

mentary to us as a nation to say that our patriotism, fear of death, or nerves compare unfavourably with similar attributes of the Japanese; and, after all, this is a matter of opinion. The fact to face is the transformation which science has effected in Japan, and the sooner our statesmen are educated to see it, the more promising will be the outlook for the British nation.

#### SOLAR CHANGES AND WEATHER.

**D**URING the last few years more than usual attention has been paid to the question of the relationship between sun-spots or prominences and "weather," and to the possibility of being able in the near future to forecast the characters of approaching seasons. Quite recently in this Journal (vol. lxxi, p. 493, March 23) we referred briefly to a pamphlet published by the United States Department of Agriculture, Weather Bureau, summing up the general state of the problem of long-range weather forecasting. In this it was stated that advances in the period and accuracy of weather forecasts depend upon a more exact study and understanding of atmospheric pressure over large areas, and a determination of the influences, probably solar, that are responsible for normal and abnormal distributions of atmospheric pressure over the earth's surface.

In the April number of the *Popular Science Monthly* the question of the relationship between sun-spots and weather is summarised in an article by Prof. Ernest W. Brown, of Haverford College. In this we have an interesting account of the problems waiting solution, and he brings together in a very clear manner a general survey of the relationship; or rather non-relationship, as he concludes to be the case. Thus he says, "it is highly probable that the direct effect of the spotted area is unimportant compared with the effects produced in our atmosphere by other causes." In his final summing up he remarks that his opinion is expressed by Prof. Cleveland Abbe, who stated that:—"The key to the weather problem is not to be found in the sun or indeed in any external influence, but that the solution is to be worked out by the conditions which hold in the atmosphere itself—conditions which can only be discovered by a thorough examination of the internal laws of motion, quite apart from any external forces which may modify the results."

In referring to the difficulties which are met with in examining the meteorological conditions on the earth's surface, Prof. Brown points out that observations made "at one place should be kept separate from those at other places, for it is theoretically possible and even probable that a maximum at one place of observation may occur at the same time as a minimum at another place. For example, the yearly averages might show that a maximum rainfall in one place always occurred with a minimum rainfall in another and *vice versa*."

In the last quotation Prof. Brown makes a suggestive remark which recent work has shown to be an actual meteorological fact; it has already been completely established for pressure, and must therefore hold good as regards rainfall, since the latter depends on the former.

In the case of these variations of barometric pressure it has been shown, and referred to at some length in this Journal (vol. lxx, p. 177, June, 1904), that there exists a barometric see-saw on a large scale the presence of which has been amply corroborated by Prof. Bigelow, of the United States Weather Bureau. There seems little doubt that it is this pressure change that will eventually prove the "key" to the situation, and its solar origin has

already been suggested in the changes in the frequency of prominences, which are, after all, allied to sun-spots.

Up to the present time those who have been attempting to explain variations of weather on the supposition of solar changes have been looking for the effect of solar action as either increasing or decreasing simultaneously the rainfall over the whole earth. The consequence has been that a study of a great number of statistics has shown that in some regions the rainfall varies directly with the number of sun-spots, and that in others the variation is inverse, while, again, in other parts there seems to be no apparent relation at all. In fact, these deductions, though quite correct, have led to the conclusion that the solar connection is of a very questionable character, as it was considered impossible for such opposite results as the first two just named to have their origin in one solar change.

It is the employment of this incorrect working hypothesis that has probably retarded the progress of the study of the connection between solar and meteorological changes.

The now recognised existence of this barometric see-saw shows that the sun's action must have a *double* effect on our atmosphere, and this of an opposite nature. Such a result is quite natural, and it is curious that use has not been made of it before.

When it be considered that the amount of air in our atmosphere is a constant quantity, a greater piling up of it on one side of the earth must necessarily mean a diminution in the antipodal regions. If greater heating power of the sun takes place, then the atmosphere must also be heated to a greater extent, and consequently more intense up-currents of warm air are formed, resulting in more pronounced low-pressure areas. There must, however, be a compensating effect somewhere, and this is found on the opposite side of the earth when the previously heated air arrives, descends, and creates an area of excess pressure.

This backward and forward transference of air becomes, therefore, of great importance in studying the weather changes in any one region, because the rainfall phenomena are so closely related to the pressure changes.

Away from the middle portions of those two large areas which behave in this see-saw manner, the variations of pressure should, and actually do, have a different periodic nature. It is of extreme importance, therefore, when trying to trace the sun's action on our atmosphere, to separate the regions over which the variations may be truly solar from those which exhibit variations modified by the mechanism of the atmosphere itself.

There is therefore no reason why we should take a pessimistic view of the attempts made to solve this fascinating riddle of the relationship between changes of solar activity and the vagaries of the weather. An enormous amount of accumulated material is ready for discussion, and efforts should be made to secure the continuity of these observations and at the same time to coordinate the data along lines most suitable for this particular research.

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#### THE SURVEY OF INDIA.<sup>1</sup>

**T**HE extracts from the narrative reports of the Survey of India for the years 1902-3 are contained in a thin and attenuated volume of some eighty pages, which, as compared with previous reports, represents the effects of Indian financial economy applied to one of its most interesting departments.

<sup>1</sup> "Extracts from the Narrative Reports of the Survey of India for the Season 1902-3." (Calcutta: Government Printing Office, 1905.) Price 2s. 3d.



A committee is now sitting somewhere in India to decide on the best method of increasing the efficiency of the Indian survey department from the point of view (amongst others) of the English expert. It may be doubted whether the Indian surveyor has much to learn from the English expert, excepting in the science of map reproduction; but it may be that the Indian financier will learn therefrom that the way to improve and develop a department is not to starve it under the pressure of each successive spasm of financial depression but to give consistent support to its work in the field and encourage the publication of such results as are of world-wide interest. Compare this half-starved production with the survey reports of North America, of Canada, of any Continental country, or even with the intermittent publications of South America, and it would really appear as if India offered no field for scientific research that was worth a descriptive record. The report is unworthy of the Government of India.

There is apparently but one triangulation party now existing in India which works on geodetic principles, and this is gradually pushing its network of triangles through Burma, giving a good basis for two topographical surveys to extend their minor triangulations and lay out a framework for detailed mapping. Only these two topographical parties figure in the report, and the narrative of their progress is confined to the dullest of all dull statistics. Yet one of them is working in the Shan States on the Chinese frontier, where, if anywhere in the eastern world, there must be a most delightful field for new experiences and original observation.

Of geographical exploration on or beyond the Indian frontier, or of scientific investigations in the Himalayas, there is not a word in the report; nor, for that matter, is there the faintest reference to the solid work of the revenue and forest surveys which are spread in more prosaic form over half the continent. Possibly there may be much of really stirring narrative rendered by the officers concerned in trans-frontier work to which it is not deemed well to make any allusion. This is comprehensible on the grounds of political prudence, but the worst feature of this form of suppression is that it is apt to be permanent. A report once pigeon-holed in an Indian office might almost as well be solemnly committed to the earth with a spade. The man who wrote it, and who knew what he wrote about, leaves India at the mature age of fifty-five, and thereafter has nothing further to say to it. His opinion is never consulted, and it becomes merely a matter of academic interest to him to watch a new generation of frontier administrators floundering along by the light of experiences gained, let us say, in South Africa or in Egypt. He faintly wonders what has become of all the detailed information of the Indian frontier gathered in his time at the cost of so much labour and expense.

There is, however, doubtless much to be learnt from the series of tidal, levelling, and magnetic tables which take up nearly fifty of the eighty pages of the report, although it is not easy to recognise their claim to be considered narrative. Presumably these tables are published for the benefit of the comparatively few men of science who are interested in these special classes of investigation, but they hardly seem to justify the title of the report, and should certainly be preserved (as they probably are) in other forms more readily accessible for purposes of reference.

There is an account of a local survey (including levelling operations) which was undertaken for the benefit of the salt revenue department in order to ascertain the source of the Sambhar Salt Lake water supply. The result of the investigation would have been interesting had it been stated. The lake was

surveyed thirty-eight years ago, and the source of supply carefully examined then. Probably the report was pigeon-holed.

It would be pleasant to congratulate Colonel Longe on the success of his first administrative report as Surveyor-General of India, but, as a matter of fact, it is obvious that hardly even the skirts of narrative have been touched so far as the Survey of India is concerned, and we can only hope that there may be another and a more comprehensive report issued hereafter in some other form.

T. H. H.

#### NOTES.

It cannot be too often emphasised that Japan owes its triumphs chiefly to the adoption of the scientific spirit as the essential principle of national progress. The State that accepts this axiom of practical politics secures for itself a place among leading nations; while, on the other hand, the country that gives little or no encouragement to science must fall behind in the future. The Paris correspondent of the *Times* states that this view is taken by M. Ludovic Naudeau, who, in the course of a telegram from Tokio on the causes of the Russian defeat, remarks:—"It is now idle to attempt to hide the fact that never was the Russian lack of science, of the modern spirit, or, to speak frankly, of intelligence—never was the absence of training and of enthusiasm which retards the efforts of the whole Empire displayed in a more melancholy fashion than in the Sea of Japan. All the Russian inferiority is in the intellectual sphere." We understand that even in the midst of the war, the subject of education is being keenly discussed in Japan. In our own country it is necessary to urge that satisfactory provision for the future can only be made by taking a wide view of scientific education, and by insisting that all who have the affairs of State under their control should possess such a knowledge of the methods of science as will enable them to understand that the most potent factors of success in the arts of peace or of war are scientific education and research.

UNDER the name of the Potentia Organisation, an international association has been formed with the object of establishing among nations a mutual relationship and cooperation for the diffusion of accurate information and unbiased opinion concerning international events and movements, and to combat narrow, prejudiced, and often interested views and news that contribute so much to international mistrust and misunderstanding. It is proposed to publish throughout the world, through the medium of newspapers and reviews, statements of simple fact and expressions of opinion by eminent public men of all nations on all important political, social, philosophical, economic, scientific, and artistic questions, to present the sincere views of experts on all current international events, and to refute false or biased news and views calculated to spread error and to endanger the peace and progress of the world. A cosmopolitan alliance of this kind should meet with many adherents in the world of science, in which the sole aims are the discovery of truth and the extension of natural knowledge. We trust that the organisation will do something to show that scientific culture is at the foundation of all national progress.

MR. STANLEY GARDINER, leader of the Sladen Trust Expedition for the exploration of the Indian Ocean between Ceylon and the Seychelles in H.M.S. *Sealark*, has sent Prof. Herdman a letter from Colombo (May 7) in which he gives the following provisional programme:—Leave