paper on the subject appears in *The Astrophysical Journal* (June, vol. xxxvii., No. 5), and the conclusions at which he arrives can be best conveyed in his own concise summary. Many prominences, by their shapes or movements, seem to indicate the existence of a horizontal current in the solar atmosphere. This current may have opposite directions at different altitudes in the same locality. It may change its direction, just as the wind changes upon the earth. In middle latitudes the average tendency for movement is towards the poles. In high latitudes the tendency is towards the equator. This tendency is more marked in the northern than southern hemisphere. From lat. 10° N. to 10° S. the average tendency is from north to south directly across the equator. The prevailing directions mentioned above apply to prominences of all heights.

THE BRIGHTON MEETING OF THE BRITISH MEDICAL ASSOCIATION.

A MEDICAL congress, especially in view of the wide development of specialism, rarely if ever helps to bring to light a new discovery or to promote a new theory, or at least to work out an application in practice of some basic theoretic facts. It has, however, the importance of grouping together men who work on widely different lines and are enabled to exchange ideas in a favourable atmosphere. In so far the Brighton meeting of the British Medical Association was undoubtedly very successful. We had, for example, a very interesting address by Prof. C. G. Barkla, F.R.S., on the secondary X-ray radiations in medicine, which, being delivered by a prominent physicist, introduced an element of exact science into empiricism of therapeutic applications. Prof. Barkla gave a detailed description of the scattered, fluorescent, and corpuscular rays. He reminded his audience that all chemical, therapeutic, and physical action attributed to X-rays was due to the secondary radiation of negative electrons. He pointed out that in order to produce a definite effect in an organ there must be a transformation of the energy of Röntgen radiation into energy of corpuscular radiation, as well as an absorption of the latter by the respective organ.

The solid basis and irrefutable arguments of physics could not be found or expected in the discussion on anaphylaxis. This was opened by Prof. W. E. Dixon, who entered into various details of the condition of experimentally produced hypersensitiveness, describing the changes occurring in the muscular and circulatory systems, and emphasising the significance of local symptoms. When he came to declare his preference for one of the three leading hypotheses as to the causation of the "anaphylactic shock," he declared himself in favour of the ferment theory, because he regarded the "classical" side-chain theory as a purely speculative hypothesis, and the more recent "colloidal theory" as still being in its infancy, whereas he found the ferment theory to be based on carefully recorded physiological facts. Prof. G. Sims Woodhead and Dr. Myers Coplans gave examples of clinical conditions which may be looked upon as similar to that of experimental anaphylaxis. Prof. Woodhead made a very interesting remark as to the possibility of explaining some of the phases of pneumonia by the sensitisation of the system by the specific bacterial protein. He also referred to the view largely held as to the possibility of organs being specifically sensitised, as instanced by the uterine muscle in eclampsia.

Drs. Embleton and Thiele related the results of their very remarkable experiments, which have shown that by sensitising laboratory animals by injection of bacterial protein of purely saprophytic bacteria like *B. mesentericus* one may make them so highly susceptible that a subsequent inoculation of live bacteria of the same species will kill the animals under symptoms of acute septicæmia. These experiments are undoubtedly of a very wide importance, as they may help in producing typical specific disease conditions in experimental animals naturally refractive to the infection produced by ordinary means.

A less debatable basis for discussion was given by Prof. George R. Murray, who dwelt on the importance of internal secretion in disease in a masterly presidential address. He explicitly limited the name of "secretion" to the useful products of glandular activity which pass into the blood stream in order to play some definite part in metabolism. Ductless glands in particular act on other tissues by means of "hormones," which excite definite forms of chemical activity in cells for which they have a special affinity. The glandular cells may form more than one specific hormone; they may also produce "inhibitory hormones," *i.e.* substances which inhibit the chemical activity of the tissue cells instead of exciting them. He passed in review the consequences of an insufficient as well as superabundant supply of glandular hormones, and insisted particularly on the relations of the thyroid and pancreatic gland which tend to inhibit each other. This, as proved by further discussion, is one of the most important facts for the practice, as it tends to explain the machinery of diabetes and all forms of glycosuria. Dr. A. E. Garrod, F.R.S., could not discover any basis for a sharp differentiation of the diabetic and non-diabetic glycosurias. In his belief the progress of research was strengthening the viewpoint that the internal secretion of pancreas was the almost only controller of carbohydrate metabolism in the system. The peculiar forms of glycosuria without a definite diseased condition he tried to explain by a disturbed correlation between the various glands of internal secretion.

A general impression gained from all the various discussions can be summarised in that the medical profession is fully alive to the importance of "control" experiments, that it errs rather in the application of a severe criticism to its scientific contributions, and keeps to the moral, "Prove all things, holding fast that which is good."

HYDROGRAPHIC AND PLANKTON OBSERVATIONS IN THE NORTH SEA.

WE have received from the Board of Agriculture and Fisheries the subjoined communication relating to observations to be made in the North Sea:—

The research vessel s.y. *Hiawatha*, chartered for fishery research in the North Sea, left the Tyne on Tuesday for the purpose of making certain practically continuous hydrographic observations, at a fixed position during the first fortnight of August. She will be taking part in a coordinated research into the movements of the great water masses in the North Sea, and for this purpose she will drop her anchor about 150 miles "E. by N. ½ N." of Shields and commence her work. Her labours will be identical in aim and in the main in methods with researches simultaneously carried out on board eight other vessels, also at anchor, at positions which collectively will permit of the study of conditions representative of the hydrographic conditions over the whole of the North Sea.

Two of these other vessels will be research vessels, acting on behalf of Sweden and Scotland, the Swedish vessel working in the Skagerak, the Scottish well to the north-east of Aberdeen. The remaining vessels are light vessels, two acting for Holland, the other four, by courtesy of the Brethren of the Trinity, for the English department.

The observations will consist of current measurements made near both surface and bottom every hour night and day, throughout the fortnight, and in fine weather at other intermediate depths. Special attention will be paid to the submarine waves which are, it is expected, to be met with at the depth at which the heavier bottom water and the lighter surface water are in contact; but information will be obtained as to all layers. Specially devised current meters are used in this work, some depending for their operation on small propellers, resembling those of an anemometer and worked by the current, others upon the deflection of a wire from which a metal cylinder depends, caused by the force exerted by the current. The temperature and salinity of the various layers of the sea will also be ascertained in the course of the work, special water-bottles being employed to secure samples of the sea from any desired depth. Samples of the minute floating organisms which, directly or indirectly, constitute the food of all our food fishes will also be taken at various depths and at the extremes of the tide.

Some idea of the scale of the operations may be gathered by the fact that it is expected that some 8000 independent current measurements will be made from the English vessels alone.

The hydrographic operations are planned by a special committee of the International Council for the Exploration of the Sea. They are undertaken because a knowledge of the constitution and movements of the sea-water is essential to the understanding of the movements and even of the abundance of the fishes upon which our fishing industry depends. As a classical instance, the herring of the Kattegat and Skagerak may be cited. Its abundance or scarcity has been found to be connected directly with the amount of water which enters the Baltic from the North Sea; and, indeed, not only the herring fishery but other fisheries of southern Sweden have been shown to change with the ebb and flow of this layer of cold salt water. It is clear, in fact, that a state of knowledge of marine currents which would permit of prognostication as to their movements and volume at a later period would in the case of many fisheries permit the fishermen to reap the utmost harvest which the year would afford or to anticipate a time of scarcity and take such precautions as were possible to mitigate its effects.

A NEW METHOD OF COOLING GAS-ENGINES.

THE summer meeting of the Institution of Mechanical Engineers was held in Cambridge last week. Among the many papers read and discussed, that by Prof. Bertram Hopkinson, of Cambridge University, takes a prominent place; the subject of the paper was a new method of cooling gas-engines. The most important peculiarity of the gas-engine, that which determines the characteristic features of its design and operation, is the heat-flow from the hot gases into the cylinder walls. About 30 per cent. of the heating value of the fuel passes into the metal of the engine in this way. The method hitherto employed in removing this heat has been by the circulation of water in jackets, except in the case of small air-cooled engines. In large engines, the piston and exhaust valve have also been kept cool by circulation of water. The appliances necessary for the carrying out of this method have been responsible largely for the great weight and cost of large gas-engines.

Water circulation has secondary effects which tend to make a large engine untrustworthy in working. The cylinder walls in places may be 3 in. thick or more. To cause the heat to flow from the inner to the outer surface of the metal requires a temperature difference of the order of 50° C. per inch, and this may become serious with thick walls. It is also difficult in large engines to secure adequate circulation about all parts of the cylinder walls and piston, and some parts may be much hotter than others. Severe stresses may be set up in consequence of the unequal expansion, and the overheating of certain parts of the inner surface is apt to cause pre-ignition of the charge. In consequence of the dangers of overheating it has been found impossible to work gas-engines, especially of large size, continuously at the maximum power which they can develop.

In Prof. Hopkinson's method of cooling, water is injected internally in thin jets directed against the walls of the combustion chamber and the end of the piston. There is thus no heat flow through the metal and no difference of temperature between the inner and outer surfaces. The water is so distributed that each part receives it in proportion to the rate at which it receives heat from the hot gases. Practically uniform temperature all over is thus maintained, and the stresses due to unequal heating are eliminated. A simple single-walled casting can be used for the cylinder, resulting in a great saving in weight and cost and in improved trustworthiness on account of the elimination of casting stresses. Piston-cooling arrangements—a frequent cause of trouble—can be dispensed with. Finally, pre-ignitions are entirely prevented.

To obtain success in this method of cooling, the water must be projected in comparatively coarse drops or jets directly against the surfaces to be cooled, so that it reaches these surfaces in the liquid form without much loss by evaporation on the way. Water which reaches the walls in the liquid form, and is there evaporated, absorbs, out of the heat given to the walls by the gas, the *whole* of its own heat of evaporation; there is no loss of thermodynamic efficiency because the heat used is waste heat, which in a jacketed engine would go to warm the cooling water. Any steam formed in this way is pure gain; and, if anything, there is an increase in the work done.

Further, if the cylinder walls are allowed to become and remain wet, they are destroyed rapidly by corrosion. This is due to the presence of sulphur dioxide in the gas, which forms sulphurous acid when dissolved in water. This difficulty has been overcome by regulating the amount of water injected in such a way that the temperature of the whole of the engine is kept well above 100° C. Under these conditions every drop of injected water is boiled when it reaches the walls, and no liquid can accumulate. It is found to be sufficient to inject water on to the surface of the combustion-chamber and the head of the piston only; the cooling of the barrel is effected by conduction into the piston. Thus no water falls on the sliding surfaces, where it would cause damage by the dissolved salts producing grinding.

Trials have been made on a Crossley engine fitted with a new cylinder embodying the principles explained above. The cylinder is 11½ in. diameter by 21 in. stroke, and is rated at 40 brake horse-power at 180 revolutions per minute. The success of this engine, as compared with the original water-jacketed cylinder, has been remarkable. After considerable preliminary trials, the engine was put to drive a dynamo in a