marks is particularly necessary in international trade to-day where the owner must part with the title or use of his trade mark in order to be able to make it available in another country.

The Congress passed a resolution that the principle of free assignment of trade marks should be adopted by all Convention countries, subject to such limitations as the domestic law of each country requires to prevent deception of the public by the transfer of the mark. A further resolution was passed embodying the principle that persons other than the registered owner may use a trade mark provided that effective control of the use could be ensured by the proprietor, and subject again to such limitations as the domestic law of each country required, so as to prevent the use from deceiving the public.

Several other resolutions of lesser importance dealt with the prevention of unfair trading. When goods have been sold under a trade name which is a word in the vernacular of one of the countries, it may happen that a trader in another country may attempt to market similar goods in that foreign country under the name which is a translation of this word. This practice causes great difficulties and frequently leads to deception of the public. These difficulties would be overcome by the adoption of the principle that the Convention countries will accept and register, in one and the same operation, composite trade marks comprising the mark in the language of origin and its translation into other languages, each element of the composite mark being protected in itself.

These resolutions were supported in principle at the Conference of the International Bar Association held in July in Great Britain.

The adoption of these resolutions at the diplomatic conference of Governments will be a great step forward to the end that problems of international law in regard to industrial property may receive uniform solution in all countries which are party to the International Convention. R. G. LLOYD

ELEVENTH INTERNATIONAL CONGRESS OF THEORETICAL AND APPLIED LIMNOLOGY

THE Eleventh International Congress of Theoretical and Applied Limnology held in Belgium was attended by about eighty people representing seventeen different nations; but, despite the small number of participants, the vigorous exchange of opinion between all and sundry was a testimony to its great value. At the opening session, held in the fine assembly hall of the University of Ghent on the evening of August 16, the members were addressed by the president of the International Limnological Association (Dr. Gunnar Alm) and heard a lecture by the chairman of the Organising Committee (Prof. P. van Oye) on "The Beginnings of Limnology in Belgium". The six scientific sessions, at which upwards of forty papers on a wide range of topics were read, were held in the four university towns, Ghent, Brussels, Louvain and Liège, between August 17 and 23. Among many noteworthy contributions special mention may be made of those by Dr. Thomas (Zurich) on the nature of the monthly sediments deposited in certain Swiss lakes, by Dr. C. H. Mortimer (Windermere) on water movements in stratified lakes, by Prof. W. Rodhe (Uppsala) on a method of sampling and analysis of lake waters by ion exchangers, by Dr. M. Lefèvre (France) on antagonisms between successive populations of freshwater algæ, by Prof. d'Ancona (Padua) on the changes induced by the environment on the marine plankton in the lagoons of Venice, and by Prof. Lenz (Plon) on problems concerning chironomid ecology, the last in particular leading to a lively discussion.

On the Sunday afternoon a visit was paid to the Congo Museum at Tervuren near Brussels, where the members of the congress were entertained to tea by the Director and his wife. Similar hospitality was afforded us on several other occasions. In the course of the journey from Brussels to Louvain the large centre for fish-culture at Linkebeek was visited under the guidance of the director of applied limnology, Dr. M. Huet, who also led a three-days tour of south-east Belgium during August 24–26, comprising visits to the principal rivers, to the Michel dam, to the thermal establishment at Spa, and to the grottoes at Han. At the concluding session held at Liège on August 23, a committee consisting of Drs. Mortimer, Ohle and Rodhe was appointed to study and co-ordinate and, if needs be, initiate, new methods for hydrobiological investigation. The next congress will be held in Cambridge during August 1953.

F. E. FRITSCH

AIRCRAFT-LANDING AIDS IN BAD VISIBILITY

AT a meeting held at Birmingham on September 5 of Section A (Mathematics and Physics) of the British Association, Mr. E. S. Calvert presented a paper entitled "Visual Aids for Landing in Bad Visibility, with Particular Reference to the Transition from Instrument to Visual Flight". Mr. Calvert said that during the past five years radio approach aids have been installed at all major airports to enable aircraft to land in conditions of bad visibility or low cloud. By means of these aids a pilot who is adequately trained in instrument-flying can align his aircraft with the runway and bring it down to a height of about 200 ft. without seeing the ground. The rest of the approach and landing, however, have to be made visually, and this means that the pilot has to make a rapid transition from instrument to visual flight when near the ground. At 200 ft. the aircraft is still about three-quarters of a mile from the end of the runway, and to bridge this gap a pattern of lights about 1,000 yd. long is laid down in the approach area. This pattern must be such that a pilot seeing only a portion of it can determine the aircraft's attitude, position and direction of motion, and the rates at which these are changing. The lights must be suitable for use by day as well as by night, and for this reason have to be of high intensity. The intensities being used at present are of the order of 100,000 candles.

During the radio portion of the approach, the pilot obtains his positional information either by listening to a voice in his earphones, or by looking at a meter on his instrument panel. From this he has to find the heading which will bring him on to the runway, a task which is particularly difficult when there is a cross-wind which varies with height. He also has to watch his flight instruments and manipulate the controls. His mind is therefore fully occupied when he sees the lights, and transition from instrument to

visual flight is difficult. If he makes the transition at 250 ft., then he will be flying on visual references for only 30 sec. prior to touch-down. With improved instrumentation the aircraft could perhaps be brought down to 100 ft., in which case this time would be reduced to 15 sec. The problem is, therefore, to find a pattern for the approach lights which will provide indications which the pilot can interpret instantly without having to use mental processes different from those which he has learnt to use in good-weather flying.

The first patterns to be tried consisted of single and multiple lines parallel to the extended centre-line of the runway, and these were followed by vees and funnels. Flight tests on these patterns extending over several years showed that in bad visibility the impressions of the pilot when he first picks up the lights often fail to correspond with the real situation. In other words, his first impressions are often illusions. Three illusions are commonly reported as follows: (1) The runway lights appear to 'float in space', or 'stand on end', that is, they appear as an inverted vee in the vertical plane instead of a pair of parallel lines in the horizontal plane. Also the pattern has 'no depth' and appears to be at a varying distance. As a result the pilot 'loses his ground plane' and has a strong impulse to pull up. (2) The approach lights appear to 'swing from side to side' or 'drift out of the field of view', so that instead of descending on a straight course, the pilot 'weaves' from side to side. (3) A strong impression of the horizon is suddenly built up in the pilot's mind, although he knows that he cannot tell where the horizon is without referring back to his instruments. When the pilot is suffering from fatigue or is in a state of mental stress, this conflict causes feelings of confusion and frustration, and in extreme cases of vertigo.

These illusions have been studied statically by means of perspective diagrams, and kinematically by means of landing simulators. It was found that when the effect of fog is simulated by removing the horizon, the visual indications become geometrically indeterminate. In other words, the same picture represents a large number of different situations. If, therefore, a pilot tries to correct an error by observing only the visual indications, he can scarcely avoid being confused by their ambiguity.

Mr. Calvert then showed that the indications can be made geometrically determinate by using a pattern consisting of a line of lights along the centre-line with bars of lights running transversely across it at intervals. The reason for this is that the bars supply the indication of the horizontal which is missing in the other patterns. This pattern, which is now known as the 'crossbar system', was installed at London Airport in November 1948, and shortly afterwards about a dozen installations were laid down in Germany, mostly for the 'Berlin Air Lift'. All reports agree that the transition is consistently easy and safe, and no illusions have been reported.

Mr. Calvert then described a new theory of visual judgment which has been developed as a result of collaboration between Capt. Majendie of B.O.A.C. and his own group at the Royal Aircraft Establishment. This theory, which is known as the 'parafoveal streamer theory', is briefly as follows. When the aircraft is several miles from the runway the angular subtense of the pattern and the rate of change of the perspective image are small, and the pilot makes his judgments by scanning the pattern and comparing the perspective image with an ideal one which he carries in his memory. As the aircraft comes closer to the pattern, its angular subtense and the apparent velocity of the lights increase. At about 150 ft. the pilot begins to stare straight ahead with his head and eyeballs fixed. After this, he derives his impressions of height and direction of motion mainly from the pattern formed by the paths which the retinal images of the lights trace out on the parafovea, and from the velocity of the images along these paths. These paths may be called 'streamers', the pattern a 'streamer pattern', and the image velocity the 'streamer velocity'. The reason why the pilot stares is that it is easier to judge streamer patterns and streamer velocities if he keeps his eyeballs fixed, because in that case the only changes in the retinal image are those due to changes in the streamer pattern and streamer velocities.

Capt. Majendie opened the discussion by showing a film which he had taken of the faces of various pilots when making landings. These showed clearly that at heights below about 150 ft. the pilot's head is rigid, and the eyes are staring straight ahead, except for occasional quick glances at an instrument or an obstruction. The film also showed some calibrated eye-movements which indicated that a movement of 1° could just be detected.

Mr. Glenny then showed some films of landings in very bad visibility which had been made in America by the Sperry Gyroscope Co. These also showed a high degree of fixated vision at low heights. A noticeable feature of both films was the expression of strain on the faces of the pilots.

Mr. Parker, speaking on behalf of the Ministry of Civil Aviation, said that the 'crossbar system' at London Airport has been very successful. During the past two winters many landings with passengers have been made on it in visibilities as low as 300 yards. The principles on which it is based are now generally accepted in Great Britain, and are being increasingly accepted abroad. It is one of three systems recommended by the International Civil Aviation Organisation, and about eight foreign countries are already installing it at their major airports. It is therefore quite possible that the 'crossbar system' will become the standard approach lighting system of the future.

PERIODIC FLUCTUATION IN THE LENGTH OF THE DAY

A PAPER by H. F. Finch "On a Periodic Fluctuation in the Length of the Day"[1] gives a full account of the performance of a number of quartz-crystal clocks employed in the Greenwich Time Service. Soon after the introduction of quartz clocks, their errors on a long-term basis were predicted, and the clock correction E was represented very closely by the expression $E=a+bt+ct^2$, where t is reckoned in time from some arbitrary epoch, and a, b, c are constants the values of which were derived from a series of time determinations extending over many months.

By applying the adopted current corrections to the standard clocks and using daily intercomparisons, it was possible to deduce the amount of correction for the clock controlling the time signal, prior to transmission. Although the method succeeded for a time, in the autumn of 1945 the observed clock corrections began to diverge from those predicted, the clocks