Annual Address to the National Institute of Sciences of India.

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CONSERVATION OF WILD LIFE IN INDIA.

I. GENERAL.

I regret to have to start my short address this year with an apology to the Fellows of the Institute for not being able to devote sufficient time to the activities of the Institute, but this was rendered impossible by circumstances over which I had no control. The headquarters of my Department were suddenly shifted from Calcutta to Benares, and owing, firstly, to my being so far away from the headquarters of the Institute at Calcutta, and, secondly, the pressure of official duties I could spare very little time for the work of the Institute. In fact, foreseeing that something like this was likely to happen, I had great hesitation in agreeing to carry on as the President of the Institute during 1942, but my colleagues on the Council did not agree with my views and I was left with no choice except to fall in with their wishes. Under the circumstances, I am afraid, I have been the President of the Institute in name only, at least during the greater part of the year.

Activities of the Institute.

Since the last meeting at Baroda the affairs of the Institute have been progressing more or less satisfactorily, and notwithstanding the great stress due to the world war, the unfortunate disturbances in the country, as also the consequent economic conditions, there has been no great change in our material prosperity during this period. The annual grant from the Government of India, as is explained later on, was reduced to its 1940 figure and we have not received any fresh donations during the year, but it is to be hoped that these are only temporary setbacks and that the Institute will, with the return of normal conditions, begin to receive more active support both from the Central and Provincial Governments, the Universities and the well-wishers of science all over the country. The record of our activities during the past year, as detailed in the Annual Report, is a matter of satisfaction and reflects great credit on the administrative officers and the Council for the very careful way in which the affairs of the Institute have been handled during these critical times.

Fellows.

The number of Fellows on our roll at the beginning of the year was 179 Ordinary Fellows and 23 Honorary Fellows. At the end of the year this number stood at 177 Ordinary Fellows and 22 Honorary Fellows. During the year one Ordinary Fellow resigned, and the

Institute lost one Honorary and one Ordinary Fellow by death. As was stated in my address last year, the number of Fellows of the Institute, considering the prevailing conditions of the country and the statutory limitations in regard to new elections, is satisfactory. The change in the rules, which was adopted in the Benares meeting of 1941, has made it possible to increase the annual number of Fellows to be elected from 10 to a number not exceeding 15, dependent on the vacancies occurring during the previous year by resignation, death, or otherwise, until the maximum of 250 is reached. As a result of this change thirteen Ordinary Fellows were elected in 1942.

Meeting of the Institute.

Owing to the unfortunate situation prevailing in the country only one General Meeting was held at Calcutta in the rooms of the Royal Asiatic Society of Bengal on the 5th of October, 1942. Another meeting was proposed to be held in Benares, but for various reasons the arrangements for the meeting could not be completed, and the Council was obliged by the prevailing conditions to give up the idea of holding the proposed meeting at Benares or at any other centre in the country. It is hoped that during the present year conditions will change materially, and it would be possible to arrange for more meetings of the Institute at various centres.

Council.

The Council for 1942 was elected at the Seventh Annual General Meeting held at Baroda on the 1st January, 1942, and with only one change, served throughout the year. The change was due to the resignation of Dr. B. S. Guha, our Honorary Treasurer, who resigned owing to the transfer of his office from Calcutta, and I am grateful to Prof. J. N. Mukherjee, one of our Vice-Presidents, for so kindly agreeing to take over the arduous duties of the Honorary Treasurer. The Council held five meetings during the year. At its meeting of the 5th October, 1942, it was resolved to appoint a Committee consisting of the two Honorary Secretaries, the Honorary Treasurer and Rai Bahadur Dr. S. L. Hora, Editor of Publications, to act on behalf of the Council in consultation with the President; the decisions of the Committee were to be reported subsequently by post to the members of the Council for information. This course was rendered necessary, as owing to the abnormal conditions prevailing in the country it was found difficult to have the necessary quorum at the meetings of the Council. The proposal was approved at the Ordinary General Meeting held on the 5th October, 1942, and the Committee has been carrying on the work of the Institute very satisfactorily. I have to express my grateful thanks to the very efficient way in which the members of the Committee have carried on the work of the Institute since this date.

Publications.

Three numbers of the *Proceedings* and two numbers of the *Transactions* have been published during the year. Considering the very unsettled conditions in the country and the difficulties for obtaining the necessary amount of paper for our publications this record is very satisfactory. The Fellows of the Institute, I am sure, realize the heavy

work involved in the editing of our publications and seeing them through the press, and join with me in expressing our gratitude to Rai Bahadur Dr. S. L. Hora, the Editor of our publications, for his work in this connection. We are also grateful to our printers, Messrs. Baptist Mission Press of Calcutta, for the expeditious printing of our publications. Printing of publications, owing to the great scarcity of paper in the country, is likely to be a difficult matter hereafter, but it is hoped that it will be possible to continue to issue our publications even though at a reduced rate. If it is at all necessary, the Council should approach Government for giving the Institute special priority for obtaining necessary quantities of paper for its publications.

The Government of India unfortunately found it impossible to sanction the increased grant of Rs.7,000 for the current financial year, and this, owing to the great increase in the prices of paper and printing, has meant a great strain on the meagre funds of the Institute. It would be a very serious matter indeed if for want of funds or any other reasons the Institute is obliged to stop or curtail its publications beyond a certain limit. It is, therefore, hoped that the Government will kindly reconsider the position next year and give us an increased grant to make it possible for us to continue our publications and thereby provide a medium of publication for the daily increasing output of scientific research in the country.

In my address, last year, I directed attention to the impossibility of the work of the publications of a learned society like ours being carried on by any one editor without the active help and support of a number of workers all over the country. I also remarked that for a work like the *Indian Science Abstracts* it is essential to have a permanent staff for the timely preparation and publication of the Abstracts. Unfortunately, the prevailing conditions in the country did not make it possible for the Council to appoint any additional staff, and further, our Assistant Secretary, Mr. C. O. Bateman, who had been so efficiently looking after our publications, was also not available owing to ill-health during the major part of the year. This has been responsible for a certain amount of delay in our publications.

During the year under review, the Government of India in a circular letter on the subject of economy of paper, suggested that Associations may discontinue certain periodical publications during the war and revise their publication programme. The Council of the Institute, after careful consideration of this proposal, decided to suspend publication of the *Indian Science Abstracts*, after completing the volumes for 1938 and 1939 which are in the press, until after the war. The preparation and compilation of the *Indian Science Abstracts* for the subsequent years, however, will be continued and the typescript kept in the office of the Institute for reference by Fellows.

The preparation of a Quinquennial Review dealing with the progress of science in the country could not also for the same reasons be taken up during 1942. I am afraid, this undertaking will have to be postponed till more propitious times.

Finances.

The financial position of the Institute is detailed in the Balance Sheet appended to the Annual Report. Our expenses, as will be seen from the Balance Sheet, are definitely on the high side, more particularly in connection with our publications. This, as I remarked last year, is a very serious matter, more particularly as the cost of publication is increasing from day to day, and the Institute has, as already noted, not only not received any fresh grants-in-aid, but the increased annual grant which was sanctioned by the Government of India last year, has also been reduced to its previous figure of Rs.6,000. In addition to the Government of India grant the Institute received the following grants during the year:—

(1) Rs.500 from the Calcutta University.

(2) Rs.300 from the Osmania University.

(3) Rs.200 from the Dacca University.

These annual grants are hardly enough even for maintaining the ordinary activities of the Institute, and the Council will soon have to approach the Provincial Governments, and other Universities in the country for sanctioning grants-in-aid if the Institute is to carry on its work satisfactorily. As a measure of economy the Council have decided to dispense with the services of our Assistant Secretary, Mr. C. O. Bateman, from the beginning of 1943, and not to fill up the post for the duration of the war. This will mean a great deal of extra work for our executive officers, but the Council faced with a material reduction in our income and the increased expenses has rightly taken this step.

Development of Scientific Research in the Country.

There is very little to comment upon in the way of development of scientific research in the country to what I stated in my address last year, but attention may be directed to the fact that in view of the urgent war requirements a great deal of attention has been paid during the year to applied scientific and industrial research. Scientific research in basic sciences has generally been relegated to the background while the prevailing conditions in the country during the year made it impossible for workers and teachers being able to devote sufficient time or attention either to research or the teaching of science. Special mention may here be made of a further development in the constitution of the Board of Scientific and Industrial Research and the Industrial Utilization Committee which were established by the Government of India in 1940 for co-ordinating and generally exercising administrative control over the ever-expanding activities of these two organizations. The Government of India have recently constituted a Governing Body of the following: (1) the Hon'ble Member of the Council of His Excellency the Governor-General in charge of the portfolio of Commerce (*Ex-officio*); (2) a representative of the Commerce Department of the Government of India, appointed by the Government of India; (3) a representative of the Finance Department of the Government of India, appointed by the Government of India; (4) two members of the Board of Scientific and Industrial Research

elected by the said Board; (5) two members of the Industrial Research Utilization Committee elected by the said Committee; (6) the Director of Scientific and Industrial Research, and (7) one or more members to be nominated by the Government of India to represent interests not otherwise represented. The functions of the Board have been further elucidated, and it has also been decided that a fund, viz., the Industrial Research Fund, should be constituted by grants from the Central Revenues to which additions will be made from time to time as funds become available from other sources. These 'other sources' will comprise grants, if any, by Provincial Governments, by industrialists for special or general purposes, contributions from Universities or local bodies, donations or benefactions, royalties, etc., received from the development of the results of industrial research, and miscellaneous receipts. The Council of Scientific and Industrial Research will exercise full powers in regard to the expenditure to be met out of the Industrial Research Fund subject to its observing the bye-laws which will be framed by the Governing Body of the Council, from time to time, with the approval of the Governor General-in-Council. For extending the work of the Board, it has been suggested that Provincial Advisory Boards of Scientific and Industrial Research should be established by the Provincial Governments to form liaison with the Central Board. Welcome as these developments are, it is unfortunate that more representatives of principal scientific bodies, societies and Universities from different parts of the country have not been included either in the main Board or the Council of Scientific and Industrial Research. Our Institute has been pressing for such representation since the date when the establishment of these bodies was first contemplated, and it is hoped that authorities concerned will take steps to make good this omission at an early date. Mention may also be made of the establishment of a Utilization Branch of the Geological Survey of India; this should ensure the rapid development of the mineral resources of the country, and add fresh laurels to the brilliant achievements of the oldest scientific service in the country.

Future.

It would be a truism to reiterate that we are living in times when great confusion of thought pervades almost all spheres of life. As a result of scientific advances and their application to modern warfare most well-established values on which man used to base his sense of security have lost nearly all significance. Naturally under such conditions of stress and turmoil, which are influencing practically all spheres of life, doubts and fears are expressed about all plans and programmes of development, and the suggested remedies often appear contradictory and conflicting. Scientists are equally influenced by this unstable state of affairs, and there can be little doubt that if they are to serve the best interests of humanity—for that after all is the *sine qua non* of all progress, whether scientific or otherwise—they can no longer continue to develop as pure *Scarabees*. In addition to being specialists in some scientific subject they must, one and all, have a good knowledge of various social sciences, and

become as conversant as possible with the pressing needs and problems of humanity as a whole. Equally with this training of the scientists more attention will have to be paid to the education of the general public in matters pertaining to science and its applications. These two essentials are, both of them, undoubtedly long-term projects, but if scientists are to do more than simply act in an advisory capacity dealing with special problems as they arise and without reference to their social contacts, it is undoubted that these two essentials must receive urgent consideration at the hands of the Government and the scientists themselves. Carefully considered long-term programmes must be drawn up in regard to the future of science and scientists, and in this connection it is urgent that the importance of organizing scientific effort should be fully realized. It is also essential to emphasize that the development of pure science should not be curtailed as a result of such organization, for as Professor Bernal so eloquently expressed in a recent article: 'There is no reason, however, for the fear that as a result of the experience of the war the development of free science will be curtailed or stunted. Effective organization of science implies neither an exclusive concern with problems of immediate application nor the subjecting of scientists to the discipline of a rigid and unimaginative bureaucracy. Those who have been working for an improvement of the present chaotic system of science in the direction of using it more effectively for human welfare realize fully that any such development would immediately frustrate their ends. If applied science was exclusively followed, the basic principles on which any new development, however practical, must depend would never be elucidated.'

Unfortunately, almost all developments in India within recent years have been directed towards the organization of Applied Science as opposed to Pure Science. The importance of this development cannot be underrated but more attention must be paid to see that with the development of Applied Science more facilities are provided for pure scientific studies and research, and it is in this connection that the National Institute of Sciences can render invaluable service to the country. Pure Science also requires not only increased endowments but more equipment, for as Professor Armstrong has rightly summed up: 'Good workshops and good teachers mean able students and first class research: a steady flow to a progressive industry.' Let us hope that this point of view will not be lost sight of by the authorities in this country and that as soon as conditions permit, efforts will be made by our Institute to have better facilities provided for the development of Pure Science equally with those provided for applied scientific work.

II. Conservation of Wild Life in India.

Compared with other living creatures man is relatively a new-comer on the face of the earth. Even according to most liberal estimates primitive man did not appear till about a million years ago. In this relatively short

period he has developed from a very primitive creature to a highly evolved dominant personality on the face of the earth. Man in the course of this period passed through various stages of development which, according to the material used by him for his tools, are respectively named the Stone Age, the Bronze Age and the Iron Age. In very early stages he began by shaping tools from bits of stone or bone, and it was only later that through gradual and hard experience he learnt to work metals which have played such an important rôle in the evolution and development of the present-day civilization. During this period of earth's history man has very materially influenced the plant and animal worlds, and his relationships with both these have become extraordinarily varied and intricate. In the earlier stages man's relations with at least the larger animals were those of direct competition in a very keen struggle for existence. The animals supplied the major part of his food and primitive clothing and various other products that he required for his very simple way of life. Later, however, when he assumed greater mastery over the surroundings in which he lived, he, in addition to agriculture, took to domesticating certain classes of animals for making them his help-mates and companions. Several of them, such as the cattle and the horse, not only proved invaluable in connection with the advance of civilization but gradually made it possible for man to occupy the proud position which he holds on the face of the earth today. *Inter alia* it may be noted that authorities are at variance in regard to the exact sequence of the agricultural and animal husbandry activities of early man. Modern man through horticulture and animal husbandry has developed numerous varieties of cultivated plants and domesticated animals which have made available a very large range of food materials for his use. With the advance of civilization has also been perfected a very complex and rapid system of communication and transportation, and this renders it possible for man to enjoy not only the seasonal products of one area, but of almost all parts of the world. In fact, as a result of these developments animal and plant products from different areas are, in normal times, easily distributed all over the globe.

No substitutes for plant and animal products, which are so essential for human existence, have so far been discovered and in spite of all scientific advances, man is still and will remain dependent on plant and animal worlds for his continued existence. In both international and national interests, therefore, it is of the utmost importance that carefully considered long-range programmes for the conservation of wild life be adopted all over the world.

In earlier times extensive areas of undisturbed forests and uninhabited parts in almost all countries provided safe sanctuaries where wild life was able to survive and even flourish, but changed conditions as a result of the rapid advance of civilization and over-population, the gradual conquest of forests and grass-lands, the opening up of new roads and waterways, and highly improved methods of transport have today left very few areas where wild life can continue to live undisturbed by man. These factors have had and are

continuing to have a very devastating effect on wild life. With these developments fortunately a gradual change is taking place in man's outlook towards Nature. This change is due to the spread of education, and the realization of man's dependence on natural resources. Apart from humanitarian measures, authorities are gradually becoming alive to the inherent dangers underlying the uncontrolled destruction of wild life. This movement for the protection of Nature and so of wild life had its origin barely 50 years back. Though the European nations paid a fair amount of attention to this highly important question, it was the Americans who led the field and set an example as to what could and ought to be done for the preservation of wild life. In the United States of America particularly the occupation and development of vast outlying stretches of the country, the extensive spread of agriculture and consequent disappearance of forests and grass-lands, the drainage of lakes and marshy areas, and the ever-increasing demands of industry have been responsible for a very great reduction in wild life, both of plants and animals. The tragedy was fortunately foreseen fairly early and has been averted, though only to a very limited extent, by the establishment of extensive National Parks or Reserves which, it was hoped, would provide inviolable sanctuaries for and preserve wild life. Such sanctuaries, originally established in the United States of America, have since been set apart in Canada, New Zealand, Australia and the Union of South Africa. In the Kruger National Park, which was founded in 1898 as the Sabi Game Reserve and changed into the Kruger National Park in 1926, South Africa has one of the most extensive and well-managed sanctuaries. Mention may also be made of 'Parc National Albert' in Belgian Congo, which was created by a Royal Decree in 1925 and greatly enlarged in 1929; in 1934 by a Royal Decree its functions were greatly extended and entrusted for management to the Institute for the National Parks of the Belgian Congo which was established with its headquarters at Brussels. This National Park was due to the incessant efforts of the great naturalist, Carl Akeley, an American nature-lover who devoted all his energies to its establishment. In addition to preserving the rapidly dwindling fauna of the area, this park has saved from almost certain extinction the Gorilla, which next to man is the King of Primates. Protection of Nature movement in Germany and adjacent countries proved very valuable in connection with the conservation of wild life in the areas concerned, and extensive National Parks were established in Switzerland, Germany, Italy, Sweden, Spain, Holland and Czechoslovakia. The cause of conservation was further advanced by various International Conferences. In 1900 the British Government convened an International Conference in London for the preservation of animals, birds and fish in Africa. The convention was signed by seven powers interested in Africa, and was to remain in force for 15 years. In 1913 an International Conference for the Protection of Nature was held in Berne at which 17 Governments were represented. The main result of the work of this conference was to establish a central organization for dealing with the question of wild life preservation on an

international basis. The world war of 1914–18 unfortunately greatly delayed the adoption of the recommendations of the Berne conference.

In 1903 a society for the protection of the fauna of the empire was founded in England by Mr. E. N. Buxton 'with the object of awakening public interest in the assemblages of wild fauna still surviving in every part of the British Empire, and taking such steps as may be possible to save them from extinction; further to co-operate with kindred societies in the Dominions and Colonies or in foreign countries with regard to any conjoint efforts'. After the world war of 1914–18 greater attention was directed towards the preservation of fauna in most parts of the world, for as was so well expressed by the president of the society, the Rt. Hon. Earl of Onslow, 'The whole world is becoming so speedily opened up to travellers, traders, tourists and settlers, and so much uncultivated land is coming under the plough that unless some more or less drastic measures are taken to preserve the distinctive fauna it must obviously disappear entirely'. The society started active work for the preservation of the fauna of the empire soon after the world war, and its revised rules, which were passed on April 27, 1928, were brought into force from 1st of May, 1928. Since this date the society began to wield a great deal of influence in connection with the preservation of the fauna of the empire. Reference may also be made here to the American Society for International Wild Life Protection and the Dutch Society for the International Wild Life Protection, which have done a great deal to further the cause of conservation of wild life in their respective spheres. In 1931 at the instance of the French Government an important International Conference for the Protection of Nature was arranged by the staff of the Natural History Museum of Paris. Representatives of Belgium, Czechoslovakia, Germany, Great Britain, Holland, Italy, Latvia, Norway, Poland, Rumania, Spain and the United States of America attended the conference, and very useful spade work was carried out for the formation of a central official international organization for the protection of wild life. An International Conference for the protection of the fauna and flora of Africa was convened in London in 1933. As a result of its deliberations it drafted a convention for the better preservation of the fauna of this continent. Among the measures suggested were the establishment of sanctuaries, National Parks, Strict National Reserves and other Reserves. The conference recommended that all settlements in National Parks should be controlled so as to ensure that as little disturbance as possible is occasioned to the natural fauna and flora. It also recommended that special steps should be taken to restrict the export and import of trophies, to stop the use of motor vehicles or aircraft for the purpose of hunting, killing or capturing or driving away, stampeding or disturbing animals, and finally the use of poisons or explosives or poisonous weapons or the use of nets, pits or enclosures, gins, traps or snares, or of set guns and missiles containing explosives for hunting animals should be prohibited. Mr. E. C. Stuart Baker, who is a recognized authority on Indian birds and wild life, attended this conference

as one of the observers on behalf of India. In a report, which he submitted to the India Office, he concluded that the results embodied in the report of this conference provided a valuable basis for any measures that may be under consideration for the preservation of indigenous flora and fauna of India. With a view to deciding whether it was desirable for the Government of India to become a contracting party to the convention, either in whole or in part, he suggested that the report should be considered by the Government of India at a special conference of representatives of the Government of India, the Provincial Governments, the Indian States and the adjoining territories of Nepal, Bhutan, etc. About the same time the Society for the Preservation of the Fauna of the Empire in London addressed a letter to the India Office directing attention to the urgent necessity for the protection of wild life in India. With the letter it supplied memoranda dealing with the position of indigenous game in some of the provinces and offered to supply expert advice in case the Government of India decided to arrange for a conference on the subject. Meanwhile the Bombay Natural History Society, which ever since its foundation in 1883, has by intensive propaganda and through the medium of its *Journal* and various publications been rendering very useful service in creating and stimulating interest in the wild life of the country, started publishing in 1934 a series of beautifully illustrated articles on the wild animals of the Indian Empire and the problem of their preservation. This series of articles provided a detailed account of the distribution of mammals in the country together with illustrations of the more important mammals, and the condition of game in different parts of the country including Burma. The articles were written by authorities with intimate first-hand knowledge of the problems of the different areas, and as a result it was possible for the authors to indicate exactly the measures that should be taken for the protection of wild life in the different parts, as also of how these measures could be best given effect to. The Government of India also had been alive to the urgency of the situation and at their instance detailed enquiries in connection with the protection of game were being carried out all over the country. After the preliminary enquiries were completed, the Government of India convened an All-India Conference for the Preservation of Wild Life at Delhi in January 1935 with a view to reviewing the position of the fauna and flora as it existed at the time and considering generally the protection of the animals peculiar to India. The conference adopted a set of resolutions and prepared two lists of species, first of animals that were to be protected as completely as possible, and second of those which 'while not requiring such rigorous protection', shall not be hunted, killed or captured except under license granted by competent authorities. The conference laid special stress on the establishment of wild life sanctuaries, and desired the contracting parties to explore the possibilities of establishing sanctuaries in which hunting, shooting, killing or capturing of all animals was to be prohibited except under the control of the authorities responsible for the management of the sanctuaries. It was agreed

by the conference that the duty of preserving the fauna should be assigned to the forest departments in the areas under their charge, but at the same time urged the necessity of co-operation of police and magistracy in carrying out the necessary measures of protection. Resolutions were also passed for the closest co-operation between the forest departments and Associations that may have been or are established with a view to the preservation of game and wild life. It also laid stress on the introduction of nature study in the country and for carrying out such propaganda as would popularize with the general public the urgent necessity of preserving wild life, as without public support no efforts to preserve wild life would be really effective. It, therefore, recommended that societies for the protection of wild life in the country should make propaganda a principal part of their work. This was further stressed by the chairman of the conference, the late Sir Fazl-i-Hussain, the Hon'ble Member in charge of the Department of Education, Health and Lands of the Government of India, in his closing remarks: 'Even at this stage, I would repeat one point and that is you should not expect much from the Provincial Governments or legislatures, but if you do propaganda in the right direction in the provinces where the power will rest, you will achieve your object.' As a result of the deliberations of this conference an All-India Convention for the preservation of fauna of India was drafted. It was hoped that the convention would be adhered to by all Provincial Governments and the States, and that the signatories of the convention would adopt all possible measures for the protection of the wild life in the areas under their jurisdiction.

Here it would be useful to include a short summary of the legislative measures which were in force for the protection of wild life in British India prior to the date of the All-India Conference for the Preservation of Wild Life. These measures consisted of (1) Wild Birds and Animals Protection Act of 1912, and (2) the Indian Arms Act—both of which were applicable to the whole of British India; (3) the Provincial Game Rules under the Act of 1912; (4) Provincial Forest Act and Rules thereunder, and (5) Provincial Acts dealing with protection. The Provincial Game Rules and Forest Acts had unfortunately been drawn up rather haphazardly and were often contradictory. In addition, no definite authorities had been set apart for enforcing these legislative measures particularly in regard to the poaching and the indiscriminate destruction of game, etc. There was no control of trade in meat, hides, skins and trophies, and at the same time there was no provision for the restriction of the modern methods of traffic such as motor cars and aeroplanes which were proving disastrous to wild life all over the world. Cases of shooting animals from motor cars after they became exhausted as a result of long chase had been reported. A more up-to-date and comprehensive measure was enacted in the Punjab in the Punjab Wild Birds and Wild Animals Protection Act of 1933, while the rules made thereunder provided for the better protection and preservation of certain wild animals including birds and fish. It later resulted in the appointment of a Game

Warden for seeing that the rules were strictly enforced and the protective measures were as comprehensive as far as possible. In addition, under the rules, District Fauna Committees were to be established in all districts for performing functions assigned to them under the rules and for advising generally about the protection of the fauna in their respective districts. Acts on similar lines were also passed in the Central Provinces in 1934 and the United Provinces in 1935, while measures were under consideration in other provinces. Mention may also be made here of the Bengal Rhinoceros Preservation Act of 1932, which prohibited the killing, injuring or capturing of wild rhinoceros in Bengal. Under the Act every wild rhinoceros killed or captured otherwise than by permission was to be the property of the Local Government and stiff penalties were provided against contravention of the Act. A small sanctuary for the preservation of rhinoceros in Bengal was also established in Jalpaiguri district. In 1934 a very great advance was made in the United Provinces through the great personal interest taken by the enlightened Governor of the Province, Sir Malcolm Hailey (now Lord Hailey), as a result of which the National Parks Act of 1934 was passed. This Act provided for the establishment of National Parks and for the preservation of wild animal life or other objects of scientific interest and for incidental matters provided therein. As a result the Hailey Park was demarcated as a National Park in the famous Patli Doon and the hill forests to the south of it consisting roughly of an area of 99·07 square miles. Under the Act the word 'animal' was defined as 'mammals, reptiles or birds', and it was an offence to kill, injure or disturb any animals or to take or destroy any eggs or nests of any birds in the park. The conditions under which the people were allowed to enter or reside in the park were laid down in the Act and were to be enforced by the forest department. In Assam certain areas had already been demarcated as game sanctuaries and more stringent action was being taken to preserve wild life which according to some reports had been reduced by almost 75% within recent years. Reference may also be made here to the Chamrajanagar Sanctuary of the Mysore State Forests which had been established with a view to offering complete immunity for animals and thereby making it possible for them to thrive without interference. Introduction of other animals not found in the area was to be attempted, and the sanctuary was to provide facilities for the scientific study of the life-histories of different indigenous species of game.

Mention may also be made of the valuable work which the Association for the Preservation of Game in the United Provinces has been carrying on ever since its foundation. After the All-India Conference for the Preservation of Wild Life this Association extended its sphere of work to the whole of India, and in July 1936 started publishing a journal entitled *The Indian Wild Life.* Its aims and objects are very comprehensive, and the two Honorary Secretaries, Major J. Corbett and Mr. Hasan Abid Jafry, have been carrying on valuable work in connection with the protection of wild life throughout British

India and in most of the Native States as well. Unfortunately, owing to the abnormal conditions resulting from the war, the membership of the Association has fallen off and it has had to stop publication of its journal, but it is to be hoped that this is a temporary setback, and before long it will be possible for the Association to restart publication of its journal and carry on its activities on a more extensive scale.

From the above it will be seen that a certain amount of spade work had been done and various provinces were becoming alive to the urgency of adopting measures for the protection of wild life in the areas under their control. Unfortunately, however, only one aspect of the conservation of wild life had been considered in all these plans, *viz.*, that of the protection of game mainly from the point of view of sport. Further, in all the measures suggested and partially adopted the work, except in the Punjab, was to be carried out by agencies which were already overburdened with work, and naturally the task of looking after wild life was something which it was not possible for them to carry out efficiently in addition to their normal work.

The problem of wild life conservation is not, however, so simple as would appear from the measures which have been taken in this country so far. In fact the multiplicity of the problems involved in any scheme of wild life conservation has begun to be realized only within very recent years. The greatest advances in this connection have again been made in the United States of America, where under the President's Reorganization Plan No. III a Bureau of Biological Survey was constituted on June 30, 1940, by the consolidation of the Bureau of Biological Survey and the Bureau of Fisheries; this Bureau is responsible for the conservation of wild life in the extensive continental area of the United States of America.

It is not possible to give in this address a detailed analysis of all the factors which must be considered in detail in connection with any scheme of wild life conservation, but it is essential to point out that, if wild life conservation is to be a success, the conservation of soil, waterways, forests and grass-lands must receive simultaneous attention. The disastrous effects of man's activities on soil and water resources, whether direct or indirect, conscious or unconscious, are very serious indeed. As an example of direct and conscious influence of man on waterways may be mentioned the pollution of rivers, streams, lakes, etc. through the dumping of huge quantities of refuse and sewage of large cities, as also of the untreated raw wastes of large industrial concerns. Such pollution materially affects plant and animal life of these waters, and has been known in many cases to have destroyed extensive and valuable fisheries. Indirect and unconscious destruction of soil for agricultural developments has similarly done a great deal of harm. In this connection it is unfortunately seldom realized that most schemes of development of large tracts of country, whether as living centres or as agricultural land, unless carefully planned, often have very serious repercussions on the plant and animal life of the area. Nature works in a vicious circle and the interdependence of all these factors is

now fully recognized by all authorities. It would suffice, therefore, to point out that uncontrolled deforestation or the utilization of grass-lands for agriculture and other purposes results in a great erosion of the soil and reduction of rainfall. Rivers, streams and other waterways become silted resulting in the flooding of adjacent areas, and water conservation becomes a very pressing question. With the fall of waterlevel the country in general becomes dry and barren. The land becomes almost useless for agriculture and does not produce even enough of grass or fodder. The repercussions of all these on the wild life in the area are equally serious, as with the disappearance of grass-lands and forests very few sanctuaries are left for wild life.

To undo even a small amount of the damage to organic resources which has resulted from the rapid spread of civilization would require carefully planned long-term programmes of reconstruction, and the development of new social concepts in regard to colonization, agriculture, irrigation, forestry and other allied activities of man. In its broadest sense, conservation of organic resources, as has been so well summed up by I. N. Gabrielson, the Director of the Fish and Wildlife Service of the United States Department of the Interior, 'means restoring to the highest possible level and maintaining in a state of high productivity those resources, including wild life, that can be used on a crop basis to sustain human society'. It will be clear, therefore, that in connection with any scheme for wild life conservation measures must also be adopted for ensuring that soil, water resources, forests and grass-lands are equally conserved.

In wild life management the existence and operation of ecological communities in the domain of nature and man's relationships to them has to be recognized and also the fundamental fact that man's activities often have been and are responsible for disturbing ecological communities. For all schemes of wild life conservation it is essential, therefore, to attempt to restore natural balance which has been and is being disturbed by human activities. With increased occupation of outlying countries resulting in deforestation and disappearance of grass-lands, soil erosion becomes a material menace, rainfall decreases and the problem of water conservation becomes more and more acute. Land gradually becomes impoverished and is not capable of producing enough for the human beings in the area, much less of providing food and shelter for wild life. In all recent schemes of wild life management, therefore, the questions of soil erosion and programmes of re-forestation and increasing grass-land areas are considered as important as the direct measures for the protection and conservation of wild life. With the information at present available most conservation programmes must of necessity be of an experimental nature. They should deal with a few species in restricted areas so that the results could be properly watched and tabulated. Only such work will gradually enable us to acquire the much-needed data and technical knowledge for evolving proper schemes of general ecological management. Meanwhile wild life management must be planned on the ecological and biological

data that are at present available. In the large area of the sub-cortinent of India the problems of wild life conservation are bound to be very complex, but as soon as possible a programme of conservation must be formulated which would deal not only with the necessity of preserving a few species of game but the conservation of animal and plant life in general.

Recently the Hon'ble Sir Jogendra Singh, Member for Education, Health and Lands of the Government of India, in his address to the meeting of the Board of Forestry rightly stressed the responsibilities of the forest officers in regard to tree plantations in villages. He remarked that:

> 'The need of 7,000,000 villages in the matter of tree plantation has so far received scant attention. It may be useful to take a group of villages and start plantations. Land should be rented for the purpose and trees planted to provide fuel and timber and the grass for feeding the cattle. These village plantations may prove of great economic value, saving the cow-dung for manure, and may even provide large quantities of material for making humus and manure.'

Indicating another direction in which he felt forest officers could do useful work, Sir Jogendra Singh referred to the vast areas which owing to climatic conditions cannot be cultivated. He suggested that:

> 'It might be possible to lift water for irrigation for starting plantations and to grow trees which require a minimum amount of water. An experiment in this direction may enable the afforestation of the areas which now lie waste, and are classed as culturable but cannot be cultivated.'

Such a scheme would not only result in extending the greatly dwindling forests but also provide grazing area for the cattle and wild herbivores, besides affording much-needed sanctuaries for wild life. In addition, the result of such a scheme of afforestation is sure to help in checking soil erosion and indirectly assist in water conservation through consequent increase in rainfall.

It is essential that similar schemes should be initiated in connection with irrigation plans which, while increasing the area of irrigated lands in the country, have materially influenced the plant and animal life of the streams, rivers, etc. The problems of water conservation in the country are in fact as important as those of the afforestation and conservation of grass-lands, and if these problems are properly tackled, they are sure to go a long way towards the solution of the problems of wild life conservation. Finally, the authorities responsible should see that the recommendations of the Wild Life Conference of 1935 are implemented and carried out as far as possible. Though various provinces are more or less autonomous in regard to the management of the areas under their charge, it should be remembered that wild life conservation in the country cannot be carried out on a provincial basis. The multifarious problems involved cannot be tackled properly until the all-India nature of the problem is realized and a separate department of the Central Government

made responsible for this work. While leaving the local problems to various Provincial Governments and Native States, a central department should be responsible for dealing with the policy of conservation of wild life for India as a whole.

I am afraid, I have given a more or less disjointed picture of a very vast problem. I have tried to indicate that protection of game alone though urgently called for is not enough, and that steps should be taken to draw up and adopt a long-term scheme of wild life conservation as a whole on an all-India basis. Until this is done it will not be possible to preserve and conserve the greatly impoverished wild life of the country.