

small. The negative result indicates that either the Fermi theory needs a substantial modification or that the origin of the forces between neutrons and protons does not lie, as would correspond to the original suggestion of Heisenberg, in their transmutations considered in detail by Fermi.

Rosenfeld described researches made in collaboration with Cambresier on dissociative equilibrium in stellar atmospheres. The number of molecules of a given kind in the atmosphere of a star can be calculated as a function of the effective temperature and surface gravity of the star on the assumption of dissociative equilibrium. In this computation it is essential to take into account the variation of pressure in the different layers of the atmosphere. The pressure at the base of the atmosphere may be calculated from the general absorption, by a method first used by Milne and Chandrasekhar. The treatment of concrete cases necessitates assumptions on the relative abundances of the atoms taking part in the reactions, but the results are quite insensitive to such assumptions. The equilibria of TiO, ZrO, and of the carbon combinations CN, CH, CO, C₂, have been computed in two different cases: when O is much more abundant than C, and vice versa. It is seen that the first case corresponds to the main sequence, the second to the branch of carbon stars, and that simply on this assumption a satisfactory

agreement is obtained with the observed variations of intensity of the corresponding bands with spectral type and surface gravity (giant or dwarf character of the stars).

The members of the Congress had the opportunity of visiting many interesting institutions in Kharkov, Moscow and Leningrad. The laboratories of the Ukraine Physico-Technical Institute, and the Physical Institutes in Leningrad and Moscow were attractive, on account of the youthful enthusiasm of the staffs, besides the variety of the researches in progress. The Dzerzhinsky School for Orphans at Kharkov, organised and supported by personal subscriptions from the members of the G.P.U., contains four hundred boys and girls. They live with a large degree of self-government, and are trained in three magnificent factory-workshops, one of which is for the complete manufacture of cameras on the Leica model, including the lenses. A *kolkhoz* of three thousand acres supporting seven hundred persons was also very instructive. At the Kharkov Tractor Works, tractors of the McCormick type could be seen running off the assembling conveyor at the rate of 140 per day. In Moscow the constructive works of the underground railway were prominent. The members of the Congress will remember for a long time the interest of their visit and the hospitality of their hosts.

Aberdeen Meeting of the British Association

IN a previous article (*NATURE*, 133, 673, May 5), reference was made to the suitability of Aberdeen as a centre for excursions, and advantage has been taken of the city's position in this respect by the local committee for the Aberdeen meeting of the British Association to be held on September 5-12. Arrangements for excursions to places of historical interest through some of the most striking natural scenery in Scotland have now been completed. The Committee did not dare to hope that it could call upon the members of the Association to repeat the experience of its predecessors of nearly eighty years ago, where some of the excursions occupied the better part of two days. It has therefore arranged that the excursions taking place on the Saturday of the meeting will start at a comfortable time after breakfast and arrive back before dinner. The Committee has been fortunate in securing the services of authorities on the different areas and places of interest to be visited to write descriptive articles on the general excursions, and these articles will add to the enjoyment of these excursions. Arrangements have also been made for guides where necessary to accompany the members and to give information concerning the different places visited.

Probably the most interesting excursion for those who enjoy natural scenery is the Highland excursion. This starts at 9.20 a.m. by train through the cultivated parts of Aberdeenshire and Banffshire, thence into the valley of the Spey, which is followed, first westwards to Boat of Garten, then southwards to Aviemore where, looking eastward, there is a striking view of the Cairngorm range of mountains. Visitors should notice a V-shaped depression between Ben MacDhui and Braeriach, which marks the position of the highest mountain pass in Scotland—Lari Gghru. After leaving Aviemore, the train proceeds towards Inverness, passing Carr Bridge and Tomatin to

Culloden Moor, where the members will leave the train and proceed by bus to the battlefield. There, local guides will join the party and give a short account of the battle and the objects of interest, including the famous Clava Cairns, on the Moor. The visitors will then proceed to Inverness, alighting on the Castle Hill. In Inverness they will be entertained by the Provost, Magistrates and Town Council to tea. After an interval, which can be utilised for seeing some of the places of interest in the city, the train will return from Inverness by the coast, from which there is a striking view of the mountains of Ross-shire, Sutherland and Caithness, the most prominent among these being probably the cone of Morven, which can be seen for a long way along the coast.

From a historical point of view, an interesting excursion is that which has been arranged to leave Aberdeen at 9.40 a.m. by train to Elgin, arriving there at noon. There, the members of the Association will be welcomed by the Lord Provost, Magistrates and Town Council of Elgin, and will be entertained to lunch. After lunch they will proceed by charabanc through the ancient province of Moray, which abounds in historical remains. The itinerary will be from Elgin Cathedral to Spynie Castle, Lossiemouth, Duffus Castle, Kinloss Abbey and Pluscarden Abbey. There will be an interval at Pluscarden Abbey, where tea will be provided near the ruins. Thereafter the party will return to Elgin, whence they will entrain for Aberdeen at 5.15 p.m., returning by a different route.

An excursion has also been arranged by motor-bus leaving Marischal College at 10 a.m., and proceeding along the North Deeside Road through the Pass of Ballater and Braemar to the Linn of Dee. On the return journey from the Linn of Dee, a halt will be made at Braemar for lunch. The party will

then return to Ballater, halting en route to view Crathie Church, then along the South Deeside Road through Pannanich and Glentanar, there being an interval for tea at some appropriate place.

Another charabanc excursion has been arranged which will take members of the Association partly along the Cairn O'Mount Road—the old main road from north to south. The starting time will be 10 a.m. from Marischal College, and from there the route lies along the south side of the Dee, thence along the valley of the Feugh to the Glen of Dye, over the Cairn O'Mount to Fettercairn and Edzell, where a halt will be made for lunch. On the return journey the route passes through Brechin and Stonehaven. Many places of historical and archaeological interest are passed through on the way.

In addition to these all-day excursions, two half-day excursions have been arranged for the Saturday. The first of these leaves Marischal College at 1 p.m. by motor bus and proceeds by Castle Fraser and Monymusk, through 'Lord's Throat' to Alford, thence by Muir of Fowlis and Crossroads, Lumphanan to Tillylodge and Tarland. This excursion will return to Aberdeen about 7 p.m. The second of these excursions will leave Marischal College at 1.30 p.m. by charabanc. The itinerary is by way of Stonehaven, over the Slug Road to Banchory, on Deeside, thence to Potarch and Torphins, returning to Aberdeen at

6 p.m. This excursion is somewhat similar in interest to the preceding one.

Excursions have also been arranged by several sectional secretaries of the Association. These include visits to places of historical, archaeological and geological interest, also visits to places typifying the various industries and activities of the area.

The meeting of the Association in Aberdeen has also provided an opportunity for commemorating the work of Prof. John Lamont, the Scottish astronomer and pioneer of modern terrestrial magnetism, who was born at Braemar in 1805 and was for many years director of the Royal Observatory of Munich, where he died in 1879. A sum of money has been raised to provide a monument which will be placed at Inverey near to his birthplace, and it has been arranged that the monument will be unveiled on the afternoon of Monday, September 10. A motor-bus will leave Marischal College on that date at 1.30 p.m., and will convey members of the Association who desire to be present at the unveiling of the memorial, which has been fixed for 4 p.m. approximately.

The Local Committee is confident that the members of the Association will show their appreciation of the arrangements made by taking full advantage of the opportunities offered.

William Froude and Experimental Tanks

THE summer meeting of the Institution of Naval Architects, which was held in London on June 10-13, was made the occasion of an International Conference on Experimental Tank Work. It was attended by delegates associated with experimental tanks in Great Britain and in Austria, France, Germany, Holland, Italy, Japan, Norway, Spain and the United States, and was notable for the many tributes paid to the work of William Froude (1810-1879) who may well be called the 'father' of the experimental tanks.

The proceedings were opened on June 10 in the hall of the Royal Society of Arts with an address by Lord Stonehaven, the president of the Institution, who said that many men of many nationalities have helped to elucidate those intriguing and often baffling problems which confront and sometimes perplex the ship designer, but there is one name which stands out above all others—that of the late William Froude, originator and pioneer of the experimental tank method of research.

Lord Stonehaven gave, in chronological order, a list of the principal tanks in the world and at the conclusion presented to the representatives of the tanks copies of Froude's portrait in bronze plaques which had been prepared for the occasion. Three papers were afterwards read, the first of these being by Sir Westcott Abell on "William Froude", while the second and third were respectively by General G. Rota of the Rome National Tank and Prof. T. B. Abell of the University of Liverpool.

Afterwards, during the proceedings, other papers were read, and there were a Government reception at Lancaster House, a dinner at Grosvenor House and various visits and excursions, including an inspection of the William Froude Laboratory at the National Physical Laboratory.

Froude's first model experiments were made in a

large storage tank at the top of his house at Paignton, where he had gone to live in 1859. He removed to a new house, "Chelston Cross", at Cockington, Torquay, in 1867. Through the suggestion of Sir Edward Reed, the Admiralty agreed to pay for the construction of a tank according to Froude's design, and thus came into existence the pioneer Torquay tank, 278 ft. long, opened in 1874.

Nine years later, William Denny at Dumbarton built the first privately owned tank, and in 1886 the Admiralty built the naval tank at Haslar which was placed under the charge of Froude, who at his death was succeeded by his son R. E. Froude. The other tanks in Great Britain now are those of Messrs. John Brown and Co., Ltd., at Clydebank and Messrs. Vickers-Armstrong, Ltd., at St. Albans and the Yarrow tank, opened in 1911, and the new Government tank, 680 ft. long, both at Teddington. Of the last-named, opened by Mr. Baldwin in 1932, an account was given in NATURE of November 26, 1932, p. 800.

Of the tanks in foreign countries that at Spezia was opened in 1889, and that at Washington in 1898. These have been followed by others at Breitenhaven 1900, Charlottenberg 1902, Paris 1905, Hamburg 1908, Nagasaki 1908, Tokyo 1910, Vienna 1919, Rome 1929, and the tank at Wageningen, Holland 1933. The Nagasaki tank was destroyed in the earthquake of 1923, while the Hamburg tank is now one of a group of five belonging to the Hamburg Model Experimental Establishment. The tanks all differ in their dimensions, and their equipment includes all the refinements rendered possible by the advance of science; but the fundamental methods employed are based on those of Froude's. Tests are carried out on models of battleships, destroyers, liners, tramps and even fishing craft and dumb barges, and each tank is a centre of research.