postgraduate study is a normal feature in the life of the Soviet physician. Soviet medicine has no fear about the standard and qualifications of its personnel.

A glance at Russian medical journals, and, still more, visits to hospitals and research institutes, show clearly that Soviet medicine is not 'practical' in the crude sense of the word. Though there is an ever-present need for personnel, and attention to the immense public health problems of the Soviet Union requires many routine workers, much of the work in the laboratories is of a highly abstract character. None the less, practical results are constantly sought. The immense flora and variety of soil conditions of the Soviet Union have been pressed into service. Systematic exploration of the pharmacological properties of the higher plants and soil bacteria is proceeding, while such institutes as that of balneology with its great variety of laboratories illustrates the use that Soviet physicians are making of the curative properties of springs and muds.

Although Russian workers have much to contribute to the rest of the world, they are borrowing freely from abroad, and, in some instances at any rate, have extensively developed work that was begun elsewhere and not carried to any conclusion. The production of lysozyme on a massive scale from a large variety of biological substances is an example. This achievement has been rather overshadowed by the coming of penicillin, but the Russian preparation of penicillin from *Penicillium crustosum* and their intensive exploration of the possibilities of producing synthetic penicillin illustrate once more that they not only borrow but also develop and improve on work from abroad. In the comity of civilized nations, Soviet medicine holds its place as an equal.

AGROCHEMISTRY

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RUSSIAN translations into English of the names of institutes and journals produce many uncouth phrases, such as "Chemisation of Socialist Agriculture" and others mentioned below, but occasionally they produce a word which we might well take over. Thus 'agrochemistry' describes fairly satisfactorily one of the halves into which our old science of agricultural chemistry is splitting up under the influence of increasing specialization. The subject covers crop nutrition and those branches of soil science concerned with soil fertility rather than soil formation and classification. The grand old man of Russian agrochemistry is D. N. Prianischnikow who, with a few other members of the Academy of Sciences, had received the highest Soviet award, Hero of Socialist Labour, a few days before our arrival. We were delighted to find him fitter and more lively in his eightieth year than when he last visited England in 1935 for the Third International Soil Congress at Oxford.

An outstanding feature of Russian agricultural science is the elaborate organization of team-work in a large number of institutes responsible to independent authorities. Considerable overlapping in programmes is not only allowed but also clearly encouraged. The necessary co-ordination is secured and a high standard of work maintained by requiring many research workers to divide their time between two or more institutes or colleges, and by giving a few overworked authorities responsibility for a broad group of problems in several institutes. Thus we saw one of Prianischnikow's teams at Dolgoprudnoye in the Gedroiz Institute of Fertilizers, Soil Management and Soil Science under the Lenin Academy of Agricultural Sciences, and another in the Department of Agrochemistry in the huge Timiriazev Academy of Agriculture, which has some sixty professors and 3,000 students. We also came across his pot-culture work in collaboration with the radioactivity section of the Institute for Geochemical Problems. Another example is afforded by the work of Prof. I. W. Tiurin on soil organic matter in the soil science departments of the University and the Forest Technical Academy at Leningrad and the Biochemistry Department of the Dokuchaiev Soil Institute at Moscow. Even Prof. Joffe, with all his other commitments in pure and applied physics, manages to find time to direct an admirable Institute of Physical Agronomy in Leningrad under the Lenin Academy of Agricultural Science. By means of his improved thermocouples, it was found that during August the night temperatures of potato leaves in th hern regions are often as much as 7° below those soil surface. This led to a new method of planting potatoes in wide high ridges across the direction of the prevailing wind, to transfer as much heat as possible from the soil to the leaves and so avoid late frost damage.

Prianischnikow has been checking his early work on nitrogen metabolism in plants and has confirmed that plants of all ages take up ammonium ions more rapidly than nitrate from dilute solutions of ammonium nitrate, though from unduly concentrated solutions nitrate may be taken up and ammonium excreted. In view of the acute shortage of nitrogenous fertilizers, which was manifest in all the crops we saw, Prianischnikow has great hopes of the benefits likely to accrue in the north from the rapid extension as a green manure crop of a frost-resistant Canadian strain of the blue garden lupin, *Lupinus polyphyllus*.

During the War, fertilizers could be spared only for a few industrial crops, such as cotton and irrigated sugar beet, but research on both the production and efficient use of fertilizers is well advanced. At Salikamsk there are larger reserves of potash than in Germany, and it is claimed that the U.S.S.R. now has larger reserves of phosphate than any other country. Until recently the only known deposits were low-grade rock phosphates and crystalline apatites, both unsuitable for making superphosphate. Brilliant work by Kazakov in the Institute for Fertilizers and Insecto-fungicides under the Commissariat for Heavy Industry has led to the discovery of vast deposits of high-grade rock phosphate in the Kara Tau region of Kazakstan. This discovery is also of considerable geological interest, for it was the outcome of a new theory of the formation of rock phosphate by precipitation from cold deep waters upwelling against a continental shelf.

Preparations are well advanced for using fertilizers on a vast scale. Thousands of field experiments have been conducted over a variety of crops, soils and regions, and individual collective farms are being mapped to show the best amounts and forms to use. Fertilizer consumption and crop yields should increase rapidly, especially in the leached soils of the centre and north, as soon as new factories and railways can be built.

The need for lime is still acute. About half the isolated limestone deposits are dolomitic, but recent

work in the U.S.S.R., as in the United States and Great Britain, has shown that the old agricultural prejudice against this form is ill-founded. Indeed, it has been shown that some sensitive crops, such as serradella, lupins and potatoes, may safely receive full dressings of magnesian, though not of high-calcium, limestones.

Great importance is attached by the Mechanization Institute to a double plough in which a half-size plough precedes the usual digger plough. It is claimed that this buries turf and weeds more completely and avoids dead air spaces, and it was stated that no other type of plough is to be made.

Much work is being done on the difficult problem of analysing the production of tilth and the stability of soil aggregates. It will come as a shock to exponents of ley-farming in Britain to hear that several Russian workers hold that leys should not be grazed, at least for three years, lest trampling by stock should annul the granulating action of the grass roots.

(To be continued)

OBITUARIES

Major C. E. S. Phillips, O.B.E.

By the death of Charles Edmund Stanley Phillips on June 17, many will mourn the death of a very interesting personality.

Phillips was born on February 18, 1871, his father being Samuel E. Phillips, one of the founders of Johnson and Phillips, the firm which made some of the earliest electric marine cables. He was educated privately and studied, for a short time only, at the Central Technical College, South Kensington. It may be that it was owing to his rather unorthodox education that he was so versatile.

After the discovery of X-rays in 1895, Phillips devoted much time to the making of vacuum tubes and in studying their performance in his own laboratory at Shooters Hill. His friend, H. O. Mance (now Brigadier-General Sir Osborne Mance), who was working with him, has preserved some of Phillips's letters written to him early in 1896 describing his difficulties. In a letter dated May 4, 1896, Phillips says, "this afternoon I made a Röntgen tube myself but afterwards found the glass used was lead glass so gave it up as useless". In July of the same year he writes: "I've got an experimental vacuum tube nearly finished which takes to pieces and can be cleaned and exhausted. . . . There seems no doubt that the X-rays consist of rays having various different properties and are by no means homogeneous".

Phillips continued to experiment with vacuum tubes and published in 1901 a paper, which created a good deal of interest at the time, on the effects produced by a magnetic field upon the distribution of ions within a highly evacuated space (*Phil. Trans.*, A, **197**, 135; 1901). In 1908 he produced an electrical conducting glass (*Proc. Roy. Soc. Edin.*, **28**, 627; 1908) from which the windows of electroscopes could be made. Unfortunately, the glass was never made commercially. In 1910 he delivered a discourse at the Royal Institution on the electrical and other properties of sand. In this he showed some striking and original experiments which might well be repeated.

Phillips was one of the founders of the Röntgen Society and read several papers before it. He served as its president in 1909. During 1914–17 he was in charge of the X-ray Department of the Royal Herbert Hospital, Woolwich, and during 1915–18 was physicist to the X-ray Committee of the War Office. Towards the end of 1915 he gave, at the 2nd London General Hospital, a course of lectures to the orderlies of X-ray departments on the physics of X-rays, Dr. Russell Reynolds dealing with the medical side of the subject. These courses of lectures may well be regarded as the initiation of the movement for training radiographers. Phillips was much concerned at the need of protection for those working with X-rays, and served as a member of the Inter-Services X-ray Advisory Committee from its inception until its dissolution in 1939. He was appointed brevet major (on reserve to the 5th Battalion Royal West Kent Regiment) in 1918 and received the O.B.E. for his services.

Phillips was one of the founders of the British Institute of Radiology and was its president during 1930–31. He was for some time lecturer on radiology at University College, London, and was also physicist to the Royal Cancer Hospital.

In 1909 Phillips suggested the use of a trace of radium with zinc sulphide for luminizing the dials of night-marching compasses, and the first model made by him is preserved in the Science Museum at South Kensington. It is unnecessary to stress the importance of this invention.

Phillips was one of the founder fellows of the Institute of Physics, and, if he was not the first to suggest the formation of the Institute, played the leading part in its formation in 1918. He was a member of the first Board and, except for one brief interval, served on it until his death; he had been treasurer since 1925. From 1929 until a few weeks before his death he was also honorary secretary of the Royal Institution.

Phillips was an excellent violinist and enjoyed playing on his Stradivari violin. In a discourse given before the Royal Institution in May 1935, he showed how he had tried to elucidate the secrets of the tone of the violins made by the old masters. He was also a good amateur artist; his portrait of Sir William Bragg now hangs on the walls of the Royal Institution. He gave great pleasure to many friends by his facility in depicting them in caricature. He was a delightful companion with a keen appreciation of a practical joke, especially if it had a scientific background. He was at his best at the dinners of the Physical Society Club, of which he was one of the founders.

In 1903 he married Winifred, the elder daughter of the late Mr. John Baines. R. S. Whipple.

Mr. R. W. F. Harrison and Mr. A. G. Hastings White, C.B.E.

The association of the main work of a lifetime with the affairs and traditions of an old foundation is, happily, not yet rare. With the recent deaths of Mr. Robert William Frederick Harrison (July 15) and Mr. Alfred George Hastings White (July 8), at the ripe ages of eighty-seven and eighty-six years, the Royal Society has lost links with a bygone generation. Both had made its interests the centre of their own and had become steeped in its traditions, though the manners of their service and the periods over which it was rendered differed widely.

Mr. Harrison was already a man of thirty-eight,