

additional matter; to Dr. P. Matschie's "Geographische Fragen aus der Säugethierkunde," published in 1896; to Mr. R. I. Pocock's "Geographical Distribution of the Arachnida," which appeared in *Natural Science* for 1899; to Dr. Max Weber's paper on the "Origin of the Fauna of Celebes" (*Ann. Nat. Hist.*, 1899); and, lastly, to Prof. H. F. Osborn's "Correlation between Tertiary Mammal Horizons of Europe and America" (*Ann. N. York Acad.*, 1900). In several of these papers special stress is laid on the evidences of connection between the faunas of the southern continents which have been steadily accumulating during the last few years; while, as already mentioned, Prof. Osborn's communication is notable on account of his theory as to the indigenous origin of the African fauna. In another part of the world a most important change in the limits of two geographical regions has been suggested (first by Mr. Sclater and then by Dr. Weber), by the transference of Celebes from the Australian to the Oriental region. If this change, together with a similar transference in the case of Bali and Lombok, which has been advocated (partly on the suggestion of Dr. Blanford) by the present writer, be generally adopted (and it seems inevitable), we have to bid farewell for ever to the almost classic "Wallace's Line," as being one of those hypotheses which, although useful in their day, were not destined to immortality. R. L.

INSTRUMENTS OF PRECISION AT THE PARIS EXHIBITION.

"AT the commencement of the nineteenth century, the French and English makers of scientific instruments were far in advance of the Germans. True, the eighteenth century knew of prominent mechanicians . . . yet the French and English makers took the lead so as almost to supply the world's entire demand in scientific instruments. This predominance had the further consequence of causing young Germans to emigrate to France or England in order to thoroughly master their subject. Many a German mechanic of to-day owes to French or English masters a substantial portion of his knowledge. The prominence of the French and English instrument makers was mainly due to the support which, in both countries, the State bestowed upon technical art." . . . "In Germany it is only within the last twenty or twenty-five years that the State has espoused the interests of the home industry in scientific instruments; but such have been the efforts and the results, that her position has, at a blow as it were, changed in favour of Germany."

These words are taken from the special catalogue of the joint exhibition of German mechanicians and opticians at the Paris Exhibition, which claims, and claims with truth, "that in this department Germany occupies now a foremost position." As to the excellence of this joint exhibition, it is difficult to speak too strongly; rumour says that some, at least, of the judges wished to award it a Grand Prix among the nations. Had the rules of the Exhibition allowed it, such an award would have met with the universal approval of all physicists who have visited Paris.

Another brief quotation from the preface will explain the position more clearly. "After witnessing," the writers say, "the steady development of our mechanical and optical trade, we cannot but look with gratification upon the practical demonstration, at the Paris Centenary Exhibition, of the flourishing state of the scientific instrument trade in Germany; and a characteristic feature of the latter is the unity of its aims, which is traceable to the history of its development and to its ultimate connection with pure science. It appeared, therefore, desirable to depart from the usual custom of grouping the

exhibits under various firms, and to place them in sections embracing certain classes of instruments, so as to demonstrate on broad lines and, as a whole, within a well-arranged though condensed area, the present position of German mechanical and optical art."

Accordingly this was done under the auspices of the German Association of Mechanicians and Opticians, and, with the help of the authorities of the Reichsanstalt and of the Standardising Commission, a most remarkable exhibit has been arranged; a catalogue has been prepared, covering some 250 small quarto pages, well illustrated, with a full account of the various instruments and references to sources of further information. This is published in German, French and English—why the English edition is printed in German type is perhaps somewhat of a mystery—and issued freely to visitors who wish to use it.

The preface to this catalogue, from which the above extracts are taken, gives an interesting account of the growth of this industry, from which it appears that in the last ten years the annual value of the instruments exported, including the optical glass used for lenses, has risen from something over 200,000*l.* to over 700,000*l.*

The general exhibition is arranged in ten sections, with various subsections; the special exhibit of the Reichsanstalt forms an eleventh section to itself. In each of these sections or subsections the exhibits of each maker form a class to themselves.

Thus Section V., optical instruments, has seven subdivisions. The exhibit of Carl Zeiss, for example, appears in five of these, as well as in Section II., astronomical instruments. By means of the table of contents and list of exhibitors, it is easy for a visitor to find either the apparatus of a special class or the exhibit of a particular firm as he will.

Section I. contains metrological and standardising apparatus, and here the exhibit of the Normal Aichungs Commission is most striking. The Commission is presided over by a director, and includes, we are told, three Government councillors, twenty-four technical officials, and ten clerks; the annual expenditure is 8500*l.* Contrast this with the staff of our Standards Department, and its expenditure, according to Whitaker, of 2877*l.* Specially noteworthy, perhaps, among the exhibits of the Aichungs Commission are the model of their great comparator, and the vacuum balance made by Stückrath for comparing masses from 200 grammes to one kilogramme. But a detailed description of the catalogue would take too much space, and would indeed be of no great value to a reader; the book itself will prove to a physicist a well of useful information; the exhibit, however, must be seen in its entirety if we wish to realise what our German cousins have done.

Not that the sight is one which brings great pleasure to an Englishman, and if he moves on to examine the English exhibit his thoughts cannot fail to be very grave. There is nothing which can be compared with the German show; some well-known firms have won well-deserved prizes; there are some few interesting pieces of apparatus from South Kensington, and here and there in the electrical department one comes across a case of instruments. For the rest, the visitor will find, not collections of scientific apparatus, but small portions—attractive portions, it is true, in many cases—of the windows of well-known opticians' shops. As much apparatus as is possible is packed together in a small space, there is much repetition, there is no organisation, there is no attempt to instruct the learner or to attract the man who comes with inquiries with a view to purchase; English mechanics and opticians have no unity of aim, and their art, with some few exceptions, is but loosely linked to pure science.

A visitor who visits Paris to look for the most recent forms of scientific apparatus must have the conviction

forced on him that it is to Germany he must go for his goods.

And the conviction is strengthened by the organisation provided for giving information as to the goods exhibited. The German exhibit is under the skilled care of Dr. Robert Drostén, with some three or four scientific assistants. One or more of these gentlemen is always ready to give information about special instruments. When I visited the exhibition I asked for a catalogue, and inquired if I could examine more closely certain special instruments. By all means, was the reply, and Herr Drostén gave me several hours of his time opening cases, taking apparatus out, looking up special catalogues, and loading me with information. At the end of this time we were both tired, and he suggested that if I found, on looking over the catalogue and my notes, that I had omitted anything, I should come again. I returned next morning, and spent nearly as long a second time.

Or take, again, my own experience with the splendid exhibit of comparators and dividing engines of the Société Genevoise des Instruments de Précision.

There was a notice in the case that M. Schwartz, at the Bureau, would give information. On asking for M. Schwartz, and explaining that I wished to examine certain things with care, he came at once, opened the cases, and answered my many questions in the most courteous manner; some information which I wanted as to certain instruments not made by the Society he could not give me. It has since been sent me, at his request, from Switzerland.

So also with some American measuring and testing apparatus; the cases were opened, and I was allowed to handle the apparatus; one gentleman gave me a very full demonstration of the use of a new testing machine, which combines a multitude of ingenious devices.

Contrast this with the English exhibit; a courteous commissionaire was, when I saw it, in charge of the whole; there were some notices as to where to apply for price lists of some of the firms exhibiting; the nearest approach to a catalogue was a set of cards hung on the wall relating to the excellent exhibit of the Scientific Instrument Company. These I found of real value, but they could not be carried away for reference.

Again the same conclusion is forced home; the Germans have organised their exhibit and are far ahead; few, if any, of the English firms will profit through the exhibition by an increase in their trade; German trade must grow as a result of a show which has been visited by thousands of men of science. The 700,000*l.* of 1898 will rapidly increase.

And why should this be so? Is it our insular ignorance and our unreadiness? In everything, this great exhibition shows the advance of our continental rivals. It is probably true that, in the special circumstances of the exhibition, many prominent firms declined to exhibit. The results will prove conclusively that they made a mistake. Why should I exhibit? said one manufacturer; last time I sent the best of my goods and won a prize, and the French immediately put on heavy duties against them. It is an argument that may have some weight, but does not apply forcibly to scientific apparatus; besides, the French are not the only customers. No; the reason lies deeper. British pluck and doggedness, the individual skill of the British workman, which, on the average, is far above that of his foreign *confrère*, the traditions of British ascendancy in the past, can all do much, but we have not realised—shall we realise them in time?—the efforts our continental rivals are making to rob us of that ascendancy. It is true, as a recent writer in the *Westminster Gazette* puts it, speaking of trade with South Africa, that

“We must be prepared to face the truth that, unless the British manufacturer bestir himself for the supply of this great African community, a great deal of business

which, in the natural course of events, should go to him will certainly have to be diverted to Germany and America.”

The first step towards curing the disease is to recognise its presence; and how slow we are to do that.

The German catalogue and the exhibit are striking evidences of the services rendered to German trade by the Reichsanstalt.

“The greatest share of the impetus given to the manufacture of scientific instruments,” says the catalogue, “is due to the Imperial Physical and Technical Institute. . . . This institution has already done great service, and a large proportion of recent progress is due to its stimulating and helpful influence.”

An inspection of the exhibit fully bears this out. We in England have for some time past hoped that the National Physical Laboratory would do for English science all the Reichsanstalt has done for Germany.

It is now two years since the Treasury accepted generally the conclusions of the report of Lord Rayleigh's Committee on the establishment of such a laboratory, and one year since the first meeting of the General Board, and for months the whole scheme has been at a standstill because certain of our rulers attach more weight to the protests of some who object to the selected site than to the deliberate opinion of those whom they have invited to organise and control the laboratory.

It is admitted that the establishment of the laboratory is of national importance. Various difficulties are allowed to delay its erection; meanwhile the Germans go ahead.

Up to the middle of the century our methods were sufficient; that condition of things has ceased. The organised application of science and scientific methods to trade and commerce, indeed to all the affairs of life, is absolutely essential if we are to continue to prosper. Will England realise this truth before it is too late?

NOTES.

THE evening discourses at the meeting of the British Association at Glasgow next year will be given by Mr. Francis Darwin, F.R.S., and Prof. W. Ramsay, F.R.S. The lecture to working men will be delivered by Mr. H. J. Mackinder.

HUXLEY's life and work is an inspiring subject for a lecturer, and Lord Avebury had no difficulty in interesting the audience which assembled at the Museum of Practical Geology on Tuesday to hear him discourse upon it. The address was the first of the annual lectures established by the Anthropological Institute in memory of Huxley; and as Lord Avebury was a close and intimate friend of the master, he very appropriately inaugurated the series. Readers of *NATURE* are familiar with a large part of Huxley's work, but a few points mentioned by Lord Avebury will bear repetition. Huxley's Friday evening lectures at the Royal Institution rivalled those of Tyndall in interest and brilliancy; yet he said himself that at first he had almost every fault a speaker could have. He was one of the foremost of those who brought people to realise that science is of vital importance in their lives, that it is more fascinating than a fairy tale and more thrilling than a novel, and that any one who neglects to follow the triumphant march of discovery, so inspiring in its moral influence and its revelations of the beauties and wonders of the world, is deliberately rejecting one of the greatest interests and comforts of life. Apart from his professional and administrative duties, Huxley's works fall into three principal divisions—science, education and metaphysics. Of his contributions to science the Royal Society's catalogue enumerates more than one hundred, and every one of them, in the words of Prof. Parker, “contained some brilliant generalisation, some new and fruitful way of looking at the facts.” The value of his