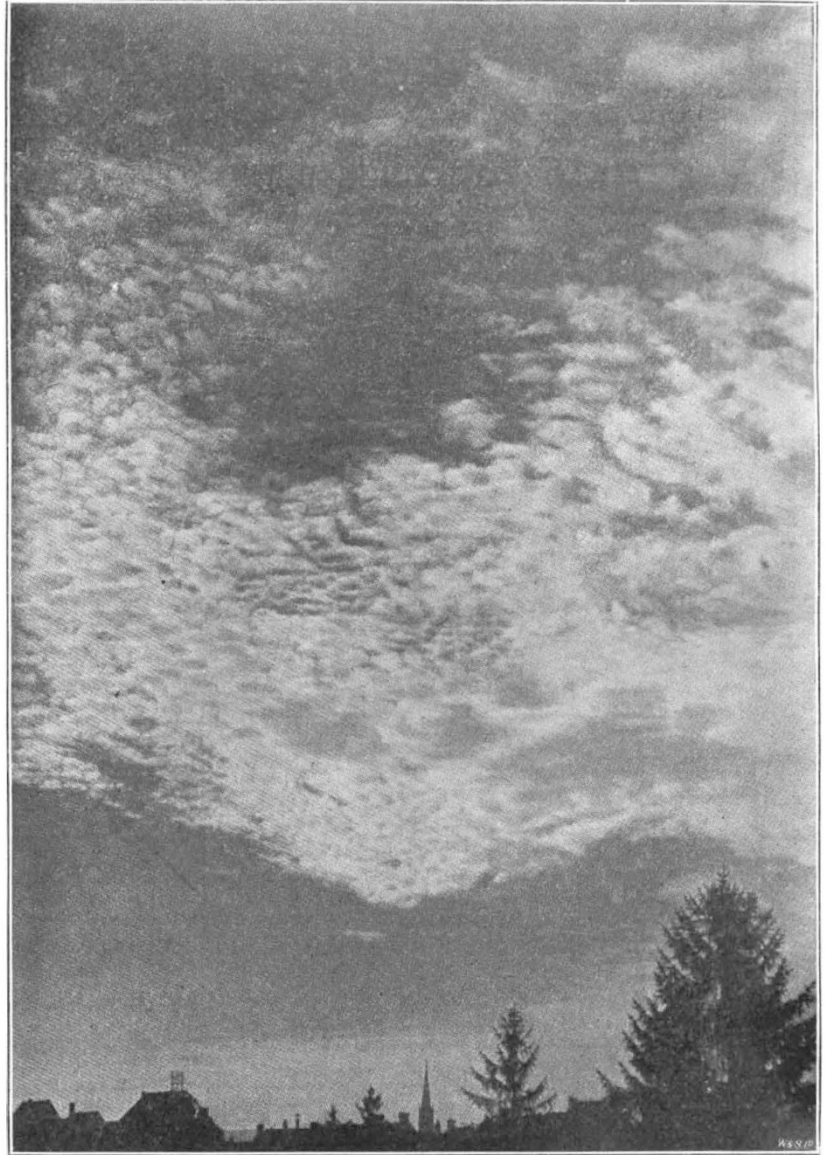


FIG. 2.—Clouds, photographed at low-level station

atmospheric currents at generally inaccessible heights. This method, which is being actively prosecuted under the auspices of the Weather Meteorological Bureau of America, has the advantage that the height of the kite is always approximately known, and is free from eddies and currents likely to be produced by irregularities on the earth's surface. Moreover, if the object of cloud observation be not so much the methods of formation as the study of air currents, kite-flying is likely to afford on

¹ M. Plumandon, of the Puy de Dôme Observatory, has also sent us some excellent specimens of his work, but the photographs arrived too late to be reproduced.

some grounds more accurate information, because a cloud produced under peculiar circumstances, such as a mountain-cloud cap, for example, may appear stationary under even a strong current of wind.

As an instance of another welcome result that attends cloud photography, we might refer to the confirmation it affords of recent mathematical investigation concerning the origin of cloud. Herr von Helmholtz has demonstrated that when one current of air passes over another of different density or different temperature, waves must arise at the two surfaces in contact, similar to those produced on water under the action of wind. These atmospheric waves are, however, of quite different dimensions to the ordinary water-wave. The distance between two contiguous crests in the atmosphere is incomparably larger than the similar wave-length in water, and, indeed, may be reckoned in kilometres. Air waves become visible when sufficient moisture is present, and the wave-crests can be seen in the form of clouds presenting the appearance of parallel billows, and for which the name of "Wogen wolken" has been suggested. In this form they have been repeatedly photographed. A well-known example that has been frequently reproduced, has been taken from the Lick Observatory. From other elevated stations, where the conditions have been favourable, pictures of these nebulous waves have been secured, proving the justness of the views held by Helmholtz. A mass of alto-stratus cloud will frequently show that a subsequent stage of the process of formation has been reached. When the regular parallel billows produced between strata of air have met other currents having different velocities and densities, the result is to break up the regular form into more or less lozenge-shaped pieces, of which the appearance is very familiar, and the methods and terms of description equally numerous. To do away with these vague terms of description, and to substitute others which may have closer reference to the physical structure, and perhaps indicate something of the relative heights of clouds, is one result for which we may look from the more satisfactory application of photography to cloud phenomena.

NOTES.

AT last Thursday's meeting of the Royal Society, the following words of congratulation were addressed to Lord Lister, the President, by Sir John Evans:—"As Treasurer and as one of the older of the Fellows of this Society, I beg to offer you on their behalf and my own our most hearty congratulations on the high yet well-merited honour that Her Majesty has been graciously pleased to confer upon you by elevating you to the Peerage. We have great satisfaction in feeling that, while this distinction is a fitting recognition of the value of your life-long labours in invoking the aid of science to the relief of suffering humanity, it comes at a time when this Society has the honour and pleasure of looking up to you as its President. If anything could add to that satisfaction, it is the fact that with your new dignity you are still able to retain the name of Lister, for the name of Lister, among the inhabitants of all the civilised countries of the globe, is 'familiar in their mouths as household words.'"

WE understand that Lady Prestwich is collecting material for a biography of the late Sir Joseph Prestwich, and will be grateful to friends if they will forward to her any letters they possess, addressing to Shoreham, near Sevenoaks. These will be at once copied and carefully returned.

A GERMAN antarctic meteorological station will be established shortly in Victoria Land, under the direction of Dr. Rudolph Mewes. The station will be in connection with the German South Polar expedition, and will have for its object the determination of meteorological conditions during the antarctic winter.

DR. NANSEN will lecture upon his Arctic expedition, at the Royal Albert Hall, on Monday next, at 9 p.m. A Reuter dispatch from Christiania says that during his visit to Great Britain Dr. Nansen will deliver forty-seven lectures. The explorer will then go to Germany, and at the end of March will be present at a great demonstration of the Geographical Society in Berlin, organised in his honour. On leaving Berlin Dr. Nansen will go to St. Petersburg, where he will have an official reception. Subsequently he will visit Paris in response to an intimation conveyed to him by the French Consul-General in Christiania, and will again be the object of an official reception. Early in October next, accompanied by his wife, Dr. Nansen will leave for New York, in order to deliver a course of fifty lectures in various cities of the United States.

IT may be remembered that a sum of money was raised, and placed in the hands of the Royal Society, to found a scholarship in honour of Joule. The Council of the Society resolved that the scholarship should be awarded alternately in England and in other countries, for the purpose of encouraging young investigators to walk in the steps of Joule. In accordance with this decision, the Royal Society asked the Paris Academy of Sciences to nominate a candidate for the award this year; and we learn from *La Nature*, that the Committee appointed to consider the claims of young French physicists have selected M. Jean Perrin, of the École normale, for that distinction.

DR. CLEGHORN, Sanitary Commissioner for Bombay, is the special Indian medical expert selected by the Indian Government to attend the International Conference, to be held in Venice on February 10, to consider what means Europe should take to control the bubonic plague, should that disease advance towards the confines of Europe. Dr. Thorne Thorne, principal medical officer of health to the Local Government Board, has accepted the appointment of British Technical Commissioner at the same Conference.

THE honour in which Pasteur's name is held throughout the world is shown by the fact, announced in the *British Medical Journal*, that the subscriptions in France and other countries for a statue to the great investigator now amounts to more than £10,000. M. Paul Dubois has been selected as the sculptor, and the site for the statue will probably be the space between the Rue de Médecin and the Luxembourg Gardens. More than £20,000 has already been spent in the erection of statues of Pasteur in various parts of France. As an instance of the high regard in which he is held outside that country, it may be mentioned that the municipality of Mexico has given the name of Pasteur to the gardens situated in front of the National School of Medicine in that city.

WHEN the regulations for the muzzling of dogs in London and adjoining counties came into force at the beginning of last year, it was pointed out in these columns that rabies could not be stamped out by leaving local authorities to deal with it. The welfare of adjacent districts is so closely involved, that to place in the hands of different County Councils the power to enforce regulations for preventing the spread of disease, which knows not county boundaries, is absurd on the face of it. The only way to effectually cope with the evil is for some central authority, as, for instance, the Board of Agriculture, to compel joint action on the part of authorities having control over the areas where rabies exist. A muzzling and registration order so enforced for a couple of years would, in all probability, bring about the disappearance of the disease from our island. The report, just issued, of the Departmental Committee of the Board of Agriculture, appointed at the end of last April, "to inquire also and report upon the working of the laws relating to dogs," bears out this opinion. Statistics are quoted to support the con-