during the excursion. It was a subject for complaint during the Russian meetings of 1897 that banquets played perhaps a more important part in the excursions than visits to exposures. We had nothing to complain against the excursions except that some were long days, nor can we say that banquets were too few for we were treated generously everywhere—from picnics in a Bashkirian forest to a banquet in the Kremlin itself. We found the U.S.S.R. to be a geologists' paradise. Nothing seemed to be done in mineral prospecting, the development of mines, the exploration of oil-fields, the erection of metallurgical works, the construction of canals and other engineering structures, and even in the reclamation of lands, without the opinion of the geologists engaged in that district or in direct consultation with the geological authorities in Leningrad.

Each mineral industry—gold, coal, petroleum, salt, mica, phosphates, etc.,—has its own so-called Trust which may have branches all over the U.S.S.R. There is exploration everywhere and mineral and metallurgical works are in course of erection in various parts of the vast territories of the U.S.S.R., which are equal to half the area of Asia and fully four times that of India—yet with a population only half that of India. We were almost bewildered by the immense activity we saw wherever we went throughout the length and breadth of Russia, and it is not too much to say that the enthusiasm of those engaged and their intense pride in all their work showed that a nation had been established and is going forward. Our unbelief in the vast claims slowly disappeared as we travelled and met geologists almost everywhere and saw their maps, their mines, their technical schools and colleges. Somehow it was no shock to us when we learned that over 10,000 geologists were engaged on State surveys or in the Trusts or in Universities and other scholastic institutions. Their equipment is not equalled in India, their museum collections (especially those in Leningrad) are splendid and well housed, their research laboratories are lavishly supplied and their work is equal to any geological work. In physics and chemistry, in geo-chemistry and geo-physical work they have little to learn from other countries. In fact it is difficult to express in words the high standard of the work—whether it be connected with the atomic structure of elements, the study of crystal structure, the synthetic production of minerals, the investigation of mineral associations in ore deposits or pegmatites, or palæontological and palæobotanical determinations—that is being steadily and carefully done in numerous centres.

It may be said that the scientific standard of work is set by the Institutes controlled by the Academy of Sciences, while the efficiency of geological work—mapping, mineral study, etc.,—is guided by the Geological Survey Committee and the Central Geological and Prospecting Institute for Scientific Research (TsNIGRI) in Leningrad. It must not be concluded that a geologist is free to do research work at his own time all the days of his life. This is not the view of the Academy and Survey authorities who are responsible to the Soviet Government from whom the generous grants are obtained for scientific research, expeditions, surveys, prospecting and for exploration and development. The mineral resources of the U.S.S.R. have not only to be found, studied and estimated, but must supply the needs of the country's industries. With all land and minerals belonging to the people, under the control of the Government, nationalization of industries is a fundamental matter and so a great deal can be done to co-ordinate development. It is the policy of the Government to make each Autonomous or Union Republic dependent on its own mineral resources for its industrial wants. Consequently geological search is widespread through the U.S.S.R. Geologists vie with each other to make discoveries and, as may be imagined, subject each other's discoveries to severe scrutiny. It is not wise to claim more than you can justify and there is little place for a geologist lacking energy—the expenditure on his training must be justified either by hard work or great ability.

The point of the Seventeenth International Geological Congress was to show us that Russia is second to none in geological work and we must admit that they have proved all their claims and congratulate them for showing the value of the geologist to their Government.

Weather Prediction.

UNDER the auspices of the National Institute of Sciences of India, a Symposium on Weather Prediction was held in the Meteorological Office, Poona, on the 25th and 26th July, 1938. Various aspects of forecasting of weather were discussed at the Symposium, attention being focussed mostly on the problems facing the Indian meteorologist and the proposed or attempted methods of solution. Thus, papers presented at the meeting concerned long-range forecasting for a whole season as developed in India, medium range forecasts for 10-day periods as developed by the German and Russian Schools, short-range, *i.e.*, day-to-day, forecasting in India with special reference to the use of air mass analysis in this task, the use of upper air data in weather forecasting, thermodynamic studies of the atmosphere with special reference to latent instability, rainfall in north-west India associated with winter disturbances, weather forecasting for aviation and the application of kinematical methods to forecasting.

In his opening remarks PROF. M. N. SAHA, the President of the Institute, referred to the fascination which the art of weather prediction held out to man from the earliest times, to the development of the synoptic chart in this country from the time of Blanford and Eliot and to the subsequent contributions made by the Indian meteorologists to the art and science of weather prediction.

DR. C. W. B. NORMAND welcomed the visitors

to the Symposium on behalf of the Meteorological Department and reviewed briefly the complexities of the problems which faced the meteorologist. At one time, it was sufficient for the forecaster to restrict his attention to rainfall alone. Now the conditions had altered largely: the meteorologist had not only to forecast for storms over the sea and land but had to warn the airman who wanted detailed forecasts of upper winds, of height of clouds, of fog, dust-storms, squalls, etc. A variety of requirements had thus to be satisfied and yet his decisions had to be made quickly. There was no time for lengthy calculation such as would be necessary if he desired to, and could, write complex mathematical equations relating to the weather situation at any instant and solve them to obtain the picture at a future instant. The most hopeful method from the practical point of view appeared to be to focus attention on the identification of air masses, homogeneous within themselves, and to the effects which a mutual interaction between the several air masses would produce. India was the country in which most attention had been paid to the subject of seasonal forecasting and yet, the most that we could do to-day was to give a very general indication of total rainfall over large tracts of the country for a period of two to four months. Dr. Normand concluded by giving a brief general survey of the different aspects of the problem which was to be dealt with in detail by the subsequent speakers.

DR. S. R. SAVUR told the story of seasonal forecasting in India. The first forecast of monsoon rain, mainly based on the data of snowfall on the Himalayas and the Sulaiman range during the preceding January to May, was issued by Blanford in 1886. Eliot who succeeded Blanford added other factors like the southeast trades at Mauritius, Zanzibar and Seychelles, data of south Australia and Cape Colony and " Nile Flood ". But in his method which was mainly graphical, there was much chance of individual bias. A great improvement in foreshadowing monsoon rainfall resulted when Sir Gilbert Walker introduced the more impersonal method of correlation coefficients in place of Eliot's graphical method. The first forecast using a regression equation was issued by him in 1909. In 1924, he worked out six formulæ for forecasting rain in the Peninsula, northeast India and northwest India in which use was made of some 28 factors selected out of a large number after applying the statistical test, now named after him. Mr. Field, the pioneer of upper air work in India, was responsible for suggesting a new factor of special interest, as he was the first to make use of upper air data in seasonal forecasting; his factor is the upper winds of Agra in autumn, to foreshadow the winter rains in northwest India. The re-examination of the data in recent years and the application of the Performance Test showed a diminution in the significance of some of the factors. Nevertheless the total correlation coefficient is still found to be 0·63 for total monsoon rainfall of the Peninsula and 0·64 for that of northwest India and 0·72 for the winter rains of northwest India. The seasonal forecasts issued at present are for (i) the winter rainfall during January to March in northwest India, (ii) the monsoon rainfall during June to September in northwest India and the Peninsula and (iii) the monsoon rainfall during August and September in the same two divisions. Efforts were being made to decrease the period of the forecasts and also the area which they covered. Dr. Savur emphasised that methods of correlation were strictly applicable only when all the quantities correlated varied according to the normal law of distribution. To overcome the handicap introduced by non-normality of distribution found in practice, general methods were being developed but the work was still in its initial stages.

Coming to medium range forecasting, MR. S. BASU explained the method developed by Franz Baur of the German Meteorological Service for forecasting for 10-day periods, a method which depended on a suitable combination of statistics and synoptics. He also explained the composite map method of forecasts developed in Russia by Multanovsky and his collaborators in which the time interval for the forecast was dictated by the prevailing weather situation, each type of synoptic system having its own characteristic persistence. Mr. Basu briefly discussed the possible application of these methods to Indian conditions.

DR. S. N. SEN explained the methods adopted in daily forecasting practice for identification of air masses which, broadly speaking, fell into two classes, oceanic and continental, but could be subdivided into several sub-classes. He illustrated by means of charts certain types of stationary fronts which often developed over the Indian area. He also showed how use was made of stream lines and convergence patterns of air currents aloft deduced from pilot balloon data and cloud movements, along with a knowledge of upper air climatology for identification of air masses and day-to-day forecasting.

DR. PRAMANIK spoke on the application of air mass analysis to the problem of forecasting nor'westers in Bengal.

DR. K. R. RAMANATHAN gave a brief review of the development of upper air work in India and explained how the data helped the issue of forecasts relating to conditions on the ground as well as in the upper air. The data provided the basic information regarding the climatology of the upper air and helped intensive studies of the structure of atmospheric disturbances. He gave a few instances of the use of these data in such studies. For instance, he showed how warm fronts somewhat similar to those in European latitudes were found to be associated with storms and depressions in the Bay of Bengal. The two air masses between which the front formed were the dry cold air from northern India and the moist equatorial air from the south Bay. A modified type of front was associated with the storms of the premonsoon season. In monsoon depressions the main front formed between fresh monsoon air and old monsoon air, the former behaving as a cold mass and the latter as a warm mass. Dr.

Ramanathan also showed a picture of the general circulation of the atmosphere over India as obtained from pilot balloon ascents made for the past few years in this country.

The role of latent instability in the atmosphere formed the subject of an interesting communication by DR. N. K. SUR ; in the absence of the author the paper was presented by DR. R. ANANTHAKRISHNAN. The term ' latent instability ' which was defined by Normand in 1931 referred to a thermodynamic state of the atmosphere in which, under suitable circumstances, the initial expenditure of a small amount of energy led to the release of a much larger amount of energy. Absence of latent instability was ordinarily associated with dry fine weather with occasionally high clouds of the non-convectional type, while its existence was associated with convective clouds or instability phenomena like dust- or thunder-storms. Interesting series of soundings taken during the formation of storms in the Bay of Bengal and their movement showed the progressive building up of latent instability conditions as a disturbance approached the station and its disappearance as it moved away or dissipated.

MR. S. P. VENKITESHWARAN read an interesting paper on rainfall due to winter disturbances and the associated upper air temperatures over Agra.

DR. S. K. PRAMANIK spoke on the use of upper air data in day-to-day forecasting and illustrated his remarks by charts.

MR. P. R. KRISHNA RAO discussed the problems which demanded attention in weather forecasting for aviators which could be divided into three categories : (i) regional, (ii) route, and (iii) local. In regard to local forecasting he explained the use being made at Karachi of tephigrams of aeroplane ascents in forecasting local convectional phenomena and formation, persistence or clearing of clouds. The soundings by aeroplanes had afforded a valuable aid in this task. He also referred to the question of fog forecasting and remarked how the Taylor Diagram had not proved very successful except in ruling out days when fog was unlikely.

The use of kinematical methods in weather forecasting as developed by Dedebant and Pettersen was explained by DR. S. K. BANERJI. Whenever any pressure system, such as a cyclone, an anticyclone, a trough or a front was in continuous motion, one could from a knowledge of the changes in the 2 to 3 hour period preceding, calculate the velocity and acceleration of each point of the system and foretell the position and configuration of the system during the next 6 to 12 hours. The deepening or filling up of pressure over an area bounded by two closed isobars was equal to the planimetric value of the barometric tendency within the same area. Dr. Banerji illustrated an application of these and other kinematical laws to certain Indian storms, particularly to explain the curvature of the tracks of the storms.

Lively discussion took place at the end of each of the papers mentioned above.

DR. NORMAN who wound up the discussion referred to the future of weather forecasting. He felt doubtful whether any statistical methods applied to surafce data alone would result in much further advance in seasonal forecasting. Here as well as in other branches of forecasting we had to look to the upper air for further improvements in our forecasting capacity. There lay our hope. More data of soundings of the atmosphere by aeroplanes, radio-sondes or balloon meteorographs were needed for day-to-day analysis of the conditions in the upper air which alone would help us to understand the mechanism that was behind the making of weather.

The proceedings terminated with a vote of thanks to the President proposed by Dr. Normand after which two cinematographic films illustrating the evolution of clouds were shown to the audience.

"Ascu"—A Wood Preservative.*

IT is but some five years since "Ascu"—a patented timber preservative treatment—first appeared on the market. A considerable amount of work, both in India and abroad, has been done on the merits and limitations of the method. In 1933, at the instance of the Railway Board, a distinguished Committee enquired into the suitability of this (and of the Falkamesam) process for treating Railway timber, principally of sleepers. Their findings were published in a Report in which they indicated several lines in which further work was desirable. This mass of literature is apt to bewilder the layman who is not always able to view scientific data in true perspective. Meanwhile, in India, preservative timber treatment is just beginning to win general recognition as part of the normal technique in modern timber utilisation. Therefore, in the interests of the individual user as well of the healthy development of timber utilisation in the country, it is opportune that this authoritative publication has appeared.

A general introduction in the book is followed by a summary of the results of tests with "Ascu". In the third chapter is to be found simple and unambiguous instructions, with the aid of diagrams, of the three methods of using Ascu—brush treatment, dipping treatment and pressure treatment. The detailed data on the "Ascu" tests are set out in ten tables, the last one dealing with tests conducted out of India. The prices at which "Ascu" could be bought in bulk and in

* "*Ascu.*—A Wood Preservative (*Indian Forest Records*, New Series, Utilisation," Vol. I, No. 6). By the Forest Research Institute, Dehra-Dun. Pp. 143–87. Price As. 14 or 1*sh.* 6*d.* Delhi, 1938, published by the Manager of Publications.