These conditions limit the choice to beryllium and aluminium. Beryllium would be excellent, but so far nobody has succeeded in making tubes from it. Aluminium has therefore to be used, although it is not ideal, as water tends to form surface films, which interfere with the heat transfer. The uranium and graphite have to be purified to a degree hitherto unknown on such a scale; the most important impurity is boron, which seems to be present in very small quantities in almost all reagents. The preparation of aluminium-sheathed rods of uranium of the required purity represents a metallurgical achievement of a very high order.

But even when these difficulties have been overcome, it is unlikely that water-cooled plants will produce useful power. In order to achieve a reasonable thermal efficiency, the water would have to be worked at a considerable pressure; the aluminium tubes would therefore have to be much thicker and would consequently capture too many neutrons. More promising is the use of liquid bismuth, or helium, both of which have very low neutron-capture cross-sections. Even then the pile would have to be very large and its design extremely critical; because the very narrow balance between the number of neutrons produced at fission and those left after capture by U238 and the various materials entering into the construction of the pile necessitates the cutting down of the escape of neutrons and their loss in impurities to a minimum.

Much smaller reactors and greater latitude in design become possible, if, instead of ordinary uranium, material enriched in fissile content is employed. The use of uranium enriched in U235 is not economical because of the high cost of separation, but it is feasible to utilize the production of plutonium by capture of neutrons in U238. This may be of vital importance for the supply of fissile fuel, because if it could be arranged that, for every nucleus of U235 burnt up, one plutonium nucleus were produced, the total number of fissile nuclei would remain constant; in fact, their proportion would increase steadily as U238 is being used up. One cannot say at present whether it would be possible to go further than this and produce more plutonium nuclei than of U235 burnt up. If such 'breeding' of plutonium could be achieved, the problem of availability of supplies of fissile fuel would be solved immediately.

In this respect the production of U233 from thorium is more promising. This is done by placing thorium in the outer layers of a graphite-uranium pile so that it is exposed to neutrons which would otherwise escape. The possibility of 'breeding' is in this case more pronounced, since the number of neutrons ejected at fission of U233 may be sufficiently high to make it possible to build a reactor in which more nuclei of U233 are formed than are burnt up. If this turns out to be practicable, then, having once made some U233 from thorium placed in a uranium pile, we could dispense with natural uranium altogether and continue to produce U233, and generate power, using only thorium as a raw material. Furthermore, this would enable us to utilize, by conversion to plutonium, any U238, from graphite-uranium piles, which became useless owing to the impoverishment in U235.

When will atomic energy be available? As a pure guess it would seem that an experimental plant will be running in the United States by 1949, and that in five to ten years there will be some fairly large power stations generating electricity in various parts of the world. It is impossible to say anything definite about the economics of these plants. The figures quoted recently in the United States depend on several assumptions and data not available in Britain; but for more remote places, without fuel resources, atomic power may well be economical even now. For example, an atomic energy power station might be built to provide power and heat for a large air-port near the North Pole, to shorten many important air routes.

The consumption of nuclear fuel is extremely low; one kilogram of fissile material liberates as much heat as the burning of 2½ million kilograms of high-grade bituminous coal. The amount of electrical energy generated in Great Britain is about 50,000 million kWh. per annum. If the heat generated in fission could be utilized with a thermal efficiency of 27 per cent, the consumption of fissile material needed to produce this amount of electrical energy would be about 7½ tons per annum. If only U235 were burnt, the quantity of ordinary uranium required would be about 1,000 tons per annum, which is just what the total world output of uranium was in 1939. Although the production has since then certainly increased, it is clear that uranium has no future for power production if only U235 could be utilized. But if a substantial part of U238 or, still better, if thorium could also be used, then the figures become reasonable.

Contrary to common belief, uranium and thorium are far from being among the rarest elements. In the rocks composing the globe there are on the average about 4 parts per million of uranium and 11½ of thorium, as compared with 0·5 of mercury and only 0·005 of gold. But unfortunately uranium does not occur frequently in large enough concentrations; thorium is rather better in this respect. Granites and rhyolites contain 10 to 20 grams of uranium plus thorium per ton; their 'calorific' equivalent is thus 25 tons of coal per ton of rock; but the very complex nature of the compounds in which uranium and thorium exist in them makes it impracticable to mine and extract the fuel from rocks.

AN INTERNATIONAL UNION OF FAMILY ORGANISATIONS

A MARKED tendency in educational and social thought of recent years, and a tendency accentuated by the strains to which society has been subjected by the War and the ensuing peace, has been the renewed emphasis placed on the family as the basic social unit and as the most powerful educational influence acting upon the individual. It is therefore not surprising that in various countries efforts have been made to set up organisations to co-ordinate activities relating to family life; organisations such as the National Council on Family Relations in the United States, the Family Relations Group in Great Britain, and the Union Nationale des Associations Familiales in France. The next needed step was clearly the formation of some machinery for international information and documentation, and the building of this machinery has now been started.

In Paris, during June 22–29, there was held an International Congress on the Family and on Population. It was attended by some two hundred delegates from twenty-four countries and, although few of the delegates attended with the official support of their

Governments, there seems little doubt that the Congress was fairly representative of the main streams of thought in most of the important countries of the world.

This very fact, indeed, was responsible for what at first appeared to the writer to be a weakness in the Congress. When some delegates were enthusiastic about large families and others little concerned with mere family size, when some were interested in the problems and techniques of family planning and others condemned it as immoral, when some represented still quite patriarchal countries and others countries in which women were fully recognized as the equals of men, it was difficult to get down to any detailed discussion or expert examination. In truth, it could not be claimed that this Congress achieved anything very important in the way of settling the problems of family life. It did, however, provide an opportunity for the exchange of information and widely differing views on housing and homemaking; sex education, marriage guidance and general education for family life; the role of women in general (and mothers in particular) in society; family allowances and other social measures for the strengthening of family life; the role of family organisations in national life, and so on.

Out of this exchange there emerged, despite all differences of opinion, a widespread and deep desire for international co-operation. Most delegates felt that they could learn much, and perhaps most of all from those from whom they differed most widely. Towards the end of the Congress, this diffuse desire for international co-operation gradually crystallized into a determination to set up an international organisation and, at the final session, a resolution to this effect was passed unanimously.

The new organisation is to be called the International Union of Family Organisations; but it was clearly recognized that all decisions as to structure and programme could at present be purely provisional. The British delegates, in common with those from most other countries, felt that they had no mandate whatsoever to commit their countries or even the organisations they represented to anything very concrete. Equally, however, they felt that it would be a great pity to allow this very representative gathering to disperse without forming at least an embryonic organisation. A provisional international committee was therefore set up, a Swiss delegate was appointed as provisional president, and a French delegate as provisional secretary. It was agreed that vice-presidents should, if possible, eventually be appointed from the United States, Great Britain, France, 'Eastern Europe' (by which the U.S.S.R. was generally understood to be meant), Scandinavia, South America, the Near East and the Far East; and, no doubt, it was by an oversight (for these provisional arrangements were necessarily made hurriedly) that Africa and Australasia were not included in this list. Finally, it was agreed that the International Union should be open to all countries, including those not represented at the Congress, and that every effort should be made to work closely with U.N.O. and U.N.E.S.C.O. It is encouraging to be able to report that an observer from U.N.O. welcomed the establishment of the International Union.

Whether the future will see a great strengthening of the new International Union of Family Organisations, or whether it will see its gradual withering, it is as yet impossible to say. Everything depends upon whether the action of the delegates is ratified when they report back to their respective national organisations. One most encouraging fact, however, is that throughout the world to-day there is great interest in the problems of family life. Catholics and Protestants, Capitalists and Communists, all, in their different ways, recognize the importance of the family, and in this lies great hope.

CYRIL BIBBY

NEWS and VIEWS

East African Agricultural and Forestry Research: Dr. B. A. Keen, F.R.S.

DR. B. A. KEEN has been appointed director of the new East African Agricultural and Forestry Research Organisation. The Organisation will work in close association with the corresponding Veterinary Organisation and the Agricultural Departments of Kenya, Uganda, Tanganyika and Zanzibar. For many years Dr. Keen was assistant director and head of the Physics Department at Rothamsted Experimental Station. During 1929–31, at the request of the Government of India, he was seconded as director of the Imperial Agricultural Research Institute to reorganise it. During 1943–45, he was scientific adviser to the Middle East Supply Centre. In 1946 he revisited Palestine to advise on the organisation needed for rural development and also went to West Africa as chairman of the United Kingdom Government Mission to inquire into the production of vegetable oils and oil seeds. Since February 1947 he has been touring East Africa at the invitation of the Governors' Conference to examine agricultural problems and research needs.

Recordings at Kew of the Brest Explosion

MR. J. M. STAGG, of the Kew Observatory, Richmond, Surrey, writes that the effects of the explosion of a cargo of nitrate in Brest harbour on the evening of July 28 were clearly recorded on one of the seismographs and on four barographs at the Observatory, which is 480 km. from Brest. The seismograph, a short-period, vertical component instrument, recorded the first effect at 16h. 48m. 52s. G.M.T. with a second pulse nine seconds later. The biggest amplitude occurred at 16h. 49m. 05s. and the whole disturbance lasted about one minute. The character of the effect on the seismograph closely resembled the effects produced by bomb explosions, flying bombs, etc., in the neighbourhood of the Observatory during the War, when, for the most part, the disturbances were due to airborne sound waves. That the seismograph disturbance was due to the explosion air wave and not to true earth movements is supported by the times of the disturbance recorded by the Kew barographs, including a very sensitive microbarograph. All four instruments showed a sudden pulse (about one millibar) of very short duration in both directions, the mean of the times being 16h. 49m. 0s. ± 15s. The Kew records taken together put the time of the Brest explosion at about 16h. 25m. G.M.T.: there was no indication of an earth movement or an upper air sound wave.