

Bridge on two wind gauges of 300 square feet and of  $1\frac{1}{2}$  square feet respectively, indicated that with an increase of area the unit of pressure fell off in a very marked degree. Under the same conditions of wind and exposure, the larger gauge registered a pressure 38·7 per cent. less per square foot than the smaller gauge. I have been able to carry experiments further at the Tower Bridge by observing the pressure on the surface of the bascules of the bridge as evidenced by the power exerted by the actuating engines. In this case we have a wind gauge of some 5000 feet in area, and it has been shown that, while small anemometers placed on the fixed parts of the bridge adjoining the bascules register from 6 to 9 lbs. per square foot, the wind pressure on the bascules is only from 1 to  $1\frac{1}{2}$  lbs. per square foot.

It is difficult to imagine the amount of money which has been expended in unnecessary provision against wind strains of 56 lbs. per square foot on large areas in consequence of this hurried generalisation from insufficient data. I know something of what the provision for 56 lbs. on the square foot for wind cost at the Tower Bridge, and I do not wish to mention it; but if the public had been told that the dictum of experts, arrived at however hastily in 1880, was to be set aside in the construction of that bridge, all confidence would have been beforehand destroyed in it, and I suppose no Committee of Parliament would have passed the Act.

I have mentioned these matters, which could be added to by many similar instances in other branches of applied science, not for the sake of reviving old controversies or of throwing a stone at highly distinguished men, honoured in their lifetime and honoured in their memory, nor for the sake of criticising more modern men of science or a Government Department. Still less do I wish to question the necessity and value of mathematical calculations as applied to the daily work of engineering science, but I recall the circumstances for the purpose of once more pointing out the extreme value of experimental research and of bespeaking the utmost caution against our being tempted to lay down laws based on unascertained data. We know the tendency there has been at all times to generalise and to seek refuge in formulae, and we cannot but know that it is not at an end now. We ought to recognise and remember how few physical questions had been exhaustively examined sixty years ago, and may I say how comparatively few have even now been fundamentally dealt with by experiment under true scientific conditions? The investigation of physical facts under all the various conditions which confront an engineer requires much care, intelligence, time, and last, not least, not a little money. In urging the vital necessity of investigations, I am sure that I shall not be understood as decrying the value of the exact analysis of mathematics, but we must be quite sure that the premises are right before we set to work to reason upon them. We should, then, exert all our influence against rules or calculations based merely on hypothesis, and not be content with assumptions when facts can be ascertained, even if such ascertainment be laborious and costly. In a word, let us follow sound inductive science, as distinguished from generalisations; for "Great is truth and mighty above all things."

In connection with this subject, I may congratulate the Association generally, and this Section in particular, that there is now more hope for experimental science and some endowment of research in this country than at any former time. The vital necessity of further work in these directions has long been recognised by men of science and was notably urged by Prof. Oliver Lodge. Last year, in no small degree owing to the exertions of Sir Douglas Galton, K.C.B., who presided over the British Association in 1895, and brought the question very prominently forward in his inaugural address on that occasion, a highly influential deputation waited on the Premier to urge that England should have a Public Physical Laboratory at which facts could be arrived at, constants determined, and instruments standardised. The importance of the questions which could be determined at such an institution in their influence on the trade and prosperity of the country, independently of the advancement of purely scientific knowledge, cannot well be exaggerated.

Our Government, while somewhat limiting the scope of the inquiry, appointed a small Committee to examine and report on this highly important subject. It is no breach of confidence to say that the Committee, after taking much evidence, visiting a similar and highly successful institution on the continent, and studying the question in all its bearings, were convinced of the great public benefits which may be expected from such an

institution, and have unanimously reported in favour of its establishment.

I feel sure that we shall all earnestly hope that Government will carry out the views of the Committee, and I venture to suggest that each of us should use what influence he may have, to induce the Chancellor of the Exchequer to find adequate funds for an institution which may be of the greatest benefit not merely to scientific research, but to the commerce of these islands, threatened as it is on all sides by foreign competition of the most vigorous description—a competition which is supported by every weapon which the science of other lands can forge for use in the struggle. It being acknowledged that our own work in life is to deal with physical facts and apply them for the use of our fellow-men, we may have good hopes that at such an institution as I have indicated, directed, as it no doubt will be, by the highest scientific superintendence, we shall be able, at least far better than at present, to have a sound knowledge of many facts which are obscure, and to deal with the many new conditions under which the applied science of the future will have to be carried on.

Those who know most of the problems of nature feel the more strongly how much remains which is unknown and realise how completely those who teach require throughout their lives to be always learners. Let each of us then in our special walk of life, seeking for further enlightenment on the various problems of our work and in the application of that science which we love, humbly recognise that,

"All nature is but art, unknown to thee;  
All chance, direction which thou canst not see;  
All discord, harmony not understood."

#### INTERNATIONAL SEA FISHERIES CONGRESS AT DIEPPE.

THE movement for the international discussion of matters connected with the sea-fishing industry has made such progress during the past few years that a summary of the proceedings of the recent international congress held at Dieppe should interest readers of NATURE, especially as the regulation of the industry tends more and more to be determined in accordance with the evidence accumulated by scientific investigators. The Dieppe Congress was organised by the Société d'Enseignement professionnel et technique des Pêches Maritimes, and is the second international congress promoted by that society. The previous congress was held at Sables-d'Olonne in 1896, on which occasion Mr. (now Sir) John Murray was the British representative. More than 300 delegates assembled at Dieppe, among whom may be mentioned Mr. C. E. Fryer, of the Board of Trade; Dr. J. H. Fullarton, formerly of the Scottish Fishery Board; Mr. Walter Garstang, representing the Marine Biological Association; Mr. O. T. Olsen, of Grimsby; Mr. Johnsen, of Hull; Drs. Brunchorst and Bull, of Bergen; Dr. Malm, of Gothenburg; M. Tabary, of Ostend; Prof. Vinciguerra, of Rome; Dr. Valle, of Trieste; Dr. Kishinouye, of Japan; Mr. Thorndike Nourse, of the United States; and of course a large number of French delegates representing the Government and various fishery societies and schools, fishing centres and municipalities, including M. Roché, Inspector-General of Fisheries; Prof. Perrier, Baron Jules de Guerne, MM. Lavierville, of Dieppe; Canu, of Boulogne; Odin, of Sables-d'Olonne; Gourret, of Marseilles; and Le Seigneur, of Granville. The proceedings of the Congress opened on the morning of September 2 with an address from the President, Prof. Ed. Perrier, Membre de l'Institut de France. The greater part of the President's address was devoted to an examination of purely French problems—the relative scarcity of steam trawlers and liners, the need of greater solidarity, of a spirit of co-operation and compromise among rival fishing industries, the present unsatisfactory arrangements—or lack of arrangements—for fishery research. This, he said, seemed to demand the creation of a central Fishery Board for France, similar to that of Scotland, which should be charged with the duty of coordinating the work of the numerous marine laboratories in which fishery research is now carried on without concerted aim. Proceeding then to matters of more general interest, he pointed out the advantages which would ensue if the study of plankton could be put upon an international basis by a regular organisation of the marine laboratories of different countries, or by international co-operation in deep-sea expeditions for the solution of problems

connected with the migrations of fishes. At the same time, he said, it would not do to be too ambitious. The extravagant expectations which were held some years ago as to the beneficent effects of sea-fish hatcheries had not been realised either in America, in Scotland or in Norway. Even if the idea were sound, the actual plan of operation needed modification, since the young fish were being turned into the sea at too early an age. Moreover, he asked, would it not be simpler, and in the end more profitable, to complete the investigation of the whole life-history of valuable fishes before launching upon costly and problematic schemes of fish multiplication? To ensure the adequate discussion of these and similar problems, the President, in conclusion, expressed the intention of himself and his colleagues to propose the creation of a permanent international committee for the organisation of future congresses on sea-fisheries, which would extend and complete the work initiated by the French Society.

The subsequent discussions of the congress took place partly at general meetings, partly at the meetings of different sections. Four of the latter were constituted, viz. (1) Scientific Researches; (2) Fishery Apparatus, Preparation and Transport; (3) Technical Education, and (4) Fishery Regulations. The subjects which came before the general meetings dealt with oyster and mussel culture, provident institutions (insurance against accidents, &c.), international regulations for preventing collisions at sea, and co-operation amongst fishermen. As regards the sectional meetings, the topics of general interest naturally fell chiefly within the scope of the first and fourth sections. In the first section the following were the more important papers read: (1) On the natural history and fishing grounds of the Tunny in the Gulf of Gascony, by M. Odin, in which the author showed that the migrations of the Tunny of these waters are less extensive than was formerly imagined, since the fish can be taken in the Gulf throughout the year, although the actual fishing grounds shift with the seasons; (2) On the natural history of the mackerel, by Mr. W. Garstang, in which it was maintained that, as a result of researches recently carried out by the Marine Biological Association, the common species of mackerel can be subdivided into several local races, viz. an American, an Irish, and a race common to the English Channel and North Sea. These researches lead to the conclusion that the winter haunts of the mackerel cannot be situated far from the localities first visited by the several races in the spring; (3) On a proposed biological and physical investigation of the English Channel during 1899, by Mr. Garstang, in which the author invited the co-operation of French societies and naturalists with the Marine Biological Association for a joint periodic survey of the Channel during the coming year. The proposal was supported by Baron Jules de Guerne and M. Odin, and a resolution on the subject was unanimously adopted; (4) On the sea-fish hatchery at Flodevigen, by Captain Dannevig (read in his absence by Baron de Guerne). This paper gave rise to a vigorous discussion on the efficacy of hatcheries. Captain Dannevig contended that the success of his methods was attested by the statistics of cod taken in Christiania Fjord, but this statement was categorically denied by Dr. Brunchorst, and also adversely criticised by Dr. Fullarton and M. Canu.

The principal papers read in the fourth section were as follows: (1) On trawling in territorial waters, by M. Sauton; (2) On the necessity of new regulations concerning the mesh of drift and fixed nets, by M. Maraud; (3) Trawling and its effects, by M. Coutant; (4) On the territorial limits, by Mr. Olsen. The discussion which followed these papers was long and interesting, but cannot be fully summarised here. It will suffice, however, to say that at the subsequent general meeting of the congress a resolution against trawling (of all kinds) within three miles from low-water mark was carried by 37 votes to 9; and that other resolutions were carried which would have for effect the prohibition of certain kinds of fishing beyond the present territorial limits, and would prohibit the sale of immature fish, the *minimum* size for each species to be fixed hereafter by an international commission of fishermen, owners, public officials, and scientific experts.

It may be stated in conclusion that the memoirs read before the general meetings of the congress are already published (Paris, Augustin Challamel, Rue Jacob 17), and that the papers communicated to the different sections, with the final resolutions of the congress, will be published in a second volume in the course of the next few months.

## NOTES.

WE are reminded that the new laboratories of Physiology and Pathology, which University College, Liverpool, owes to the generosity of the Rev. S. A. Thompson Yates, will be opened on October 8 by Lord Lister, President of the Royal Society. By his benefaction, Mr. Thompson Yates has strengthened the medical school of the College in a very marked degree, and has enabled the professors of physiology and pathology to take advantage of the most recent additions to our knowledge in their lectures and laboratory instruction. Lord Lister will be accompanied on the occasion by a large and distinguished party. The Lord Mayor will represent the city; Earl Spencer, Chancellor of the Victoria University, has promised to attend and admit Lord Lister to the degree of D.Sc. conferred on him by the Victoria University; Lord Derby, President of the College, will be present, with the authorities of the Victoria University and its Colleges. Among those who have accepted the invitation of the College Council may be mentioned: the Duke of Devonshire, Lord Derby, Lord Spencer, Lord Ripon, Lord Kelvin, Mr. A. J. Balfour, Prof. Michael Foster and Prof. Rücker (the Secretaries of the Royal Society), Prof. Virchow, Sir Douglas Galton, Sir Samuel Wilks, Sir Richard Thorne, the Bishops of Liverpool, Chester, Carlisle, and Ripon, Sir William Gairdner, Mr. Justice Kennedy, Sir James Crichton Browne, Dr. Lauder Brunton, Sir Archibald Geikie, Captain Abney, C.B., Sir George King, Mr. Thiselton-Dyer, Prof. Ramsay, Prof. David Ferrier, Dr. Pavy, Mr. R. B. Haldane, Sir John Batty Tuke, Sir Henry Littlejohn, Prof. Schäfer, Prof. Burdon-Sanderson, Prof. Kanthack, Prof. Halliburton, Prof. Meldola, Prof. Poulton, the Dean of Lichfield, Prof. Charlton Bastian, the Hon. Sydney Holland, Prof. Rose Bradford, Prof. Forsyth, Prof. Bower, Dr. Alexander Cope, Prof. Crookshank, Prof. Waller, Prof. Noël Paton, Dr. Ludwig Mond, Dr. Mott, Prof. Stirling, Prof. Liveing, Mr. Gerald Yeo, Prof. Macallum, and Dr. Byrom Bramwell. The proceedings will commence with the degree ceremony, which will take place in St. George's Hall at 3 o'clock. Lord Lister will then, with the President, Earl Derby, proceed to open the new laboratories. In the evening a banquet will be given by the Lord Mayor in the City Hall.

ON Sunday, the 11th inst., one of the most destructive hurricanes that has occurred for many years visited Barbados and the Windward Islands, causing immense damage to property and great loss of life. These storms usually occur between July and October, when the equatorial calms are furthest north of the equator; the late A. Poey, of Havana, compiled a list of all hurricanes observed in the West Indies since 1493, and of these nearly 80 per cent. occurred in those months. They usually commence to the eastward, and travel in a north-westerly direction till they reach about latitude 25° N., when they recurve in a north-easterly direction. So far as is known from the meagre reports which have yet been received, this disastrous storm followed the usual track, as the observer of the United States Weather Bureau at Jamaica seems to have forwarded notice through New York that a storm was approaching Barbados from the southward on Saturday, the 10th inst.; but, owing to an unfortunate interruption in the cable, the warning arrived too late. The late Rev. B. Viñes, S.J., formerly director of Havana Observatory, made a special study of West Indian hurricanes during a period extending over twenty-three years, and shortly before his death (in 1893) prepared a paper upon the subject for the Meteorological Congress at Chicago, which is regarded as the most satisfactory statement of the behaviour of these storms that has yet been made. This paper has just been published in a separate form by the United States Weather Bureau. In it the author discusses very completely the general laws of cyclonic circulation and translation,