

THE RADIAL VELOCITY OF THE SUN, AND DOPPLER'S PRINCIPLE.—In No. 5, vol. xxxiii., of *The Astrophysical Journal* Mr. A. Cotton has a paper dealing with the legitimacy of applying Doppler's principle, purely and simply, to determine the radial velocity of the sun's parts from the measured displacements of the lines in the solar spectrum. He shows that the fact that the sun is surrounded by an extensive, turbulent atmosphere, in which densities and thermic qualities of vastly different magnitudes coexist, is sufficient to call for prudence when applying a simple, single interpretation to the displacements.

PECULIAR STELLAR SPECTRA AND SELECTIVE ABSORPTION IN INTERSTELLAR SPACE.—We have just received No. 51 of the *Lowell Observatory Bulletins*, in which Dr. Slipher discusses evidence for the existence of some material in interstellar space which differentially absorbs star radiations.

A spectrum of  $\beta$  Scorpii displayed a sharp K line, whereas all the other lines in this "Orion"-type spectrum were diffuse and broad; and while the latter show a Doppler displacement equivalent to a range of 240 km., the K line gives no sign of shift.

Further research indicated that  $\sigma$ ,  $\delta$ , and  $\pi$  Scorpii exhibit the same phenomena, and in this are like  $\delta$  Orionis,  $\zeta$  Ophiuchi,  $\iota$  and  $\eta$  Orionis,  $\alpha$  Persei, and other binaries. Apparently the matter wherein this calcium absorption takes place is, in each case, independent of the star, and the theory at once suggests itself that it takes place in an absorbing medium lying between us and the stars. Evidence for this accumulates in other directions; and the matter is one of fundamental importance to which the attention of astrophysicists must soon be directed. Dr. Slipher asks for cooperation; as a preliminary, the examination of all the spectra of "Orion"-type stars in existence would indicate those in which the independent behaviour of the calcium, and maybe the sodium, lines was marked.

FRENCH ASTRONOMICAL WORKS.—Readers of French will find that "Quelques Heures dans le Ciel," a franc "paper back," by the Abbé Th. Moreux, gives a very complete, lucid, and well-illustrated *résumé* of present-day astronomy. The chatty freedom with which the various points are explained will attract the beginner, and the illustrations will considerably assist his comprehension.

Those who wish to practise astronomy will find the Commandant Ch. Henrionnet's "Petit traité d'Astronomie pratique" a useful summary and guide. The author describes the books and the instruments used, the simpler methods employed, and gives a brief statement of the interesting things in various constellations. Gauthier-Villars publish the book at 1.75 francs.

#### THE MANCHESTER MEETING OF THE INTERNATIONAL ASSOCIATION OF SEISMOLOGY.

THE meeting of this association, which was held in Manchester on July 18-22, proved to be one of considerable interest and importance. The time spent on business and administration was less than at preceding meetings, so that more was left for original communications and discussions.

On the opening day, the Vice-Chancellor of the University of Manchester received the delegates in the Whitworth Hall, and during the day a telegram was received from the President of the Board of Education in the following terms:—

"His Majesty's Government heartily welcome your association, and wish success to their deliberations. They rejoice to see the attempt to organise seismology internationally, which was initiated by the British Association under the influence of Dr. Milne, bearing fruit, through your proceedings on British soil."

Amongst the communications received, probably the most important was the description by Prince Galitzin of his new instrument for measuring the vertical component of the motion of the soil. The instrument shown at the meeting has been acquired for the observatory at Eskdalemuir, where it will be set up as soon as a proper foundation can be built.

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Mr. Oddone showed an ingenious and simple apparatus for measuring the elasticity of rocks, and Mr. Wiechert's communication on the constitution of the interior of the earth gave rise to an interesting discussion.

An instrument was also shown at the meeting constructed by the Cambridge Scientific Instrument Company, with which it is intended to count the number of waves which strike the shore in a given time in order to test whether the period of these waves is the same as the period of the microseismic disturbances. This instrument has already been taking records on the coast of Northumberland, under the superintendence of Mr. Morris Airey.

There was a reception in the Town Hall on one of the days of meeting, which was well attended, and a dinner was given by the university on the last evening.

Saturday, July 22, was given up to excursions, and at the invitation of the director of the Meteorological Office and of Mr. and Mrs. J. Walker, nearly twenty foreign delegates visited the new magnetic and meteorological observatory at Eskdalemuir.

The foreign delegates both privately and publicly expressed their gratification at the presence of Dr. Milne, and, in addition, British men of science were well represented, amongst others by Sir George Darwin, Profs. Lamb, Love, Knott, Mr. Oldham, and Dr. Shaw.

Prince Galitzin was elected president, and Mr. Leconte vice-president, for the next period of three years, dating from April, 1912.

The opening address delivered by Prof. Schuster on July 18 is subjoined.

#### Some Problems of Seismology.

Since our last meeting important changes have taken place in our Central Bureau. Increasing age has compelled Prof. Gerland, to whose strenuous efforts the foundation of this association is mainly due, to resign the directorship of the seismological station at Strassburg. Prof. O. Hecker, who has been appointed in his place, has thereby become the director of the Central Bureau, and you will agree with me that no better choice could have been made. The excellence of his work is well known to you, and since he has entered into his new office he has with characteristic energy already done much to make the bureau more efficient for its international work. You will have an opportunity of showing your confidence in him when we decide on the locality of the Central Bureau for the next period of four years, as though we have no official voice in the choice of the director, it lies in our power to move the seat of the Central Bureau at any meeting of the general assembly if such a course seems desirable in the interests of our work.

Our association primarily deals with the study of the causes of earthquakes and of their effects, but the interest which the public shows in our investigations is mainly due to the sympathy roused by the human suffering which follows the trail of these seismic catastrophes. At present we feel helpless, though perhaps not altogether hopeless, in the face of the destructive convulsions of the earth. The problem of constructing buildings which can withstand shocks of earthquakes does not enter into our programme, but it has been asked, and the question will be raised during the present meeting, whether there are any preliminary indications which would allow us to predict the occurrence of a dislocation of the soil and take precautions to mitigate to some extent its power of destruction. Remembering how meteorologists have succeeded in preventing loss of life at sea by predicting the course of cyclones in the Indian Ocean or the Gulf of Mexico, we might be tempted to hope that similar warnings may help us to fight the dangers of an earthquake. I am afraid that the cases are not quite analogous, and even if our knowledge should allow us in the future to form predictions of equal certainty, the dangers accompanying such predictions may overbalance its benefits. The precautions which can be taken in a harbour against an approaching storm are of a comparatively simple character, and the meteorologist is therefore justified in warning us against a probable storm which does not appear; but would the seismologist be justified in creating a panic and dislocating trade by predicting an earthquake which failed to take place? We can easily forgive the meteorologist who fore-



casts the weather as "fine to doubtful and stormy"; but should we forgive the seismologist when he forecasts the approaching seismic condition of our town as "calm to unstable and collapsing"? Perhaps it may seem to you that I am wandering beyond the range of practical science even in alluding to this subject; nevertheless, the fear of creating panics by premature forecast is one which has already cast its shadows in advance, and I am informed that insurance companies in this country have shown some irritation by the early publication of the indications of a destructive earthquake which has taken place in a distant part of the world.

To the man in the street the question whether a thing is large or small is all-important; to the scientific man it matters not at all; and a great part of our deliberations will deal, not with catastrophes, but with microscopic movements of the soil, movements so small that the vibrations due to the traffic in a city compare with it as the waves of the ocean with the ripples on a pool. At the last meeting of the general assembly, four years ago, you appointed a committee to investigate these microseisms. I need not remind you that there are two types of short waves which are frequently observed. One of them has independently been traced in different countries, and by several observers, to the action of the wind, which seems to create waves over an extended land surface just as it does over the ocean. The second type of vibration, which occurs in periods of from five to ten seconds, is more difficult to trace. It has been suggested that the vibrations are due to the impact of waves on the shore against which the wave strikes. For the purpose of testing this hypothesis, an instrument has been set up on the coast of Northumberland (partly paid for by the funds of this association) which automatically counts the number of waves which in a given time strike the shore. The instrument, which was designed by the Cambridge Scientific Instrument Company, Ltd., will be exhibited at this meeting. It has been set up and looked after with great ability by Mr. Morris Airey, and we are already able to say that it will fulfil its object, though the observations at present are too few to allow us to draw any conclusions.

While we rightly attach much value to the systematic investigation of minute disturbances, we must not forget to keep in mind the source and origin of all dislocations of the soil. The recent advances in physical science render it imperative to review our position with regard to this fundamental question.

In our youth we were taught that the earth, once a molten and fiery globe, had gradually cooled down, leaving the inside still hot, but gradually cooling and contracting. This contraction of the nucleus was looked upon as the primary cause of geological dislocations. But how do we stand at present? In the breaking up of radio-active products we find a source of heat which—if the amount of radium and thorium in the interior of the earth is not decidedly less than that which is found near the surface—would not only balance the earth's loss of heat by radiation, but actually increase its average temperature. Though reasons may easily be found why the surface layer of the earth may be richer in radio-active products than the core, I think that we are nevertheless driven to the conclusion that the earth is now, and has been for a long time, in thermal equilibrium, and that shrinkage by cooling does not account for any of the more recent displacements. Why, then, should not the earth long ago have settled for itself all seismic questions, and have come to rest in a comfortable state of equilibrium? After the four or five million years which it has had to calm down, we might have expected that everything should be quietly arranged in uniform layers round the centre of the earth. Instead of this regular distribution of matter, we have not only mountain chains, but also the depressions and elevations which cause the distribution of land and water over the globe.

The causes of these inequalities have long interested geologists and mathematicians, but the wider discussion of the stability of the whole structure on which we live has only recently come into prominence. The subject is a most difficult and intricate one, and a most important contribution towards its elucidation has appeared within the last few weeks. In an essay to which the Adams prize of the

Cambridge University has been adjudged, and which, I think, will become a classical guide to all who intend to pursue the subject, Prof. Love has treated the problems of geophysics with masterly ability and lucidity. I wish it had been possible to arrange—perhaps it is still possible—for Prof. Love to give you an account of his investigations, and in his presence it would be impertinent in me to explain, as otherwise I might have been tempted to do, the main conclusions at which he has arrived. I must therefore content myself with directing attention to the great importance of this work, and alluding to one suggestion contained in it which more particularly touches a subject with which this meeting is concerned.

The important work of Prof. Hecker, confirmed since by others, has allowed us to trace the tidal deformation of the earth, and has brought to light the curious result that the earth appears to resist a change of shape less in the north and south than in the east and west direction.

Prof. Love, having failed to account satisfactorily for the effect in other ways, suggests that the want of symmetry in the rigidity is apparent only, and that the observed effects are caused by the attraction of the tide wave in the North Atlantic and its accompanying excess pressure on the sea bottom. In the investigation of the tidal deformation of the earth, our work overlaps that of the International Geodetic Association, and a communication from that body will have to be considered by us. In other directions our work closely touches that of the geologist, and there may be points of contact with other parts of geophysics, such as meteorology and terrestrial magnetism. This interdependence of different branches of science will force us before long to consider our relationship to other international associations.

The extreme specialisation which finds expression in the formation of so many different societies and associations is an evil which may be a temporary necessity, but which we should try to mitigate so far as possible. There ought to be a connecting link which draws us away from the minute elaboration of detail and towards the great problems that ought never to leave the mind of a man of science. But what is this connecting link to be, and what are the bonds which are to unite it to bodies of such varied interests and constitutions? I have formed my own opinion, but I am afraid on this occasion to enter on to ground which may be controversial.

In concluding these few words of introduction, I feel that I express your wishes by thanking the Vice-Chancellor, who has found time among his many heavy duties to come here to welcome you.

#### THE PROGRESS OF CANCER RESEARCH.

THE tenth annual meeting of the Imperial Cancer Research Fund was held on July 20 at the Royal College of Surgeons, the Duke of Bedford presiding. The presidents of the Royal Colleges of Physicians and Surgeons, Sir Wm. Church, Sir Douglas Powell, Sir John McFadyean, Sir Henry Morris, Sir John Tweedy, Dr. Sidney Martin, Mrs. Bischoffsheim, and many other supporters of the fund were present. Sir Wm. Church, in moving the adoption of the annual report, gave an outline of Dr. Bashford's statement of the progress of knowledge of cancer, from which we give some extracts below. In seconding the resolution, Sir Henry Morris directed attention to the widespread influence exercised by the investigations of the scientific staff. This was evidenced in one way by the number of distinguished voluntary workers attracted to the laboratory from abroad, not only from all European countries, but also from America, Australia, and Japan, and in another way by the number of learned societies at home and abroad which invited the director to address them. Thus Dr. Bashford had visited, among other centres, Berlin, Heidelberg, Toronto, Paris, Budapest, Christiania, and Utrecht. Its influence was felt in a third way by the large increase in the number of centres engaged in the investigation of cancer in the laboratory. The other business was purely formal.

A feature of this year's work is the extension of experimental investigation to rabbits, in which animal a carcinoma of the mamma and a sarcoma of the sub-