Now comes the interesting sequel. Deuterium and its triatomic molecule supply two links, missing before, of the three forming a closed chain of masses by which H can be directly connected with O, given a mass-spectrograph of sufficient resolving power. These links are the doublets D—H_2, at mass 2, C^{++}—D, at mass 6, and O—CH_4 at mass 16. By means of an improved collimator I have recently increased the resolving power of my mass-spectrograph to that necessary to achieve at least a partial separation of the extremely close doublet D—H_2, and to make a much more accurate estimate of the doublet O—CH_4. The latter has disclosed the disturbing fact that this is really wider than I had taken it to be and so no longer confirms the early value of C and H. Provisional work on the wide doublet C^{++}—D_3 makes it reasonably certain that my original value for H is 2 or 3 parts in 10,000 too low, as is also suggested by nuclear transformation experiments. Here we have the pretty paradox of the element discovered providing the means to remove that very discrepancy which seemed to point the way so clearly to its discovery. In view of its valuable results I am not likely to regret my mistake, however serious it turns out to be. The only moral to be drawn from this seems to be that you should make more, more and yet more measurements. Even a bad one *may* be of service, but, fortunately, it will be essential for you to make a considerable number of good ones first, or no notice will be taken of it.

In the field of isotopes, as in so many fields of physical and chemical research to-day, the objective we now aim at is the next decimal place, an elusive object which always appears to be running away from the observer, like a distant spiral nebula. The need for isotopic weights of the highest accuracy is urgent. In artificial radioactivity and transmutation we see the real beginnings of a great new subject, the nuclear chemistry of the future. Its equations can only be founded securely upon direct determinations of masses by the mass-spectrograph, and the nuclear chemist already demands these to an accuracy of 1 in 100,000. I have little doubt we shall be able to provide him with these in the course of a year or two. Armed with reliable equations, and thereby with more and more definite knowledge of nuclear construction, he will transmute and synthesize atoms as his elder brother has done molecules, with results to be wondered at and possibly even misused by his fellow creatures. I foresee a time, not immeasurably far distant, when it will be possible for us to synthesize any element whatever, wherever and whenever we please; alchemy indeed in the service of man.

THE FIFTEENTH INTERNATIONAL CONGRESS OF PHYSIOLOGY

THE CONGRESS AND RUSSIAN PHYSIOLOGY

NEARLY one thousand persons (not all physiologists!) have just returned from a visit to the Soviet Union after attending the fifteenth International Physiological Congress. Every conceivable kindness was shown and honor done to us, and we had the best possible opportunity (in the limited time available) of making ourselves acquainted with Russian physiologists and physiology. We came away filled with affection and regard for our Russian colleagues and deeply touched by their welcome; glad indeed to witness the respect with which they, as scientists, are treated in their country and to appreciate the important position which science, pure as well as applied, and particularly physiology, occupies in the economy of the Soviet Union; moved by the ardor and enthusiasm of the army of young scientific workers; looking forward with hope, not perhaps unmixed with trepidation, to the contributions which these will make to our subject in the next twenty years.

Those twenty years will be critical, and their result will depend very largely upon a factor of which, as yet, the youthful ardor of Russian science takes little obvious account. The devotion of the state to science is proclaimed, and huge resources are lavished upon scientific work. Great new laboratories and scientific establishments are being built and equipped. In a few years there will be literally thousands of enthusiastic workers in physiology and its allied sciences—there were said to be five hundred at the congress. With all this devotion, with all these resources, with all this faith in science—not only for its practical uses, but as an instrument of human culture—is it possible that anything can be missing? One wonders.

In Great Britain and America we are not unacquainted with this problem. The state, as state, may not devote so large a fraction of its resources to the encouragement of scientific work, but our traditions and our particular forms of government—imperfect as in many respects they may be—do in fact allow other and not inconsiderable resources to be so used. The Rockefeller Foundation, the Commonwealth Fund, the buildings and endowments of innumerable universities and institutions of teaching and research throughout America; the ancient and other foundations of the schools and colleges and universities in Great Britain, the endowments of the Royal Society and of various

other bodies, the vast resources of many private agencies available throughout the British Empire for research; these, and many other such, certainly no less in total amount than those devoted to science in the Soviet Union, have given us, over a long period of years, a fair amount of experience in the administration of funds for scientific research and development. We know well that laboratories, equipment, thousands of enthusiastic and devoted workers, even public honor paid to scientists (not quite negligible, even in capitalist England!) are not enough. With all these in full measure, there may still be something missing. We know it only too well.

A proper degree of scientific skepticism, a stern capacity for criticizing the work of oneself and others, a habit of rigorous "control" of experimental results, a severe standard in scientific accuracy of experiment and thought, these are fundamental conditions of high scientific achievement. Without them vast resources may be wasted, great and idealistic plans may be brought into contempt, huge unstable edifices may be erected. Are these critical factors, by some political magic, inevitably present in the science of the Soviet Union? Some of us wonder. If not, can we look to the future of Russian science with quite unmitigated hope?

These doubts are expressed in all friendliness, in the desire to help. One would hate to see "a good ship spoilt for a ha'p'orth of paint." But science is like a chain, built up one link on to another; if one is bad the chain may be worse than useless. Each link separately must be examined and tested; it must be mistrusted until it is proved good. Can we be sure that the present environment of Soviet science is one which breeds this necessary skepticism? If not, may the following suggestions, of which the third is far the most important, be of service?

I. That publication, at least of a significant fraction of the more important papers, should be made in some language which the rest of the world can read, preferably in English, which is more widely read than any other language. The Japanese publish journals in English and German, the Italians in French, the Scandinavians in English and German, the Dutch in English and French: there are many such examples. At present the physiological world does not know what is being done in Russia. We can neither appreciate nor criticize, yet both appreciation and criticism are needed in a rapidly developing science. Why not publish in English, or if necessary in French or German, a Russian physiological journal, to be circulated outside the Soviet Union as well as inside, not for purposes of propaganda, but as an ordinary scientific publication, to allow our colleagues to bring their ideas and work readily to the notice of the world, to join as partners in criticism and discussion with the rest of us?

II. That, conversely, our Russian colleagues should be given the financial means of purchasing abroad the journals, at least the most important journals, of the rest of the world, together with sufficient text-books and monographs on special subjects. At present, in many places at least, they are being intellectually starved for lack of foreign publications.

III. That the ablest of the younger scientists should be sent, as a matter of course, outside the Soviet Union to study in other countries, not merely for a month or two but for a sufficient period to enable them to make proper scientific contacts, to learn what is being done and to pick up some of the scientific skepticism which is traditional in the older scientific schools. They long for the opportunity to work abroad. They are pathetically eager for the wider contacts. They told one that it seemed like a dream to see and talk with Barcroft, Cannon, Gasser, Adrian. Their eagerness and their imaginative qualities would make them welcome in any foreign laboratory, and they would return all the better equipped to build up Russian science on sound and critical lines.

The government of the Soviet Union believes in international cooperation. Will they not make these fundamental contributions to Russian and so to international science? The reason for not sending their young scientists to study abroad has been alleged to be the difficulty of finding the necessary *valuta,* but the trade balance is not really so bad as that now, and when fellowships were available, through one of the great international foundations, a few years ago, they were not used. No country can be, or can dare to try to be, self-sufficient in science, particularly when developments are taking place so fast. The fear, which perhaps underlies the inhibition, that the pure faith of the young scientists from the USSR might be corrupted in other lands, is an unnecessary one: we do not subject our guests, at least in England and America, to the dismal drone of political propaganda. One can not doubt the genuine and earnest wish of the government of the Soviet Union for closer and friendlier relations with other countries, or their sincere appreciation of science, or their desire to forward science, pure and applied, in their own country and so in the rest of the world. By their extraordinary courtesy to their thousand guests of the Physiological Congress they made all this abundantly clear. Why, therefore, should they not take these three simple practical steps to fulfill their admirable purpose?

A. V. HILL

LONDON, AUGUST 26, 1935

PROCEEDINGS OF THE CONGRESS

THE fifteenth International Physiological Congress, which took place in Leningrad and Moscow from August 8 to 18 under the presidency of Professor I. P. Pavlov, was in many respects a unique occasion. It marked the first time that this or any other large in-

ternational scientific congress has been held in the USSR, and for the first time physiologists from all parts of the world obtained first-hand contact with the work of their Russian colleagues. Further, the excellence of the entertainments and general arrangements, as well as the great interest of the new social developments of Soviet Russia engrafted upon the old culture, made the event a memorable one for all privileged to attend.

The opening events took place in the large hall of the Uritzky Palace, formerly a royal residence and later the meeting place of the State Duma, but now part of the university system of Leningrad. The great hall, which had been newly renovated and was decorated with flowers and large palms, was a brilliant scene as the membership convened. Head phones were provided at every seat through which one could listen to the speakers directly, or plug in for a translation in Russian, German, French or English. General comment was made on the satisfactory operation of this system. Professor Pavlov declared the congress open and welcomed the visiting members to the Soviet Union in the address which follows:

I declare the session of the fifteenth International Congress of Physiologists open. I am greeting here in the name of all the physiologists of my country our dear comrades who have come here from every part of the world, and I heartily wish them to spend the time here usefully and pleasantly.

This congress of physiologists, which is the fifteenth in number, is the first to meet in this country. This is as it should be. Ours is a young physiology. We are only the second generation of Russian physiologists, although this generation is nearing the end of its days. We must regard as the father of our physiology Sechenov, who was the first Russian to deliver his lectures, not from somebody else's book but as a specialist with his own demonstrations, and who established the first physiological school in this country. All this was due of course to his outstanding abilities. That is why we deemed it appropriate to present to the members of the congress his best works and a medal with his likeness. Sechenov was the promoter of physiological works on a large segment of the globe.

The manifold benefits of international congresses are so obvious and have been so much talked of that I shall emphasize only a few points which are of special significance in the present case.

It is time for us, physiologists, as has already been stated among us on numerous occasions and as is being practiced at other congresses, finally to adopt a decision on what is known as questions of program, that is, questions which provoke a particularly lively interest at the moment, perhaps coupled with a limited number of communications on special subjects. General meetings ought to be held, to which should be invited both persons investigating the question selected and disputants. In such instances of deliberate and stimulating discussions, special remarks from colleagues not directly connected with the question may prove to be of considerable value.

The second point which I wish to raise as being of particular importance to us at the present time is the question of the special influence which such meetings of scientists exercise over the young generation, over the young scientists. I know the power of this influence from my own experience in my young days, from the old congresses of our naturalists and physicians. Our government is now spending very large sums for scientific research and is drawing masses of young people into science, and the spectacle of world scientific achievements embodied in living persons must have an enormous stimulating effect on these young people.

Finally, point 3. We are all different people, yet at the moment we are united and stimulated by a keen interest in the common task of our lives. We are all of us good comrades, with clear bonds of friendship uniting many of us. We are apparently working for a rational and final unification of mankind. But should a war break out many of us will enter into hostile relations with each other, and precisely in our scientific sphere, as has happened more than once. We shall not want to meet together as we are doing now, even our mutual scientific appraisal of one another will become different. I can well understand the greatness of a war for liberty. At the same time, it can not be denied that war is essentially a beastly method of solving life's difficulties [applause], a method unworthy of the human mind with its immeasurable resources. At the present time there is to be observed an almost world-wide desire and intent to avoid wars, perhaps by more certain means than in the past and I am happy that the government of my mighty fatherland, in its fight for peace, was the first to declare for the first time in history: "Not one inch of foreign soil" [stormy applause]. We must particularly sympathize with and promote this, of course. And as seekers of truth we must add that it is necessary strictly to observe justice in international relations. This is the chief real difficulty.

This year our active world society has lost two true members. There has passed away Professor Schaeffer, formerly of the University of Edinburgh, who had devoted all his long life very successfully to our science. There has also passed away at the height of his working powers Professor Macleod, of Aberdeen University, who had been crowned with a Nobel prize. Let us honor, by rising, the memory of the comrades who have passed away from us. [All rise and the Chopin funeral march is played.]

In conclusion, we, native physiologists, must tender thanks to our government which has given us the opportunity to accord a worthy reception to our dear guests. I am giving the floor to the chairman of the government commission specially appointed for assisting the organization of the congress.

Following the address of the president, I. A. Akulov, secretary of the Central Executive Committee of the USSR, delivered a speech on behalf of the Soviet

Government. I. S. Kadatski, chairman of the Leningrad Soviet, welcomed the members on behalf of the city Soviet and the workers of Leningrad. Greetings were also delivered by Professor Karpinsky for the Academy of Sciences. The principal address was by Dr. W. B. Cannon, of Harvard University, who spoke on "Some Implications of the Evidence for Chemical Transmission of Nerve Impulses." A second plenary session was held in the same room a few days later, at which Professor L. A. Orbeli, of Leningrad, spoke on "Pain and Its Physiological Effects" and Sir Joseph Barcroft, of the University of Cambridge, on "The Velocities of Some Physiological Processes."

All the scientific sessions were held in the Wiborgsky Dom Cultury, where the various sections met in convenient relation with each other. A total of forty morning or afternoon sessions were held, including some which consisted of demonstrations and moving pictures. Five sections met simultaneously, each including a group of papers having a more or less common interest. These programs suffered from the usual deficiencies incident to such occasions, where many languages are spoken and where a large number of brief communications on varied topics are read. However, the sessions in general were well attended and the standard was not below that set by recent meetings of the congress.

Outside the lecture halls in a large number of rooms of the Wiborgsky Dom Cultury there was arranged an elaborate series of exhibits depicting the development of the science of physiology in the USSR, and graphically showing, in an excellent series of charts, representative results of recent investigations by Russian workers. This demonstration portrayed in a vivid manner the enormous expansion in the facilities for physiological research and the increase in the number of investigators which have taken place within a very few years. For example, it is stated that in tsarist Russia there were only 24 institutions for physiological research, whereas the Soviet Union already has 380 institutions working in the field of physiology. Similarly, Russian workers in physiology have greatly increased, and they are said now to be numbered in thousands, of whom over 500 were present at the congress. The rate of expansion has been so great that many of us have felt that there is danger of a loss in critical judgment and a lowering in the standards of scientific work—a feeling which is voiced by Professor Hill in this number of SCIENCE.

Most of us have heard of the alleged conflict between science and religion, but to the visiting members of the congress a more serious conflict was that between science and the many forms of entertainment which Russian hospitality provided. It is the latter phase of the congress which has left the most enduring impressions on the visiting members. Private cars were provided between the hotels and meeting places as well as for daily excursions. Passes were issued giving members free use of street cars and busses. In fact, the membership badge or the word "congress" was effectively the key to the cities of Leningrad and Moscow, giving free access to the picture galleries, museums, parks, palaces and other public buildings. The official entertainments, of which there were a large number, were on a scale and of a magnificence which but few of us had previously experienced. Among these may be mentioned the opening reception in the Ethnographical Museum given by the Physiological Society of the USSR, which was attended by more than 1,200 members and Soviet officials. The display of food and refreshments in the beautifully decorated marble hall will long be remembered. The official banquet, which was given at Detskoye Selo, 15 miles from Leningrad, in the throne room of the Catherine Palace, was a scene of great splendor, said to be strongly reminiscent of the elaborate feasts of the tsarist régime. The banquet, lasting many hours, was followed by an impressive display of fireworks in the garden, after which there were further refreshments and dancing in the Cameron Gallery. Another event of great interest, which may be mentioned now, was the reception given later in honor of the delegates of the congress by V. M. Molotov, chairman of the council of the peoples' Commissars of the USSR, in the Grand Kremlin Palace in Moscow, at which over 1,500 people were present. On this occasion Mr. Molotov made a speech describing the position and importance of physiology in the Soviet Union. Replies were made by the president, Professor I. P. Pavlov, and various other members of the congress, including Andres Mayer (France), Otto Loewi (Austria), A. V. Hill (England), U. Ebbecke (Germany), H. J. Jordan (Holland) and I. P. Rasenkov, chairman of the All-Union Physiological Society. The reception ended with a concert, in which the actors from Moscow theaters and the amateur art group from the Central House of the Red Army participated. In Leningrad also a special concert was given for the membership of the congress in the state theater of drama, in which many of the outstanding artists of Russia took part.

Facilities were provided for visiting the numerous laboratories and medical institutions in Leningrad and Moscow, as well as the various government enterprises and social institutions developed for the furtherance of educational and recreational opportunities for the workers. These various "extracurricular" activities gave abundant opportunity for getting in touch with the scientific work going on in Soviet Russia and the opportunity to meet investigators in their own laboratories and of talking with them during excursions

and other entertainments, and it is perhaps from this source that the most important fruits of the congress are to be expected. In the past Russian physiology has developed with very little interchange with other countries, and if the contacts made during the congress are further developed, as they almost certainly will be, it may well mark an important milestone in the advance of physiology.

The scientific sessions in Leningrad ended on August 16, and during the evening the entire membership of the congress entrained for Moscow, where the final plenary session was held on the following day. At this meeting, held in the great hall of the Conservatory of Music and presided over by Professor Pavlov, Professor Lapicque delivered an address on "Recent Progress in the Study of Nerve Function" and Professor Ukhtomski on "Physiological Lability and the Act of Inhibition." Professor Hill then presented the report of the International Committee, the substance of which follows:

(1) The retirement of W. H. Howell, Baltimore, and I. E. Johanson, Stockholm, was announced with regret. These vacancies were filled by the election of W. B. Cannon, Boston, and G. Liljestrand, Stockholm. The other members of the committee are: F. Bottazzi, Naples; O. Frank, Munich; A. V. Hill, London; L. Lapicque, Paris, and I. P. Pavlov, Leningrad.

(2) It was decided to accept the invitation of Professor Hess, of Zurich, and the Society of Swiss Physiologists to hold the 1938 congress in Switzerland, a decision which was unanimously ratified by the general session. A reminder has been received from the Hungarians to the effect that an invitation to Hungary still exists and will be renewed in 1938. Reference was made to the fact that the first International Physiological Congress was held in Switzerland in 1889, so that the next meeting will effectively be the jubilee of the first congress.

(3) The International Committee recommended to the Swiss National Committee that applications for membership should not be accepted directly from individuals, but only through committees of national physiological organizations. This recommendation was made for the purpose of limiting membership in general to investigators in laboratories of physiology, pharmacology, biochemistry and experimental zoology.

(4) The International Committee decided that the next national organization should be advised of the strong opinion of the committee that the arrangements of future congresses, particularly in regard to entertainment, should be simplified so that not too great a financial burden should have to be faced by the national committee. The membership fee should as far as possible cover the cost.

(5) It was decided to recommend to the next national committee that experiments be made on the matter of improving the programs. The method proposed is to arrange that printed communications with suitable references supplied by registered members should be circulated some months before the meeting. Any member might signify his wish to take part in a discussion, which would be arranged in subject groups having a common interest. Discussion only and not presentation would be allowed.

(6) The function of the International Committee had been in practice advisory, but if, for any reason, any national committee should resign, temporary executive functions would be taken on, pending the formation of another national committee. To secure permanency a permanent officer is required and the committee decided to appoint a permanent secretary to act as their center between meetings and to conduct correspondence with the national committee. Professor A. V. Hill, of University College, London, was asked to act in this capacity. Any correspondence to the international committee can be sent to the secretary, but business of the next congress will be in the hands of the Swiss committee.

Professor Hill expressed the deep gratitude of the international committee to their Russian colleagues for the warmth and wealth of their welcome and then called upon Professor Barger, of Edinburgh, to voice the opinion of the congress membership. This Professor Barger did most acceptably and to the admiration of all present in eight languages—Russian, English, German, French, Spanish, Italian, Dutch and Swedish. After the business session was concluded, Professor Pavlov closed the congress with a few words, thanking its members for their cooperation in the work of the sessions and expressing his gratitude that the congress was held in the Soviet Union.

McKEEN CATTELL

LONDON, AUGUST 28, 1935

SCIENTIFIC EVENTS

FELLOWS OF THE BEIT MEMORIAL FELLOWSHIP FOR MEDICAL RESEARCH

AT a meeting of the business department of the Beit Memorial Fellowships in London on July 12 it was reported that fellowships during the year 1934–1935 were held by 26 workers. Among the appointments gained during the year by past fellows may be noted that of J. R. Marrack (1914) to the professorship of chemical pathology, University of London, at the London Hospital; of A. St. G. Huggett (1922–1925) to the professorship of physiology, University of London, at St. Mary's Hospital; of W. P. Kennedy (1929–1932) to the professorship of biology, Royal Medical College, Baghdad, and of F. H. Smirk (1930–1934) to the professorship of pharmacology in the