

few hundred hectares, and estimates of the quantities of ore available are given as follows:—

French Lorraine	...	...	3100	million tons
German Lorraine	...	...	1841	" "
Luxemburg	...	...	250	" "
Total	...	...	5191	million tons

It may be added that the Briey basin alone, by far the most important of the French ore-fields, is estimated here to contain 2000 million tons, or more than the whole of the German deposits, and it is this particular basin that, as shown above, is the main objective of German rapacity.

There is, however, more in the question than appears even from the above figures of quantity of Minette; it is also a question of quality. The German writer of the article referred to admits that the Briey ore is at least 4 per cent. richer in iron than the Minette on the German side of the frontier, whilst other authorities put the difference at 6 per cent., averaging the German ore at 29 per cent. and the Briey ore at 35 per cent. of metallic iron. No ironmaster will need to be told that the advantage in favour of the French ore is of immense importance, and the German writer shows very clearly how great is the fear of French competition. "From the point of view of the domestic Minette-mining industry," he writes, "it would be a matter for sincere regret if in the German customs area [*i.e.* Germany proper and Luxemburg] the import of French ore were to increase more and more, thus displacing Minette of German origin."

The fear of French competition grew year by year, and in 1913 the same paper, *Stahl und Eisen*, pointed out that owing to the increasing production of the richer French ore, large portions of the Minette of German Lorraine would necessarily have to remain unworked. The anxiety of the plutocratic German ironmasters was becoming evident; they were gradually, by their methods of "peaceful penetration," getting a considerable financial control over the Briey ore-field, but these methods were too slow and too costly for their measureless greed, and they did not hesitate to sacrifice millions of human lives in order to effect their policy of rapine. So recently as October last a Pan-Germanist Leipzig paper was maintaining that Germany must not only keep Alsace-Lorraine, but must also annex the ore-fields of Longwy. It says:—

Before the war France produced annually twenty-two million tons of ore, of which nine-tenths came from the Longwy basin, and Germany extracted annually from Lorraine twenty-one million tons, or, say, three-fourths of its entire output. If therefore Germany keeps the mines of France and of Lorraine, she would have available fifty million tons of iron ore yearly. She would then possess the monopoly of iron ore in Europe, which would furthermore assure continuous work and prosperity to the German working classes.

All this mass of evidence drives home the contention of the writer in the *Fortnightly Review*, and shows clearly how important the German ironmasters consider the ores of the Briey basin to be to them. The present war would have been

impossible had not two British inventors, Messrs. Gilchrist and Thomas, shown how to convert phosphoric iron ores into good steel, incidentally also producing at the same time a slag of a high manurial value; having applied this process, which, by the way, was not discovered until after 1870, to the Minette in the portion of Lorraine already annexed, German ironmasters now want to grasp the rest of this valuable iron-ore deposit, the importance of which has been rendered evident through the basic steel process.

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SCIENCE, INDUSTRY, AND COMMERCE IN INDIA.

LITTLE more than ten years have come and gone since the suggestion was first made that lack of co-ordination, in the scientific departments of India, had often resulted in needless duplication, in useless departmental jealousies, and in the divorce of what may be called economic research from commerce and industry. Under Lord Curzon's enlightened guidance this *impasse* led to the formation of the Board of Scientific Advice for India. Since 1902 each year has witnessed important advances of a gratifying nature, so that it may be said that the annual reports of the Board, of which that for the year 1915-16 is before us, epitomise certain aspects of the scientific work accomplished in India.

The Government of India had previously tried the experiment of subsidising societies and institutions (both in India and England) with the view of delegating to them its responsibility in the matter of science research. This had the effect, not of encouraging the growth of science, but of degrading local scientific men into specimen collectors. The linking together, therefore, within India itself, of the chief scientific departments gave the strength of unity and the courage of public recognition. But has this very necessary reform been carried to its rational conclusion? The chief officers of the following departments constitute the Board: the Secretary of the Department of Revenue and Agriculture (*ex-officio* President of the Board), the Directors of Observatories, of Zoology, and of Surveys, the Principal of the Veterinary College, the Inspector-General of Forests, the Agricultural Adviser, the Directors of the Geological and Medical Services, the Secretary in the Public Works, and the Directors of the Indian Institute of Science and of the Botanical Survey.

But why is education not more directly and fully represented? Surely the utilisation of the chemical and physical laboratories of the universities, and of the services of the professors in charge of these, are obvious directions of economy and utility. So, again, one is tempted to ask, Why has statistics been overlooked? Still again, Why has the Director-General of Commercial Intelligence no seat on the Board? To the non-official mind the Department of Commerce and Industry should very possibly have a co-equal share with the Department of Revenue and Agriculture (and certainly a

stronger claim than that of the Public Works Department) to participate in the deliberations of the Board. But, leaving the great departments of State on one side, there are other very important interests that might with advantage be directly associated with State science, such as the chambers of commerce, the various associations of special trades and industries, the learned societies, the Industrial Conference, the superintendents of museums, the directors of industries, of engineering works, factories, foundries etc., and the experts in charge of the investigations into silk, cotton, jute, paper, timbers, dyes, furs, leather, tea, coffee, etc., both public and private—these and many others need opportunity, guidance, encouragement, or, it may be, direct help. The Board of Scientific Advice will not fulfil its programme of public service until it has designed a working plan that will link up all branches of industry with both official and private science research.

For some reason, unknown to the public, the old office, first designated that of the Reporter on Produce to the Secretary of State and then resident in London, and afterwards that of the Reporter on Economic Products to the Government of India and resident in India, has been abolished and its duties assumed apparently by the officers of economic branches in botany, zoology, geology, agriculture, and forestry. But this new arrangement, while it gains in official influence, fails in public advantage, since it loses touch very largely with commerce. To the merchant it is immaterial whether a resin, a medicine, or a fibre is of animal, vegetable, or mineral origin. If, therefore, he has to go from one State department to another in search of needed information, he may find his patience exhausted long before he has discovered the object of his quest. With a Reporter on Economic Products (and a commercial museum fully equipped with all products, whether of animal, vegetable, or mineral origin) attention could be focussed on the products themselves, not on departmental limitations. It is to be feared that this illustration exemplifies the danger that underlies much of the Indian departmental research, even when controlled by a central organisation such as that of the Board of Scientific Advice. The cart is put before the horse. The machinery is cumbersome and research made to supersede material, both in interest and value. Is the Board working so as finally to meet this position? Has it not even now been made evident that a bureau or exchange (call it by whatever name you please) may have to be reorganised so as to act as the Reporter on Economic Products did, as the intermediary between science and commerce in all departments?

It is scarcely necessary to classify research; there are obvious diversities according to the object aimed at—commercial, medical, veterinary, etc. Hence it follows that the field of operations covered by the Board of Scientific Advice is far wider than that of economics pure and simple, but it may perhaps be useful to concentrate attention on one issue, since it is more or less illustrative of the whole of the

Board's activities. Is there any particular advantage in the report becoming a channel of publication for jottings, interesting no doubt, but often gleaned from papers and periodicals published throughout the world, instead of being confined to a fairly detailed Imperial review of the actual operations controlled by the Board? In place of jottings one is surely justified in looking for special chapters devoted, far more than they are, to narrating commercial and industrial requirements and setting forth the progress made with such previously agreed-upon subjects of investigation.

So, again, too much importance would appear to be attached to the compilation of lists of scientific papers, books, and periodicals. The report is thereby converted into a sort of advance proof of the catalogue of the Royal Society. Doubtless these classified lists, especially of extra-Indian publications, are useful to the various departments concerned, but they do not appear of sufficient importance to constitute so very distinct a feature of the annual report of the Board of Scientific Advice for India. Further enumerations of the names to new species of plants or animals, discovered during the year, scarcely amount to manifestations of scientific research. Systematic studies in the aggregate stand on quite a different platform from the mere mention of a few individual species, in themselves of no importance. Trivialities of this nature give the impression that the fundamental principles of research are being lost sight of, and possibly very largely so, through the reason set forth, namely, of science being divorced from commerce and industry.

PITFALLS OF METEOROLOGICAL PERIODICITIES.¹

THERE is a real danger that some meteorologists, resenting the accusation frequently made against them of accumulating masses of data without making any real use of them, may be tempted to apply the processes of mathematical analysis to any and every set of observations, regardless of the considerations which limit the suitability of the method for the particular data proposed for analysis. This may easily be the case when hunting for periodicity. There is a great temptation, especially for anyone accustomed to the regularity of so many cosmic phenomena, such as eclipses, comets, planets, etc., to expect to find such periods recurring in the weather, but the work before us, consisting of the essential portions of a dissertation by Dr. Ryd, fortunately thought worthy by Capt. Ryder, director of the Danish Meteorological Institute, of a wider publication, and so included in the Communications of the Institute and done into intelligible English, should be studied before much time is spent in the search.

Dr. Ryd sets out clearly certain characteristics of meteorological data, wherein they differ essentially from, e.g., astronomical data. One of these

¹ Publikationer fra Det Danske Meteorologiske Institut Meddelelser. No. 3, "On Computation of Meteorological Observations." By V. H. Ryd. (Copenhagen, 1917.)