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, tans, 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 cumbrous 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.)

is the impossibility of eliminating some forms of "systematic" error, which are too likely to be variable to be strictly systematic, such as the difference between the indications of a thermometer, under various conditions of exposure, and the real temperature of the air. Another is an error neither accidental nor systematic, but due to the fact that the data are meteorological; a good example of this is afforded by the mean diurnal variation of air temperature as shown on (*a*) overcast or (*b*) cloudless days.

Dr. Ryd regards harmonic analysis applied to such data as an excellent interpreter, but a very untrustworthy probe. The known periods—the day and the year—are unexceptionable, and the variation from hour to hour in one case, and from day to day, or preferably from "pentad" to "pentad," in the other, are obviously fit subjects for analysis. Dr. Ryd prefers to use both sine and cosine terms instead of the usual transformation, because the determination of mean error is more direct when two constants enter similarly. This is clearly important, as the mean error is a vital consideration. Analysis for testing a real period, such as one of the lunar periods, on the meteorological data is not quite so risky as tentative fishing for an unknown period, in which case at least one coefficient, according to Dr. Ryd, must be five times its probable error before it can be regarded as likely to be real.

The brochure is divided into two sections, the first dealing generally with such routine problems as the computation of the mean error, smoothing and adjustment of observational data, and harmonic analysis, with an additional chapter on secondary minima and maxima in the annual variation of the temperature, in which the author deals with the proverbial "Ice-men" of May 11, 12, and 13, and exposes the weakness of Dove's supposed proof of the reality of this legendary phenomenon. The second part deals fully with "mechanical" adjustment, factors of variation, and suggestions on the choice of adjusting formulæ, of which several are given, and a longer chapter is devoted to the working out of four concrete examples, viz. the hourly inequality of air temperature, Greenwich, 1849 to 1868; and of pressure, Greenwich, 1854 to 1873; the annual inequality of pressure, Batavia, 1876 to 1905; and the annual variation of temperature, Copenhagen, 1875 to 1910, the last being a case of partial data—only three observations at fixed hours of the day, instead of the full set.

Dr. Ryd reminds the reader that when data such as July air temperature for twenty years are entered in rows for days and in columns for years, they cannot be analysed similarly in both directions, inasmuch as the successive days are not independent, while the columns are. He also discusses at some length the "order" to which harmonic analysis, if used for adjustment, should be pushed, with hints for saving labour; but on the whole he prefers the "mechanical" adjustment with a suitable formula in the majority of cases, and thinks this method less liable to introduce new errors into a problem. W. W. B.

NOTES.

SIR ARCHIBALD GEIKIE, O.M., who has long been a correspondant of the Paris Academy of Sciences, has now been elected an associate member of the academy.

THE *Times* announces that the report of the Departmental Committee on salaries of teachers will be issued within the next few weeks. The report of Sir J. J. Thomson's committee on science teaching is also expected at an early date.

THE council of the Royal Meteorological Society has awarded Dr. H. R. Mill the Symons gold medal for 1918 "for distinguished work in connection with meteorological science." The medal will be presented to Dr. Mill at the annual meeting of the society in January next.

AT the meeting of the Chemical Society to be held on December 6, Dr. F. L. Pyman will deliver a lecture entitled "The Relation between Chemical Constitution and Physiological Action."

THE Hon. Sir Charles Parsons, member of council of the Institute of Metals, is to give the eighth annual May lecture before the institute next spring. He will deal with the subject of the formation of diamonds, with the artificial production of which he has been experimenting for more than thirty years.

THE death of Mr. Alexander Adamson is announced in *Engineering* for November 23. Mr. Adamson was born in Glasgow in 1846, and took a prominent part in the evolution of the modern Atlantic liner, and was later identified with the early stages of development of the Barrow works, now the most important naval armament and munition works in the kingdom. He served for some years on the council of the Institution of Naval Architects.

THE death is announced in the *Chemist and Druggist* of November 24 of Prof. Charles Caspari, jun., dean of the Department of Pharmacy in the University of Maryland, and Food and Drug Commissioner of the State of Maryland. Prof. Caspari's "Treatise on Pharmacy" is well known on this side of the Atlantic. In addition, Prof. Caspari was one of the editors of the U.S. Dispensatory and a member of the Revision Committee of the United States Pharmacopœia.

WE regret to note that *Engineering* for November 23 announces the death, from heart failure, of Mr. Peter Denny, a member of the Dumbarton family which has done so much work to establish shipping and marine engineering on a truly scientific basis. In this work Mr. Denny took an effective part, and also fulfilled in a marked degree those varied duties of an employer of labour connected particularly with the social life of the worker. Mr. Denny, who was in his sixty-fifth year, joined the Institution of Naval Architects in 1880.

AT the monthly meeting of the Zoological Society of London, held on November 21, it was stated that during the months of August, September, and October 281 additions had been made to the society's menagerie. Of these, perhaps the most interesting are a brindled gnu, from South Africa, and an anoa, from Celebes. Having regard to the times, one can scarcely be surprised at the announcement of a falling-off in receipts during 1917. From January 1 to October 31 this amounts to 380*l*. Happily, the number of fellows elected and re-admitted shows an increase of thirteen, as compared with the corresponding period last year.

IN his presidential address to the Royal Statistical Society on November 20 Sir Bernard Mallet referred to the damage which the present war must inflict upon this and other nations. The United Kingdom has lost