



British Commonwealth
Scientific
Official Conference

LONDON

1946

Report of Proceedings

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by Command of His Majesty
November 1946*

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BRITISH COMMONWEALTH SCIENTIFIC OFFICIAL CONFERENCE

Assembled in accordance with the Decision of Governments
London, July, 1946

COMPOSITION OF THE CONFERENCE

List of Delegates

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

Sir Edward Appleton, G.B.E., K.C.B., F.R.S.	Secretary, Department of Scientific and Industrial Research (<i>Chair- man of the Conference</i>).
Mr. E. Barnard, C.B.E., D.S.O. ...	Deputy Secretary, Department of Scientific and Industrial Research.
Sir John Fryer, K.B.E.	Secretary, Agricultural Research Council.
Mr. J. Gordon, M.B.E.	India Office and Burma Office.
Dr. C. R. Harington, F.R.S. ...	Director, National Institute for Medical Research.
Mr. E. H. E. Havelock, C.B.E. ...	Administrative Secretary, Agricul- tural Research Council (alternate delegate).
Dr. Alexander King	Head of U.K. Scientific Mission, British Commonwealth Scientific Office, Washington.
Sir Edward Mellanby, K.C.B., F.R.S.	Secretary, Medical Research Council.
Sir Thomas Merton, F.R.S. ...	Chief Scientific Adviser, Board of Trade.
Mr. J. A. Scott-Watson, C.B.E., M.C.	Representing the Agricultural Re- search Council.
Dr. J. L. Simonsen, F.R.S. ...	Colonial Office and Leader of the Colonial Delegation.
Sir Reginald Stradling, C.B., M.C., F.R.S.	Chief Scientific Adviser, Ministry of Works.

CANADA

Dr. C. J. Mackenzie, C.M.G. ...	President, National Research Council.
Dr. E. S. Archibald, C.B.E. ...	Director of Experimental Farm Service, Department of Agricul- ture.
Professor A. T. Cameron, C.M.G.	Professor of Biochemistry, Univer- sity of Manitoba.
Professor J. B. Collip, F.R.S. ...	Director, Research Institute of Endocrinology, McGill University.
Professor P. E. Gagnon	Professor of Chemistry, Laval Uni- versity.

CANADA—(continued)

Professor J. H. L. Johnstone ...	Professor of Physics, Dalhousie University.
Professor L. Lortie	Professor of Inorganic Chemistry, University of Montreal.
Professor O. Maass, C.B.E., F.R.S.	Professor of Physical Chemistry, McGill University.
Mr. J. M. Manson	Secretary to the Delegation.
Mr. G. C. Monture	Department of Mines and Resources.
Dr. R. Newton	President, University of Alberta.
Mr. J. H. Parkin, C.B.E.	Director, Division of Mechanical Engineering, National Research Council.

AUSTRALIA

Sir David Rivett, K.C.M.G., F.R.S.	Chairman, Council for Scientific and Industrial Research.
Mr. N. K. S. Brodribb, C.B.E. ...	Controller-General of Munitions.
Dr. L. B. Bull	Chief, C.S.I.R. Division of Animal Health and Production.
Dr. F. M. Burnet, F.R.S.	Director, Walter & Eliza Hall Institute for Medical Research.
Mr. J. R. S. Cochrane	Department of Munitions.
Mr. J. E. Cummins	Officer-in-Charge, C.S.I.R. Information Service, Secretary to the Delegation.
Professor E. J. Hartung	Professor of Chemistry, University of Melbourne.
Professor E. S. Hills	Professor of Geology and Mineralogy, University of Melbourne.
Professor Sir John Madsen	Professor of Electrical Engineering, University of Sydney.
Mr. H. R. Marston	Chief, C.S.I.R. Division of Biochemistry and General Nutrition.
Professor H. C. Trumble	Professor of Agronomy, University of Adelaide.

NEW ZEALAND

Dr. E. Marsden, C.M.G., C.B.E., M.C., F.R.S.	Secretary, Department of Scientific and Industrial Research.
Professor C. E. Hercus, O.B.E., D.S.O.	Dean of Medical Faculty, Otago University.
Sir Theodore Rigg, K.B.E. ...	Chairman, Research Council, Department of Scientific and Industrial Research.
Professor F. G. Soper	Professor of Chemistry, Otago University.

SOUTH AFRICA

Dr. B. F. J. Schonland, C.B.E., F.R.S.		President, Council for Scientific and Industrial Research.
Dr. E. H. Cluver		Director, South African Institute for Medical Research.
Dr. L. T. Nel		Deputy Director of Geological Survey.
Professor S. F. Oosthuizen ...		Professor of Radiology, University of Pretoria.
Dr. A. R. Saunders		Department of Agriculture.
Dr. J. Smeath Thomas		Master of Rhodes University Col- lege.
Dr. P. J. du Toit		Director, Veterinary Services.

IRELAND—EIRE

Professor F. E. W. Hackett ...		Professor of Physics and Electrical Engineering, National University of Ireland, Dublin.
Dr. E. T. S. Walton		Lecturer in Experimental Physics, Trinity College, Dublin.

INDIA

Sir S. S. Bhatnagar, O.B.E., F.R.S.		Director of Scientific and Industrial Research, India.
Dr. B. C. Guha		
Dr. S. L. Hora		Director of Fisheries, Bengal.
Mian Muhammad Afzal Husain, I.A.S.		Public Service Commission, Punjab.
Dr. M. S. Krishnan		Superintending Geologist, Geological Survey.
Professor P. C. Mahalanobis, O.B.E., F.R.S.		Director, Statistical Laboratory, Presidency College, Calcutta.
Dr. K. N. Mathur		Assistant Director, Scientific and Industrial Research, India, Secretary to the Delegation.
Professor J. N. Mukherji, C.B.E. ...		Director, Imperial Agricultural Re- search Institute, New Delhi.
Dr. D. N. Wadia		President, National Institute of Sciences.

BURMA

Mr. M. V. Edwards		Burma Forest Service.
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SOUTHERN RHODESIA

Dr. D. M. Blair, O.B.E.		Field Officer, Department of Public Health.
Mr. J. K. Chorley		Chief Entomologist.
Dr. J. C. F. Hopkins		Senior Plant Pathologist.

EAST AFRICA

Mr. R. Daubney, C.M.G., O.B.E.	Director of Veterinary Sciences, Kenya.
Mr. A. Glendon Hill	Director, East African Agricultural Research Institute.
Dr. H. H. Storey, F.R.S.	East African Agricultural Research Institute.

WEST AFRICA

Mr. A. G. Beattie, C.M.G.	Director of Agriculture, Nigeria.
Major W. R. Junner, O.B.E., M.C.	lately Director of Geological Survey, Gold Coast.
Dr. F. MacLagan	Assistant Director of Medical Sciences, Sierra Leone.
Mr. F. E. V. Smith, C.M.G., O.B.E.	Development Secretary, Nigeria.

CEYLON

Mr. L. J. D. Fernando	Government Mineralogist.
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HONG KONG

Dr. G. A. C. Herklots	Secretary for Development.
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PALESTINE

Mr. J. C. Eyre	Senior Agricultural Officer.
Dr. S. Sambursky	Executive Secretary, Board for Scientific and Industrial Research.

WEST INDIES

Mr. Smith Bracewell	Director of Geological Surveys, British Guiana.
Dr. H. H. Brown, O.B.E.	Director of Fisheries Investigation.
Professor E. E. Cheeseman	Professor of Botany, Imperial College of Tropical Agriculture, Trinidad.
Mr. R. Johns, O.B.E.	Director of Agriculture, Leeward Islands.
Dr. P. E. Turner	Sugar Agronomist, Trinidad.

IMPERIAL AGRICULTURAL BUREAUX

Lt.-Col. J. G. Robertson	Chairman, I.A.B. Council.
Sir David Chadwick, K.C.M.G., C.S.I., C.I.E.	Secretary, I.A.B. Council (Liaison Officer for the Dominions Office).
Sir Herbert Howard	Secretary Designate, I.A.B. Council.

IMPERIAL INSTITUTE

Sir Harry Lindsay, K.C.I.E., C.B.E.	Director, Imperial Institute.
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Secretariat of the Conference

Mr. O. F. Brown	Department of Scientific and Industrial Research, U.K. (<i>Chairman of Working Party and General Secretary of Conference</i>).
Dr. W. L. Francis	... ..	Department of Scientific and Industrial Research, U.K. (<i>Joint Secretary of the Working Party</i>).
Dr. T. C. Roberts	... ..	Department of Scientific and Industrial Research, U.K. (<i>Joint Secretary of the Working Party</i>).
Mr. G. Bird	... ..	Department of Scientific and Industrial Research, U.K.
Mr. E. Boden	... ..	Scientific Liaison Officer for South Africa.
Mr. G. B. Gresford	... ..	Council for Scientific and Industrial Research, Australia (<i>former Scientific Liaison Officer</i>).
Dr. F. J. C. Herrald	... ..	Medical Research Council, U.K.
Dr. P. S. Hudson	... ..	Imperial Agricultural Bureaux, also representing the Agricultural Research Council.
Mr. L. Lewis	... ..	Scientific Liaison Officer for Australia.
Dr. J. G. Malloch	... ..	Scientific Liaison Officer for Canada.
Dr. K. N. Mathur	... ..	Secretary to the Indian Delegation.
Mr. H. L. Verry	... ..	Department of Scientific and Industrial Research, U.K.
Dr. N. C. Wright	Director Hannah Research Institute, representing the Agricultural Research Council.

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REPORT OF THE CONFERENCE

INTRODUCTION

HISTORICAL REVIEW

In 1933, the Imperial Committee on Economic Consultation and Co-operation, under the Chairmanship of Dr. O. D. Skelton, suggested in its report, among other things, that a conference should be summoned as soon as possible to consider "the question of what research activities should in future be carried out co-operatively." The Governments concerned accepted this recommendation and a British Commonwealth Scientific Conference was accordingly held in London in 1936. The suggestion, previous to its assembly, that this Conference should be a general one proved impracticable at the time, with the result that the discussions were mainly limited to agricultural subjects and in particular to a review of the activities associated with the Executive Council of the Imperial Agricultural Bureaux.

2. During the war the outstanding success achieved as a result of collaboration between scientists from all parts of the Commonwealth stimulated the desire for the continuation of this method of approach in dealing with problems of common interest. In 1943 the Report of the British Commonwealth Science Committee set up by the Royal Society stressed the desirability, on the return to peace-time conditions, of establishing machinery for permanent scientific liaison between the various countries of the Commonwealth, for extending existing information services and improving facilities for personal contact between scientists and for the interchange of scientific staff.

3. Early in 1945 the Royal Society, with the approval of His Majesty's Government in the United Kingdom, entered into correspondence with the High Commissioners for the Dominions and India in London regarding arrangements for convening an Empire Scientific Conference during 1946. This Conference would necessarily be concerned with general questions of scientific collaboration, particularly in the academic field. In view, however, of the part played during the war by the British Commonwealth Scientific Office in Washington and the Dominion Scientific Liaison Offices in London, it was considered by His Majesty's Government in the United Kingdom that the question of continued scientific collaboration between the official scientific services of the Commonwealth was a matter which called for special attention, and would be appropriate for an Official Conference. Moreover, many of the conclusions reached at a conference organized by the Royal Society would require a background of official policy, and perhaps official support, for their full implementation.

4. Accordingly, His Majesty's Government in the United Kingdom proposed to the other Governments of the Commonwealth that an Official Scientific Conference should be convened in close association with the Royal Society's Conference, and that the terms of reference of the Official Conference might be:—

"To consider the best means of ensuring the fullest possible collaboration between civil Government scientific organizations of the Commonwealth and to make formal recommendations for the approval of the Governments represented."

It was suggested that the Official Conference should deal only with civil science, and that questions of liaison between the various Governments on defence science, which raised special issues, should be left for separate discussion between the appropriate authorities. It was further suggested that a conference of the kind proposed would afford an opportunity of conducting the periodical investigation into the working of the Executive Council of the Imperial Agricultural Bureaux which had been proposed for 1941 but postponed on account of the war.

These proposals were accepted by the Governments of the Commonwealth, and it was decided to hold the three Conferences during the summer of 1946.

5. The Royal Society's Conference was opened by His Majesty the King, accompanied by Her Majesty the Queen, on the 17th June and ended on the 8th July, during which period the Conference spent a week in Oxford and a week in Cambridge. The Official Conference was opened by the Lord President of the Council and met from the 9th July to the 19th July, and the Imperial Agricultural Bureaux Review Conference was held during the week following.

6. The Conferences were attended by over 100 oversea delegates from Canada, Australia, New Zealand, South Africa, Ireland, India, Burma, Southern Rhodesia, and very many parts of the Colonial Empire. An atmosphere of the greatest cordiality and friendship pervaded the proceedings throughout the Conferences, and the desire for the fullest co-operation in every possible way was extremely marked. Practically no differences of principle were revealed and complete agreement on most subjects was arrived at with little difficulty. This was no doubt due in large measure to the careful preparation for the Conference and to the prominent part played during the preparatory period by the Dominion Scientific Liaison Officers in London and by Dr. Alexander King, British Commonwealth Scientific Office, Washington, who visited Canada, Australia, New Zealand and India early in 1946.

ROYAL SOCIETY EMPIRE SCIENTIFIC CONFERENCE

7. The Royal Society's Conference covered a wide field, both in its full sessions and in less formal evening discussions arranged at Oxford and Cambridge. Questions considered in full sessions of the Conference included some of the outstanding problems of the Empire in agricultural science and nutrition, physiological and psychological factors affecting human life under tropical conditions, the control of infectious diseases, modern methods of mapping and exploration by air, means for obtaining uniformity in standards of physical measurement, the collection of scientific records and material such as plants, seeds and animals, land utilization and conservation throughout the Empire, the survey of mineral and natural resources of the Empire and the chemical industries which might be based on the latter. As a result of the evening discussions, recommendations were considered by the full Conference dealing with research on cosmic rays, fisheries, oceanography, geo-chemistry and several other subjects.

8. Resolutions for dealing with the above matters together with resolutions concerning Scientific Information Services and the means for facilitating personal contact and the movement of scientists throughout the Empire, were passed on to the Official Conference for further study. These resolutions and reports of the sessions of the Royal Society's Conference will be found in Appendix I.

ARRANGEMENT OF REPORT

9. The Report is divided into three parts, viz., a brief account of the preparatory arrangements, a summary of the proceedings with an index of the resolutions passed and thirdly, a detailed report giving the text of the resolutions and the reports of Committees as adopted by the Conference. A short preamble to each subject gives such information, taken from the documents before the Conference, as is necessary to set the resolutions in their proper context.

10. Sets of papers presented to the Conference, the minutes of the plenary Sessions and the reports of Committees have been supplied to each of the Governments represented.

PART I.—PREPARATORY ARRANGEMENTS FOR THE CONFERENCE

WORKING PARTY

11. In October, 1945, a Working Party of the Civil Science Panel consisting of representatives of various Government Departments and Research Councils, together with the Scientific Liaison Officers of the Dominions and an Indian representative, was set up under the Chairmanship of Mr. O. F. Brown, of the Department of Scientific and Industrial Research, to carry out the necessary preparatory work and make the arrangements for the Conference. Contact was maintained through the Working Party with the Royal Society's Conference committees and with the Executive Council of the Imperial Agricultural Bureaux through its Secretary. The three Conferences were thus planned in the closest collaboration. In January, 1946, a list of suggested subjects for the Official Conference accompanied by explanatory documents was sent to the overseas delegates for comment and further suggestions. The final Agenda were drawn up in the light of the response to these suggestions and to the recommendations of the Royal Society's Conference.

PLACE OF MEETINGS

12. The arrangements for the meetings of the Conference were in the hands of the Ministry of Works which by courtesy of the Institution of Electrical Engineers was able to provide excellent facilities in the Institution's premises on the Victoria Embankment.

STEERING COMMITTEE

13. Immediately after the arrival of the delegates in London, the Heads of overseas Delegations, together with the Secretaries of the Department of Scientific and Industrial Research, Agricultural Research Council and the Medical Research Council and a representative of the Colonial Office, formed a Steering Committee with Sir Edward Appleton, Head of the United Kingdom Delegation and Secretary to the Department of Scientific and Industrial Research, as Chairman and Mr. O. F. Brown, General Secretary of the Conference, as Secretary.

14. At the first meeting of the Steering Committee it was agreed to entrust the arrangements for each session to the chairman of that session. The secretaries were responsible for the documentation of the sessions and for bringing before the chairman all the information relevant to the subject under consideration.

PROGRAMME OF CONFERENCE

15. The following programme was carried out:—

9th July, 1946	...	Official opening by the Lord President of the Council, The Rt. Hon. Herbert Morrison, M.P. Election of Officers. Statement by Chairman.
10th-13th July and 15th-17th July (inclusive)	}	Plenary Sessions and Committee Meetings.
18th-19th July		

PART II.—PROCEEDINGS OF THE CONFERENCE

OPENING STATEMENT BY THE LORD PRESIDENT OF THE COUNCIL

16. The Conference assembled on the 9th July, and was formally opened by the Rt. Hon. Herbert Morrison, M.P., who said:—

“ GENTLEMEN,

As you know, in the United Kingdom, the Lord President of the Council is the Minister responsible for the Department of Scientific and Industrial Research, the Medical Research Council and the Agricultural Research Council. It therefore falls to me to perform the duty of formally opening this Conference and of extending a very hearty welcome to you on behalf of His Majesty's Government in the United Kingdom.

Many of you have been close friends for a number of years and those who are now meeting for the first time have had an opportunity of getting to know each other during the Royal Society's Conference which has just ended. This Conference is therefore a meeting among friends already well acquainted with each other's problems and all actuated by a sincere desire to help each other to the greatest possible extent in finding solutions to them through mutual co-operation.

The Royal Society's Conference has been an admirable preparation for the Official Conference. Many matters have been raised in the last three weeks, both in the formal sessions of the Conference and in valuable informal discussions. It is now your duty to consider how collaboration in these matters, and in a number of other directions, can be best brought about. In many cases you yourselves will be able to make the necessary arrangements. In other cases, it will be necessary for you to make recommendations to your respective Governments.

There is one guiding principle I think you should adopt in approaching your task. It is that you should first of all consider carefully what you want to achieve and then consider how the desired results can be best brought about and what additional machinery, if any, is necessary for the purpose.

It is possible to pay too much attention to organization. If there is the will to co-operate—and there is abundant evidence that this exists throughout the Commonwealth—then very frequently the means follow naturally. It is important to remember that throughout the British Commonwealth we shall be faced for some years to come with an acute shortage of scientific manpower. That being so, there is a risk that too elaborate organizations may result in absorbing into the administrative machine many scientifically trained men who are badly needed in research laboratories, whether in universities or similar institutions, Government laboratories or industrial laboratories. We do not want to see too many scientific men transferred from their laboratories into offices.

It is also important in a Conference such as this, to distinguish between subjects on which work can be safely left to develop along its own lines in the industrial countries of the Empire and subjects in which successful collaboration demands closely similar methods being employed by all engaged in the work. In the former case, full collaboration can be achieved by ensuring that industrial scientists wherever they may be working know what others are doing and are able to meet together at intervals for discussion of their results, their method of work and their future plans. The other type of work requires the adoption of concerted plans of action. The discussions at the Royal Society's Conference on agriculture and nutrition have revealed that many different parts of the Commonwealth

have their own special problems but that the scientific principles for attacking them are very much the same. Work on these subjects, therefore, provides examples of the first type of investigation I have in mind. Examples of the second type are the study of the upper atmosphere and its effect on the travel of radio waves or the study of cosmic rays. In both these cases planned investigation on a world-wide scale, carried out according to an agreed programme, appears to be necessary. In some cases it may be necessary to devise new machinery for achieving the closer collaboration required. Satisfactory progress in many investigations will require more scientists to be engaged on the work, and better facilities will be required to enable leaders among these scientists to meet together for discussion. Better equipment, particularly apparatus which will result in the saving of manpower, may be necessary. This may mean that more money may be necessary for the work.

As far as His Majesty's Government in the United Kingdom is concerned, I can assure you that the recommendations of this Conference will receive most careful and sympathetic consideration. The Government is fully alive to the importance of research in the future development of this country and of the British Commonwealth, and we are determined that science shall play its proper role in the formation of policy and that its results shall be applied in improving the standard of life, both of the people in this country and of the whole Commonwealth. I am equally certain that His Majesty's Governments overseas are also determined to accept all the help which scientists can render in making the world a better and safer place for the people. In achieving this, the results of the discussions at this Conference and the concrete proposals arising from them should bring forth a rich harvest in the years to come. I am, therefore, happy to declare the Conference open and to wish you the fullest possible success in your labours."

SESSION I

Election of Officers

17. On the motion of Dr. C. J. Mackenzie, seconded by Sir David Rivett, Sir Edward Appleton was elected Chairman of the Conference.

On the motion of the Chairman, seconded by Dr. E. Marsden, Dr. C. J. Mackenzie was elected Deputy Chairman.

The appointment of the General Secretary and the members of the Secretariat was confirmed. The Conference also agreed unanimously to the adoption of the suggested programme and agenda of the Conference. The subjects for discussion in full session were agreed on and Chairmen and Secretaries were appointed as follows:—

<i>Session</i>	<i>Subject</i>	<i>Chairman</i>	<i>Secretaries</i>
2.	Scientific Liaison ...	Dr. E. Marsden ...	Mr. H. L. Verry. Dr. J. G. Malloch.
3.	Collaborative Investigation	Sir David Rivett ...	Mr. G. B. Gresford. Dr. W. L. Francis.
4.	Movement of Scientists ...	Sir Shanti Bhatnagar	Mr. G. Bird. Dr. N. Wright. Mr. G. B. Gresford.
5.	Information Services ...	Dr. B. F. J. Schonland	Dr. T. C. Roberts. Dr. P. S. Hudson.
6.	Utilization of Scientific Results.	Dr. C. J. Mackenzie ...	Dr. J. G. Malloch. Mr. H. K. Warr-Langton.
7.	Aspects of Collaboration in Research between Government and Industry.	Sir Edward Appleton	Mr. L. Lewis. Mr. C. A. Spencer.
8.	Arrangements for future Conferences.	Sir Edward Appleton	Mr. O. F. Brown. Dr. W. L. Francis.

Opening Statement by the Chairman

18. Sir Edward Appleton said:—

"GENTLEMEN,

I thank you all most warmly for electing me to be Chairman of this Official Conference. I am as sensible as anyone could be of the inadequacy of my qualifications for this office, but I accept it, knowing full well that I shall have the ready support and assistance of all of you.

Being in this position does, however, give me conveniently one opportunity which I wish to seize at once. And that is to say, on behalf of the United Kingdom Official Delegation, how delighted we are to welcome so many of our oversea colleagues to this country.

After our recent experiences we may seem to you to be a trifle shabby and faded externally and the fare we have to offer somewhat meagre, but I can assure you that the warmth of our welcome is anything but faded and meagre.

Now I don't intend to make a long speech to-day, but I feel that there are a few points to which I should like to draw your attention.

There are, first, two general remarks I wish to make concerning the Official Conference. I think everyone will completely agree that the plan of holding the Royal Society's Conference first has proved to be a very happy and successful one. It has enabled delegates to get to know each other, to appreciate the extent and variety of Commonwealth science problems and to make many specific recommendations for the consideration of the Royal Society and of this Conference. A cordial invitation has therefore been sent to the President and Officers of the Royal Society and I am particularly glad to see Sir Alfred Egerton here this morning.

Secondly I would like to say how much I feel we here to-day owe to the splendid work done by the Working Party in the preparation of papers and draft programmes in advance of the Conference. It is my experience that the success of a scientific experiment is usually fairly well proportional to the thoroughness of the preparation for it. The Commonwealth Scientific Liaison Officers in London, working in conjunction with representatives of U.K. Departments, under Mr. Brown's chairmanship, have, I feel, by their preparatory work, thrown up sharply the various matters which need our consideration. But I know that the Conference would not wish to stick rigidly to any plan which is inadequate. So if any delegate wishes to raise any additional matter for consideration will he please ask the leader of his own Delegation to bring it forward for the consideration of the Steering Committee?

Now the Royal Society's Conference has naturally been an opportunity to hear the point of view of the independent scientific worker but I think that the discussions have also demonstrated very clearly that the methods of scientific research are the same whether the research worker is carrying out his work in a University or Government Laboratory or even in an Industrial Laboratory. In other words it has emphasized that science is one and indivisible.

At the same time we must not forget that the work of independent scientists in Universities all over the Commonwealth is now largely supported from public funds. Thus, the implementation of many of the recommendations made at the Royal Society's Conference would require Government action, either in the expenditure of public money, or in the provision of facilities which can only be provided by Government and sometimes through the collaboration of more than one Government.

I feel strongly, therefore, that we, as Official Scientists, should not hesitate to do all we can to convince our Governments, where this is necessary, of the importance of the proposals for the extension of facilities for independent fundamental research at Universities throughout the Commonwealth. At the same time the resources of the Commonwealth are limited, particularly as regards the supply of trained research workers, to a less extent as regards equipment and to a less extent still, financially. It is, therefore, our duty to satisfy ourselves that the recommendations we finally put forward can, in fact, be carried through and that they take into account the national interest both of the individual countries of the Commonwealth and of the British Commonwealth as a whole.

I was much interested, as I think we all were, in the review, at the Royal Society's Conference, of the organizations for supporting science, and scientific effort, set up by the various Governments of the Commonwealth. It brought out very clearly the great variety of Department of Scientific and Industrial Research and Council of Scientific and Industrial Research organizations in the United Kingdom and in the rest of the Commonwealth.

I did not find the differences in the D.S.I.R. and C.S.I.R. organizations in any way alarming. In fact, I feel they may be a good thing. It is quite clear that the organizations are all doing good work, and are well suited to their tasks; and, what is more important, all of them seem to have flexibility to tackle the variety of problems with which they are faced. After all, it is not so much the administrative organization of science, but the atmosphere in which scientific work is carried out, which really matters; and as long as the scientist is in control of the conditions under which he and his staff work we may be quite sure that the maintenance of the right atmosphere will be assured. I should say that it is far too early to decide what the ideal Government organization for research should be, and the machinery for fostering scientific effort must remain for many years in a state of active development. I feel sure the force of that will appeal to a gathering of experimental scientists.

There is one point, however, regarding United Kingdom Official Science with which I should like to deal. I want to kill a rumour that is current in some circles that United Kingdom scientific civil servants are now "established" in the sense that the provision of their pensions rights binds them to Government service in the same way as administrative civil servants are bound. This is not true. The pension provision of the civil "Scientific Officer" grades in the service is in most Departments in the form of the Federated Superannuation System for Universities (F.S.S.U.) and, as you know, this system is specially designed to facilitate movement of workers from one job to another. Many of the staff of D.S.I.R. have been released to take up posts in universities and in industry, and we have always given our blessing to such transfers, because it is a special duty of the Department to encourage both independent fundamental research at the universities and applied research in industry. The release of trained workers for particular posts is, we consider, an effective way of assisting both. This policy, which we have always pursued, will be continued in the future. It is specially important at the present time in view of the report of the Barlow Committee on "Scientific Manpower"* which recommends that, in making the best use of our limited supply of scientists, the order of priority in this period of reconstruction should be

- (1) Teaching and Fundamental Research;
- (2) Civil Science, both Government and Industrial;
- (3) Defence Science.

* Cmd. 6824.

I should, however, add that this order of priority is the one that operates at the moment and obviously will be subject to constant review.

There are some special points which struck me during the early sessions of the Royal Society's Conference which should, I think, repay some general consideration perhaps in the latter part of this opening session of our Conference. The Royal Society's Conference emphasized the importance of small university units as spear-heads of scientific progress. I think everyone would agree with that view. But there are problems requiring large scale attack which can only be undertaken by official scientists working in Government organizations. The proper balance between university research and research under Government auspices is a matter, I think, that each nation must work out for itself according to its particular requirements. In the United Kingdom I think we have succeeded in evolving a very satisfactory balance of financial support particularly through the work of the Scientific Grants Committees of the Royal Society and of the Advisory Council of the Department of Scientific and Industrial Research, the Agricultural Research Council and the Medical Research Council. As Sir Edward Mellanby has said, the great advantage of the university unit is that it can be disbanded when its useful purpose has been achieved. This is, of course, not easily possible with a fixed Government research institution, especially when it has grown to a considerable size, and here I think a certain danger lies. In Great Britain we have tried to avoid the danger by budding off new establishments from existing ones when the case for it has become clear. For instance, in the near future we expect to establish and support research organizations for radio and mechanical engineering instead of keeping them, as at present, under the National Physical Laboratory.

The maintenance of the scientific health and freshness of outlook of workers in the Civil Service is, I readily agree, a matter which needs active consideration. We have all seen and admired the wonderful work done by University scientists during the war when they left their academies and joined our Government Departments. It has been said that the reason for their outstanding success was that "it never occurred to them that it couldn't be done!" I agree that that was one reason, but I rather think there were others. But what cannot be doubted is that University conditions certainly do, somehow, generally ensure the maintenance of mental adventurousness and lively imagination so necessary for scientific progress. And we therefore believe that in the Scientific Civil Service we must try to ensure that conditions are encouraged which will bring these same things about. In this connection I would like to refer you all to the report of the Barlow Committee on the "Scientific Civil Service"* which I have had circulated to you, in which suggestions to this end are made. An Inter-departmental Scientific Panel, of which I am Chairman, is now considering the implementation of these very recommendations.

Turning now to the programme of the Conference itself, you will see that we begin with a session on Scientific Liaison. I think we all agree that the appointment of Scientific Liaison Officers in important centres has been extremely successful. Various methods of organizing the work of Liaison Officers have grown up during the war, for example, the growth of the British Commonwealth Scientific Office (B.C.S.O.), Washington. It will be for the Conference to consider what conditions of appointment, and of work, are best suited to peacetime conditions. It may well be that different arrangements may be necessary to suit conditions in different countries. The Steering Committee has put this subject first on the agenda because decisions

* Cmd. 6679.

taken on this question may influence later discussions on machinery for facilitating collaboration in many matters.

Next we are to consider collaboration on specific investigations. This is probably the most important topic upon our agenda, but, of course, it presents some of the greatest difficulties. As far as this Conference is concerned the field to be covered is very wide. Many possible subjects for collaboration have been suggested in the documents circulated before the Conference, and many proposals have been made during the Royal Society's Conference. I think it may be well to recall here the important distinction drawn by the Lord President between subjects on which work can safely be left to develop along its own lines in the countries of the Commonwealth and those subjects in which a concerted attack is necessary. The first class of investigations requires only that those engaged in them should know what is going on in their fields in other parts of the Commonwealth, and indeed of the whole world, that they should be able to exchange information quickly on their problems, and that they should be acquainted with the progress in the development of new techniques and with the results obtained by their fellow-workers. This should largely come about, as conditions return to normal, through the ordinary methods of publication, but these need supplementing by personal contact. I am quite sure that all of us are agreed that the facilities by which scientists can travel and meet each other at suitable intervals are essential for promoting the kind of collaboration we seek.

In the second class of work, the scientist's laboratory is not enclosed by four walls but extends over wide expanses of earth, sea or sky and further means for securing complete collaboration are essential. To this class belong the study of Cosmic Rays, and of the Ionosphere, and possibly the problems of Oceanography. A plan of attack, in which all the countries of the Commonwealth take part, may be necessary if we are to get results economically and rapidly. The delegates to this Conference naturally do not include specialists from every country of the Commonwealth qualified to draw up such plans. All I think we can do, therefore, is to recommend that specialist conferences should be held in the near future at suitable times and places to formulate definite schemes for co-operation in world-wide experiments and series of observations.

In view of the importance we all attach to personal contact in promoting collaboration in research, one session of our Conference is devoted to discussing the movement of scientists. As far as short period visits are concerned I think that, once the Governments of the Commonwealth appreciate the reasons which make travel essential in promoting both the progress of research and the effective training of young graduates, there should not be much difficulty in obtaining the financial assistance, from Government sources, necessary to augment the provisions for travel already available from private sources. We in this country at any rate, find no difficulty in sending men overseas when we wish to do so and it would seem to be a matter for delegates, supported by the general resolutions which the Conference will no doubt pass on this matter, to move their Governments to make such arrangements as may appear to them most suited to their particular circumstances.

So much for short term visits. When we pass to long period transfers of staff to fill posts overseas, the matter becomes, however, more complicated. The question of pension rights, for example, arises. It has been suggested that the difficulty could be got over by the adoption of a general Commonwealth scheme for F.S.S.U. There are, however, difficulties in

implementing such a proposal and we have accordingly arranged for F.S.S.U. experts to attend the session so that the Conference may be aware of these difficulties and consider how they can be overcome.

Next, we consider certain aspects of collaboration in research between Government and Industry, in particular the question of Dominion and Colonial participation in the activities of the collaborative research associations established in the United Kingdom. These as you know are autonomous bodies, formed to serve various industries, which are mainly supported by contributions from their member firms but also receive grants from D.S.I.R. The main question to be considered is the conditions under which Government Departments and firms overseas might receive some or all of the benefits of membership of the research associations. The Chairmen and Directors of a number of Research Associations have been invited to attend the Conference and take part in the discussion.

The next subject to be dealt with is Information Services. The Royal Society sessions on this subject dealt largely with the technique of abstracting, specialist libraries and possible changes in the methods of publication. The Royal Society is proposing to call a Specialist Conference on these matters and I am sure that we all endorse this proposal. Our approach to the matter must be rather different. The results of research which is now going on or which is just beginning, will take time to accrue but there is at the moment a vast amount of scientific knowledge which could have immediate application were it known to the men on the job. Much of this knowledge has come from research carried out during the war years in the Commonwealth, in allied countries and in enemy countries, which so far has not been published in the ordinary way. It is scattered through many countries and through many Government Departments. The problem is how it can best be tapped without setting up unwieldy machinery whose operation would demand an effort in manpower which we may not be able to afford. This seems to me to be the main problem, which we shall have to consider in our session on information services. I feel that we shall only arrive at a solution if we approach it from the point of view of the users of information. We have in our country been taking steps to try to put our own house in order in this matter, and we have submitted a paper describing what we at present do in D.S.I.R. and giving some indication of what we hope we may be able to do in the future. It goes without saying that we shall be only too willing to collaborate with any similar organizations which other countries of the Commonwealth may set up.

Besides a general discussion on the application of scientific knowledge through information services, the means for carrying research into the development stage will be dealt with in the session on the Utilization of the Results of Research in which both Canada and Great Britain will tell the Conference of the proposals which are under consideration for the institution of Research and Development Organizations, particularly for the exploitation, in the national interest, of discoveries which can be patented. There will also be a discussion of proposals from South Africa for the establishment of a "Commonwealth Patent." It has also been suggested that a report should be prepared on the methods which have been found most successful in various countries for utilizing non-patentable discoveries. Exchange of experience on this subject will, I believe, prove most valuable to all of us responsible for encouraging the application of research.

Now you will all feel, I am sure, that the programme before us is a very heavy one and I expect the Conference will decide to refer the detailed examination of many questions, including many of the proposals for collaborative investigations, to Committees. Reports of these committees will be

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considered at the review sessions when the Conference will also be invited to approve finally resolutions resulting from the previous sessions.

Finally, we shall have to examine carefully proposals for dealing with the planning of future scientific Commonwealth Conferences. We have all of us seen a number of excellent reports of previous Conferences containing many admirable resolutions; but in a number of cases corresponding action does not appear to have followed. I sincerely hope that this will not be the fate of a number of the resolutions passed at this Conference and that we shall be able to claim in a few years' time that definite and valuable results have arisen from our labours. But if we are to avoid the risk of much of our labour being in vain I am certain that some means of following up our decisions is essential. This important matter is to be the subject of the last session of the Conference.

In conclusion may I say a few words about finance. The effective implementation of many of our recommendations will involve increased expenditure in one way or another and it may be desirable to examine very broadly what this implies. The main purpose of the Conference is to devise practical measures for closer collaboration. The brief review I have attempted of the chief topics to be considered, to my mind, shows that there are four ways by which this purpose may be served:—

- (i) Through direct contact both by correspondence and by visits of individual research workers.
- (ii) Through more or less informal collaboration between two or more research stations or units.
- (iii) Through the general efforts of scientific liaison officers.
- (iv) By the establishment through joint Commonwealth action of special agencies for particular purposes.

I think it should be possible to fit in under one or other of these headings all the proposals likely to arise from the work of the Conference. The first two classes—individual contact and informal collaboration between stations—as a rule involve expenditure only by individual governments. The value of our resolutions will lie in strengthening the hands of those responsible for research in obtaining from their Governments the funds they require. The last class, and possibly the third, according to the recommendations we may make on scientific liaison offices, may involve the provision of some common finance. If this is to come from public funds it may take two forms. Firstly, one Government may be responsible for the administration and control of an organization and other Governments may subscribe to it whatever funds are deemed suitable. The Imperial Institute is an organization supported in this way, and we have also received financial contributions of this kind in respect of work of certain D.S.I.R. stations, particularly those of the Food Investigation Organization, in carrying out work of interest to the Dominions. The second type of organization may be a truly co-operative official agency providing services or carrying out work for all. In this case each co-operating Government contributes an agreed percentage of the funds required on the understanding that other co-operating Governments provide their appropriate share. An example of the second form is the Imperial Agricultural Bureaux.

Many of the recommendations, particularly those arising from the Royal Society's Conference, involve the establishment of new agencies for research, and in considering such proposals I think we should be clear in our minds which of these two kinds of financial collaboration we are going to recommend. We must, of course, be guided by the purposes to be served, and that is one reason why we should first of all be sure of what we want to achieve. If, however, the Conference decides to recommend the establishment of a truly

co-operative agency then we should keep in mind the fact that Governments have already laid down the principles to be observed in the organization of such agencies. They are to be found in the Report of the Imperial Committee on Economic Consultation and Co-operation of 1933.*

I think, however, it might be well to repeat them here. They are as follows:—

- (a) Complete constitutional equality of the participating governments;
- (b) Each government appoints its own member to the 'managing body' of the agency;
- (c) Adequate financial provision must be forthcoming with reasonable certainty of income over a definite period of years;
- (d) At the same time there must be careful and periodical examination of these agencies and their work by Empire conferences suitable for the purpose, as without that assurance Governments could hardly be expected to provide the financial support;
- (e) The managing bodies of inter-Imperial agencies should in no way be subject to financial control by the Finance Department of any one government of the Commonwealth, but over and above scrutiny by a suitably constituted finance committee, should be free to take advantage of the experience of such departments;
- (f) Each such inter-Imperial Agency should approach the participating governments directly through the appropriate channel."

I suggest that if in the course of the Conference, Committees are set up for formulating any schemes which may involve the creation of new co-operative agencies on a Commonwealth basis it might be well to instruct our Committees that these principles should be borne in mind.

Finally I am sure I am voicing the feelings of the whole Conference when I say how indebted we are to the President and Council of the Institution of Electrical Engineers for making these magnificent facilities available to us for the fortnight of our deliberations. Later on in the Conference we shall doubtless wish to express, in some more formal manner, our great appreciation of these privileges."

The Heads of Delegations spoke in endorsement of the Chairman's statement, giving brief comments on the suggested programme.

Appointment of Committees

19. The Conference then set up Committees on the following subjects:—

<i>Subject</i>	<i>Chairman</i>	<i>Secretary</i>
Medical Sciences	Sir Edward Mellanby ...	Dr. F. J. C. Herrald.
Agricultural Sciences ...	Sir John Fryer ...	{ Dr. P. S. Hudson. Dr. N. C. Wright..
Oceanography and Fisheries	Dr. A. T. Cameron ...	{ Dr. H. H. Brown. Dr. S. L. Hora.

with these terms of reference:—

" To consider questions of collaborative research and such other topics as may be referred to them by the Conference and to report."

The membership of these Committees is given in Appendix 2.

* Cmd. 4335.

SESSION 2

Scientific Liaison Offices

Chairman: Dr. E. Marsden.

Secretaries: Mr. H. L. Verry, Dr. J. G. Malloch.

20. Resolutions* were adopted relating to the following subjects:—
- (1) The resolution of the Royal Society's Conference on Commonwealth Liaison Offices (Para. 48 (a)).
 - (2) The establishment of a British Commonwealth Scientific Office in London (Para. 48 (c)).
 - (3) The continuance of the British Commonwealth Scientific Office, Washington (Para. 48 (d) and (f)).
 - (4) Other Commonwealth Scientific Liaison Offices (Para. 48 (e)).
 - (5) Scientific representation in certain foreign countries. (Para. 48 (h)).
 - (6) General availability of the services of Liaison Offices (Para. 48 (b)).
21. A Committee was appointed to formulate for the approval of the Conference detailed proposals on accommodation, finance and administration of the proposed British Commonwealth Scientific Office in London and the British Commonwealth Scientific Office in Washington (Paras. 48 (g), 49 and Appendix 2).

SESSION 3

Collaborative Research and Specialist Conferences

Chairman: Sir David Rivett.

Secretaries: Mr. G. B. Gresford, Dr. W. L. Francis.

22. A number of recommendations arising from the Royal Society's Conference relating to collaboration on specific subjects was referred to the Committees on Agricultural Sciences, Medical Sciences and Oceanography and Fisheries set up in the first session (Paras. 19, 52 and Appendix 2).
23. Resolutions† were passed concerning the following subjects:—
- (1) The need for an Interim or Standing Committee which would be responsible for the arrangements for specialist conferences to discuss collaborative investigation (Para. 51).
 - (2) The endorsement of the Royal Society's Conference on modern methods of mapping and exploration by air (Para. 53).
24. The Conference set up Committees on the following subjects to discuss the feasibility of collaboration and to report to the Conference at the review sessions (Para. 52 and Appendix 2).

<i>Subject</i>	<i>Chairman</i>	<i>Secretary</i>
Building Research	Sir Reginald Stradling	Mr. J. W. Rice.
Food Preservation	Dr. C. S. Hanes ...	Dr. C. S. Hanes.
Fuel Research	Dr. A. Parker ...	Dr. R. B. Randall.
Mineral Resources and Geology	Professor E. S. Hills ...	Mr. G. B. Gresford.
Radio and Cosmic Rays ...	Sir Edward Appleton	Dr. A. F. Wilkins.
Regional Research in Africa ...	Dr. B. J. F. Schonland	Mr. E. Boden.
Type Cultures	Dr. C. R. Harington ...	Mr. G. B. Gresford.* Dr. F. J. C. Herral

* The resolutions adopted at this Session will be found in Section III, together with certain resolutions concerning B.C.S.O. passed at other plenary sessions.
 † The resolutions adopted at this Session will be found in Section III.

SESSION 4

Movement of Scientists

Chairman: Sir Shanti Bhatnagar.

Secretaries: Mr. G. Bird, Dr. N. C. Wright, Mr. G. B. Gresford.

25. Sir Charles Jeffries of the Colonial Office, also Professor G. N. Watson and Mr. C. R. Macdonald, the Vice-Chairman and Secretary, respectively, of the Council of the Federated Superannuation System for Universities were present by invitation.

26. Resolutions* were passed on the following subjects:—

- (1) The general need for the movement of scientists (Para. 69 (a)).
- (2) The need for the compilation, classification and publication of lists of post-graduate scholarships tenable for scientific study within the Commonwealth (Para. 69 (b)).
- (3) The need for the provision of further travelling scholarships and fellowships (Para. 69 (c)).
- (4) The possibility of co-operation between Universities throughout the Commonwealth in the award of post-graduate degrees (Para. 69 (d)).
- (5) The adequacy of emoluments of research scholarships and travelling grants (Para. 69 (e)).
- (6) The conditions of movement of scientists (Paras. 69 (f) and 70).
- (7) Supplementary means of facilitating interchange of scientists (Para. 69 (h), (i)).
- (8) Demand from territories outside the Commonwealth for expert scientific advice (Para. 69 (j)).

27. A Committee under the Chairmanship of Professor G. N. Watson was set up to consider the question of superannuation in connection with the movement of scientists and to report to the Conference (Paras. 69 (g), 71 and Appendix 2).

SESSION 5

Aspects of Collaboration in Research between Government and Industry

Chairman: Sir Edward Appleton.

Secretaries: Mr. L. Lewis, Mr. C. A. Spencer.

28. The Chairmen, Directors and representatives of many Research Associations and also Mr. A. L. Hetherington, C.B.E., who, while Assistant Secretary in the Department of Scientific and Industrial Research had devoted many years to the development of the Research Association movement, were present by invitation.

29. The Conference took note of papers which had been submitted on Collaboration with Industry in Research and on Industrial Research Fellowships, and discussed at length the subject of Research Associations. A resolution* was passed concerning:—

- (1) Membership of Research Associations in one part of the Commonwealth by Government Departments, research institutions and firms in another part (Para. 77).

* The resolutions adopted in this Session will be found in Section III.

SESSION 6

Information Services*Chairman:* Dr. B. F. J. Schonland.*Secretaries:* Dr. T. C. Roberts, Dr. P. S. Hudson.

30. A number of observers from the Board of Trade, the Ministry of Supply and other Government Departments were present by invitation.

31. Resolutions* were adopted on the following subjects:—

(1) The recommendation of the Royal Society's Conference that a Specialist Conference of the libraries, societies and institutions responsible for abstracting and information services should be convened (Para. 81 (a)).

(2) The need for preventing the duplication of translations (Para. 81 (b)).

32. The Conference appointed a Committee under the Chairmanship of Mr. G. C. Monture to consider and report on proposals for alterations in the organization and functions of the Imperial Institute (Paras. 83, 84 and Appendix 2).

SESSION 7

Utilization of the Results of Research*Chairman:* Dr. C. J. Mackenzie.*Secretaries:* Dr. J. G. Malloch, Mr. H. K. Warr-Langton.

33. Resolutions* were passed relating to the following matters:—

(1) The preparation of a report on successful methods for promoting the utilization of non-patentable scientific and technical results (Para. 90 (a)).

(2) The establishment of the necessary machinery to ensure the maximum utilization, in the national interest, of patentable discoveries (Para. 90 (b)).

(3) A re-examination of the subject of a Commonwealth Patent (Para. 90 (c)).

SESSIONS 8 AND 9

Review Sessions*Chairman:* Sir Edward Appleton.*Secretaries:* Mr. O. F. Brown, Dr. W. L. Francis.

34. *Establishment of Standing Committee.*

Resolutions* were passed concerning the establishment, constitution and terms of reference of a Standing Committee and of a Working Party to be set up in London. (Para. 42 (a) to (g).)

Note:—A meeting of the Standing Committee was held immediately after the conclusion of the Official Conference. Mr. O. F. Brown of the Department of Scientific and Industrial Research, General Secretary of the Conference, was invited to become the first Secretary on a part-time basis. The oversea members of the Standing Committee indicated that their deputies on the Working Party would be their Liaison Officers serving in London.

* The resolutions adopted in this Session will be found in Section III.

35. *Adoption of the Minutes of the Plenary Sessions of the Conference.*

The minutes of the plenary sessions were adopted with slight amendments as a correct record of the proceedings of the Conference.

36. *Adoption of the Reports of the Committees of the Conference.*

The Chairman of the Conference invited the Chairmen of Committees to present their reports. After discussion and, in some instances, amendment, the reports of the Committees were adopted by the Conference.

37. *Recommendations and resolutions from other Conferences.*

(1) The Conference received and noted reports from the following Conferences:—

Commonwealth Conference on Aeronautical Research, London, June, 1946.

Conference of Empire Meteorologists, London, March, 1946.

Extraordinary Conference of Directors of Meteorological Offices, London, February/March, 1946.

(2) The Conference considered the following recommendations from the Royal Society Empire Scientific Conference on subjects which had not already been dealt with or remitted to Committees.

(a) Measures to secure greater uniformity in physical standards of measurement and use of units, terms and symbols. (Appendix 1 (h).)

It was noted that paragraph 6 of this report, referring to radio transmission of standard frequencies, had been covered by the report of the Radio and Cosmic Ray Committee, Recommendation (h). (Para. 62 (2).)

The Conference took note of the remaining resolutions and of the action by the National Physical Laboratory which they entailed.

(b) Post-war needs of fundamental research (Appendix 1 (m)).

Resolutions

The Conference adopted the following resolutions:—

(a) The Conference is of the opinion that action should be taken in all countries of the Commonwealth to encourage fundamental research work in all important subjects.

(b) The needs of the future will require a great increase in the number of research scientists, and it is considered important that plans for extending research in any field should be supported by measures designed to increase the number of trained scientists able to carry out such plans.

(c) In order to secure the proper flow of young scientists from educational establishments, it is considered of importance that the educational system of each country should take into account, so far as may be necessary, this particular long-term need.

CLOSING CEREMONY

38. In bringing the Conference to a close the Chairman said:—

“ I believe that this Conference will inaugurate a new era in Commonwealth scientific co-operation, for not only have we decided on numerous specific recommendations to that end, but we have also set up permanent machinery both to implement those recommendations and to deal with any similar proposals that may emerge in the future.

I am glad that we found time to appoint Committees on special subjects suitable for Commonwealth co-operation and collaboration. These have not been specialist conferences in the strict sense of the term, but it is abundantly clear from the work and reports of these Committees that many Commonwealth links can be immediately strengthened and new ones forged. We are most grateful to the members of those Committees for their strenuous and devoted services to the cause for which we all stand.”

He then expressed the indebtedness of the Conference to the Ministry of Works for the arrangement of the Conference Hall and for the various structural alterations to the building which had contributed very considerably to the satisfactory working of the Secretariat, to the Engineering Staff of the Post Office for the installation of a convenient and adequate telephone service, and to the Stationery Office for the loan of neostyling equipment and a team to work it.

Resolutions

In conclusion he proposed the following resolutions:—

- (a) The Delegates of this Conference express their high appreciation of the work done by the General Secretary, Secretariat, typists, duplicating staff and messengers, which has so materially contributed to the success of the Conference.
- (b) The Delegates to the Conference wish to express their warmest thanks to the President and Council of the Institution of Electrical Engineers for the loan of the Institution's premises during the course of the Commonwealth Scientific Official Conference of 1946.

39. The resolutions were supported on behalf of the delegates from overseas by Dr. Mackenzie, who expressed their gratitude for the arrangements that had been made for the convenience and entertainment of the delegates and for the conduct of the business of the Conference, and felt sure that their deliberations would give rise to increased Commonwealth collaboration in science in the future.

40. Sir David Rivett, in endorsing these remarks, drew attention to the significance and potential importance of the British Commonwealth Scientific Office, London, and of the Standing Committee and Working Party set up by the Conference to follow up their decisions. He wished them success in their labours and closed by thanking the Chairman for the way in which he had presided over the proceedings of the Conference.

41. The resolutions were passed unanimously and the Conference then dispersed.

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PART III.—RECOMMENDATIONS AND RESOLUTIONS
OF THE CONFERENCE AND REPORTS OF
COMMITTEES

ESTABLISHMENT OF STANDING COMMITTEE

42. Throughout the Conference the question of suitable machinery for initiating action for the calling of specialist conferences and for following up the recommendations and decisions of the Conference after it dispersed was present in the minds of the delegates. For these purposes and generally for furthering its objects the Conference adopted the following resolutions establishing a Standing Committee, with a Secretariat and Working Party in London:—

Resolutions

- (a) A Standing Committee should be established, consisting of the executive heads of Government organizations for scientific and industrial, agricultural and medical research in the United Kingdom, the Dominions and India, together with three scientific representatives nominated by the Colonial Office.
- (b) The terms of reference of the Standing Committee should be to further the objects of the Conference, namely:—
“to consider the best means of ensuring the fullest possible collaboration between the Government scientific organizations of the Commonwealth and Empire”.
- (c) The Standing Committee should have power to co-opt other members as may seem desirable.
- (d) The Committee should immediately appoint:—
(i) a Secretary,
(ii) a Working Party in the United Kingdom, composed of deputies of the members of the Standing Committee to propose action within the terms of reference of that Committee.
- The Secretary of the Standing Committee should act as Chairman of the Working Party.
- (e) The Working Party may invite to its meetings, as additional members, representatives of other interests and organizations concerned.
- (f) The Working Party should submit to the Standing Committee its proposals for the calling of the next Commonwealth Scientific Conference at least 18 months before the suggested date.
- (g) The Secretariat services for the Standing Committee and the Working Party should be provided from the common services of the British Commonwealth Scientific Office, London, when this is established. Meanwhile, the Department of Scientific and Industrial Research should be asked to provide these services.

SCIENTIFIC LIAISON OFFICES

43. Because of its bearing on many of the problems before the Conference, the question of Scientific Liaison Offices was the first to be considered. In opening the discussion, the Chairman, Dr. E. Marsden, paid a tribute to the value of the work done by the Scientific Liaison Offices during the war in London and Washington. There was throughout the Commonwealth a fair unanimity of opinion that Scientific Liaison Offices were a necessary part of the peace-time as well as war-time organization of collaborative research work, but there had been some doubt as to the best means of utilizing their services. There were at present two types of liaison in operation, the system in London where the liaison officers worked almost as part of the administrative machinery of the offices of the High Commissioners and the alternative arrangement in Washington of the British Commonwealth Scientific Office. One proposal before the Conference was that a central office similar to the British Commonwealth Scientific Office (B.C.S.O.), Washington, should be established in London on the following lines:—

(1) *Centre for Scientific Liaison*

A centre for scientific liaison in London should be established by housing the several scientific liaison offices of the various parts of the Commonwealth, including suitable U.K. representation, under one roof.

(2) *Status of the Constituent Offices*

Each of the offices which collectively constitute the centre should be completely autonomous, retaining complete liberty of action in the conduct of its affairs. Specifically, each office should have complete and sole control over all its correspondence, incoming and out-going documents, and each office could maintain its own secretariat, filing system and such other services as would be necessary for the carrying out of its functions. The officer in charge of each office should be responsible only to the authorities of his own government.

(3) *Co-operation in Liaison Functions*

Experience in Washington has shown that propinquity leads to a substantial measure of co-operation between the offices in the conduct of their liaison work. However, co-operative practices of this kind should not be legislated for, or even covered by any formal agreement, but should be allowed to develop as the needs of the situation and the desires of the officers concerned dictate.

(4) *Co-operation in Clerical or other Services*

Sharing of common premises would permit increased economy and efficiency in the operation of the offices by making possible the sharing of common services, which might include reproduction service, photographic, microfilming and photo-stating service, stenographic pool to supplement the secretariat of the individual offices when required, messenger service, etc. Provision should be made for the financing of such common services and for their administration.

(5) *Finance*

The salaries and allowances of the staffs of each constituent office, and the rental of the space occupied by each office should be paid directly by the appropriate organ of the government concerned. The charges for common services, including the rental of space occupied by such services should be allocated in a manner to be agreed on.

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(6) *Office Administration*

The common services should be administered by an administrative officer (who may have other duties) responsible jointly to the heads of the constituent offices, acting through a chairman selected by themselves, if they so desire.

44. It was further proposed that the British Commonwealth Scientific Office, Washington, should continue to carry out its present functions set out below, and that these might well serve as a model for any similar centre set up elsewhere. These functions are:—

- (1) To assist official scientific visitors from the home countries.
- (2) To maintain close personal contact with U.S. Government and other research institutions and technical bureaux.
- (3) To obtain prompt and comprehensive answers to questions asked by Government departments in the home countries.
- (4) To stimulate and maintain the exchange of official scientific and technical reports, and to pass inward reports to the appropriate U.S. recipient.
- (5) To report new developments and changes in policy and organization on scientific matters in the U.S.
- (6) To facilitate supply, within certain limits, of books, chemicals scientific apparatus and biological materials for official scientists in the home countries.
- (7) To advise agencies of the Commonwealth countries in the United States on Service, Industrial and other aspects of Science.

45. The discussion revealed that the Dominions and India were keenly interested in the proposals and would welcome the facilities which the continuance and development of these offices would provide. As regards the Washington Office, emphasis was laid on the fact that the U.S. welcomed the B.C.S.O. type of liaison because of the economy of time and labour achieved by the single approach from a number of interested bodies.

46. A related question before the Conference was the establishment of civil scientific representation in foreign countries. In the United Kingdom the subject had already received some detailed consideration and it had been suggested that the tasks of representatives might be some or all of the following:—

- (1) To co-operate with the appropriate Departments of the United Kingdom Government in providing early general information about new developments and trends in scientific and industrial research.
- (2) To co-operate with the Diplomatic staff, on scientific and technical matters, and, if required, to advise Service Attachés on scientific matters.
- (3) To do everything in their power to maintain British scientific and technical prestige in the country of their appointment, e.g. by supplying information on recent work, directing enquiries to the best source of information, delivering lectures on British scientific effort, etc.
- (4) To assist visitors from this country to Government, University and, where possible, industrial laboratories overseas by arranging contacts, tours, visits, etc.
- (5) To make arrangements as requested for scientific missions and conferences from this country.

(6) To assist in making reciprocal arrangements for foreign scientific visitors coming to visit this country.

(7) To facilitate oversea publicity for British scientific and industrial research, particularly by arranging lectures, broadcasts and Press conferences for distinguished British scientific visitors.

(8) To maintain general liaison with Government laboratories in the country of their appointment and, as far as possible, with Universities and industrial laboratories and to assist British research organizations where a contact at the Embassy would be helpful, e.g. obtaining early models of new equipment and arranging for the exchange of reports, pamphlets and other published information.

47. The question of filling specified positions in certain countries was at present under consideration. Whether this representation would eventually develop on a regional or a territorial basis would depend on circumstances. The regional basis was already exemplified in the Middle East and in the proposal that the B.C.S.O. Washington should be recognized as serving all North America.

Resolutions

48. The following resolutions were passed by the Conference:

(a) The Conference notes the resolution of The Royal Society's Conference on the functions of Liaison Offices (Appendix 1 (f)) as an essential part of the machinery for facilitating interchange of scientists and activities connected therewith, and fully endorses the views expressed in the Resolution.

(b) The Conference agrees that the services of Liaison Offices should be available to all scientific organizations and individual scientists, to assist in facilitating enquiries or visits to such extent as is appropriate.

(c) The Conference warmly welcomes the proposed setting up of a Liaison Office in London to be operated generally on the lines suggested, (Paras. 43 and 44) and invites the Governments concerned to proceed with the necessary arrangements as soon as possible.

(d) The Conference, regarding the British Commonwealth Scientific Office, Washington, as a valuable and necessary element in the permanent machinery for scientific liaison, invites the Governments concerned to make suitable arrangements for its continuance.

(e) The Conference would welcome proposals by Governments to set up Liaison Offices in other parts of the Commonwealth as opportunity offers.

(f) The Conference recommends that the name of the British Commonwealth Scientific Office, Washington, be changed to "British Commonwealth Scientific Office, North America" and invites the Governments concerned to give effect to this recommendation.

(g) The Conference invites a committee under the chairmanship of Dr. Marsden, with representatives from the various delegations concerned, to formulate proposals for the approval of the Conference on matters of detail relating to the accommodation, finance and administration arrangements proposed for the London centre and for the British Commonwealth Scientific Office, Washington. (See para. 49 for recommendations.)

(h) The Conference notes with interest the plans proposed by the United Kingdom Government for scientific representation in certain specified foreign countries or regions and invites the attention of the other Governments and scientific institutions concerned to such plans with a view to any practicable collaboration.

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The following resolutions involving the British Commonwealth Scientific Office were passed by the Conference at other Sessions:—

(j) The Conference considers that information on the methods for promoting the utilization of non-patentable scientific and technical results which have been found successful in the countries of the Commonwealth or elsewhere, would be of value to its members. Accordingly, it desires that the Standing Committee should appoint an editor to be attached to B.C.S.O. (London) with appropriate assistance, to collect this information and to prepare a report for circulation not later than December, 1947. The members further agree to furnish the editor with relevant information in their possession.

(j) The Conference supports the recommendation of the Royal Society's Conference urging the need for the central compilation, classification and publication of lists of post-graduate scholarships available for scientific study within the Commonwealth. Such a task would be appropriate to the proposed British Commonwealth Scientific Office in London.

(k) The Conference notes the increasing demands from territories outside the Commonwealth for expert scientific advice and for the provision of training facilities in many different fields. It suggests that these requests should pass through the British Commonwealth Scientific Office, London, so that the resources of scientific manpower and of educational establishments in other parts of the Commonwealth as well as the United Kingdom can be used to the best advantage.

(l) The Secretariat services for the Standing Committee and the Working Party should be provided from the common services of the British Commonwealth Scientific Office, London, when this is established. Meanwhile, the Department of Scientific and Industrial Research should be asked to provide these services.

(m) The London B.C.S.O. should organize machinery for ensuring that there is within each co-operating country a list of translations of scientific papers in languages other than English made or contemplated throughout the Commonwealth.

SCIENTIFIC LIAISON OFFICES IN LONDON AND NORTH AMERICA

49. The Report of the Committee set up by resolution (g) above, as summarized below, was presented by the Chairman, Dr. E. Marsden, at the first review session and adopted by the Conference:—

Report of Committee

SUMMARY OF RECOMMENDATIONS

A. ACCOMMODATION AND COMMON SERVICES GENERALLY

London

(1) The United Kingdom Government to be invited to arrange accommodation in central London as soon as practicable, in agreement with the various Liaison Officers, on the basis of estimates to be supplied by the delegations concerned.

(2) Accommodation to be provided for the scientific and attached staffs, visitors, common services staff for typewriting and duplicating, technical reproduction unit, library and records, executive and general offices, conference room, messengers.

- (3) Accommodation to be provided for the Secretariat of the Standing Committee.
- (4) Accommodation is desirable, in the same building, for the Executive Council of the Imperial Agricultural Bureaux.
- (5) The accommodation of the Department of Scientific and Industrial Research (U.K.), in the same building is a matter of considerable importance.
- (6) Certain specified common service facilities will be essential.
- (7) A technical library is a necessary common service.
- (8) Certain specified telephone facilities will be necessary.
- (9) An efficient despatch system will be necessary; also certain transport facilities will be desirable.

B. ADMINISTRATION

London

The central administration of the Office as a whole to be limited to that needed for supervision of the common services; an informal "House" Committee of Management to be appointed for this purpose, composed of representatives of Missions or Liaison Officers, with a Chairman selected from among them. The D.S.I.R. (U.K.), to be invited to appoint an officer who would be responsible to the Committee for the day-to-day operation of common services.

Washington

Similar arrangements should apply.

C. FINANCE

London

- (1) Salaries and expenses of scientific and attached personal staffs to be borne directly by the Governments concerned.
- (2) The cost of the various specified common services including accommodation (less amounts received by way of the token payments referred to below), to be shared in agreed proportions by the Governments permanently represented in the Office.
- (3) Token contributions to be invited from those Dominion and Colonial Governments which are not permanently represented in the Office.
- (4) The contribution by each Government permanently represented in the Office to consist of the cost of accommodation of its Mission plus a proportion of the cost of common services calculated according to the floor space occupied by the Mission.
- (5) Expenditure to be met initially by the United Kingdom Government, and the agreed contributions recovered annually.

Washington

The same arrangements to apply so far as appropriate.

D. MISCELLANEOUS

- (1) The London Office to be styled the "British Commonwealth Scientific Office, London".
- (2) The Governments concerned to be invited to bear in mind the advantage of securing reasonably balanced scientific representation in the B.C.S.O. and to have regard to this, so far as practicable, in their selection of Liaison Officers.
- (3) The recommendations in the Report to be reviewed in three years' time.

COLLABORATIVE RESEARCH AND SPECIALIST CONFERENCES

50. Considering collaborative research in specific fields; the Chairman, Sir David Rivett, referred to the discussions at the Royal Society's Conference which had covered a very wide range of topics, on most of which recommendations had been made for future collaboration. He suggested that the present Conference could, in most instances, do no more than work out a general policy; specialist conferences would have to be called on most of the subjects and this involved the formation of some organization which could make the necessary arrangements. A proposal for the setting up of a Standing or Interim Committee representative of the various parts of the Commonwealth would be brought before the Conference at a later stage and it was suggested that this Committee would be a suitable body to which to refer future proposals for collaborative investigation.

Resolution

51. The following resolution was adopted:—

This Conference recognizes the need for a Standing Committee which would be responsible for the arrangements for specialist conferences to discuss collaborative investigations in the manner suggested in the papers before the Conference* irrespective of any other functions which might be assigned to it. The Standing Committee should be requested to cooperate with appropriate Commonwealth or international bodies in arranging such specialist conferences.

52. At the opening session of the Official Conference, Committees had been appointed in the Agricultural Sciences, Medical Sciences and Oceanography and Fisheries, with the following terms of reference:—

“To consider questions of collaborative research and such other topics as may be referred to them by the Conference and to report.”

In the series of resolutions given below, the Conference referred to these Committees and to other Committees on special topics set up by resolution of the Conference, the appropriate recommendations of the Royal Society's Conference. The membership of committees is given in Appendix 2.

Resolutions

(a) *Medical Sciences*

The Conference resolves that the following topics be referred to the Medical Sciences Committee:—

The Royal Society's Conference recommendations on

- (i) The physiological and psychological factors affecting human life under tropical conditions and in industry (Appendix 1, (b) (i)).
- (ii) The etiology and control of infectious and transmissible diseases (Appendix 1, (b) (ii)).
- (iii) Discussion of the present state of the science of nutrition with particular reference to the special problems of the Empire, including the nutritional status of the indigenous peoples of the Colonies (Appendix 1, (c) 1, 2 and 3).

* Details are given in Paragraph 42 on the Standing Committee.

The recommendations of the evening discussions on

(iv) Fish culture and malaria control (Appendix I, p. 68).

(v) Hormones (Appendix I, p. 68).

and the following subject recommended for discussion by the Indian delegation:—

(vi) A properly organized machinery for collaboration with the various centres of Medical Research in the United Kingdom, with particular reference to medicinal and insecticidal plants.

(See para. 59 for recommendations.)

(b) Agricultural Sciences

The Conference resolves that the following topics be referred to the Agricultural Sciences Committee:—

The Royal Society's Conference recommendations on

(i) A survey of some outstanding problems in agricultural science in the Empire (Appendix I (a)).

(ii) Discussion of the present state of the science of nutrition with particular reference to the special problems of the Empire, including the nutritional status of the indigenous peoples of the Colonies (Appendix I, (c) 3, 4 (a) and 5).

(iii) Collection of scientific records and material and risks involved in the distribution of plants, seeds and animals (Appendix I (i)).

(iv) Problems of land utilization and conservation throughout the Empire (Appendix I (j)).

(See paras. 54 and 55 for recommendations.)

(c) Oceanography and Fisheries

The Conference resolves that the following topics be referred to the Oceanography and Fisheries Committee:—

The recommendations of the Royal Society's Conference on

(i) Discussion of the present state of the science of nutrition with particular reference to the special problems of the Empire, including the nutritional status of the indigenous peoples of the Colonies (Appendix I, (c) 3 and 4 (b)).

and the recommendations of the evening discussions on

(ii) Fish culture and malaria control (Appendix I, p. 68).

(iii) Fishery and oceanographic problems (Appendix I, p. 67).

(See para. 61 for recommendations.)

(d) Radio and Cosmic Rays

The Conference recommends that a committee be set up to discuss the suggestions of the Working Party on Radio and the Royal Society's Evening Discussion on Cosmic Rays, and any other radio matters which might be appropriate.

(See paras. 62 and 63 for recommendations.)

(e) *Type Cultures*

The Conference recommends that a committee be set up to consider the desirability of establishing a Commonwealth Collection of Type Cultures. (See para. 65 for recommendations.)

(f) *Mineral Resources and Geology*

The Conference, recognizing the importance of the most effective utilization of the mineral resources of the Empire, recommends the setting up of a Mineral Resources Committee, including representatives of the United Kingdom, Dominions, India and the Colonies, to discuss the recommendations of the Royal Society's Conference on the need for a co-ordinated survey of the mineral resources of the Commonwealth and any other matters which might be appropriate.

(See para. 60 for recommendations.)

(g) *Building Research*

The Conference recommends that a committee be set up under the Chairmanship of Sir Reginald Stradling, to consider Building Research, with special reference to housing in the Commonwealth.

(See para. 56 for recommendations.)

(h) *Fuel Research*

The Conference recommends that a committee be established to discuss Fuel Research in the Commonwealth.

(See para. 58 for recommendations.)

(i) *Food Preservation*

The Conference recommends that a committee be set up to discuss research work in the Commonwealth on processing, storage and transport of food.

(See para. 57 for recommendations.)

(j) *Regional Research in Africa*

The Conference recommends that a committee, with representatives from the African Colonies, the Colonial Research Committee, Southern Rhodesia, the Medical Research Council and South Africa, should be set up to consider the recommendations of the Royal Society's Conference on subject (n)—Africa as a regional area for fundamental scientific research (Appendix 1 (n)).

(See para. 64 for recommendations.)

The reports of all these Committees were considered at the Review Sessions.

53. A proposal was put before the Conference that a committee should be established to consider the recommendations of the Royal Society's Conference on the subject of mapping and exploration by air, but since very few specialists in the subject were present it was suggested that a specialist Conference might be called at a later date and the following resolution was accordingly passed:—

The Conference endorses the recommendations of the Royal Society's Conference on modern methods of mapping and exploration by air (Appendix 1 (d)).

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REPORTS OF COMMITTEES ON COLLABORATIVE
INVESTIGATIONS

AGRICULTURAL SCIENCES

54. The Chairman of the Committee, Sir John Fryer, presented the report of the Committee which was adopted in the following form:—

Report and Resolutions of the Committee

(1) TERMS OF REMIT

The Agricultural Sciences Committee was constituted at the First Session of the Conference with the following remit:—

“ To consider questions of collaborative research and such other topics as may be referred to it by the Conference, and to report ”.

At the Third Session of the Conference this remit was amplified to include consideration of a series of recommendations and topics from the Royal Society's Conference (see para. 52 of this report).

(2) MEETINGS AND ATTENDANCE

The Committee has held three meetings under the Chairmanship of Sir John Fryer, at which some 15 to 25 members attended.

(3) ARRANGEMENT OF RECOMMENDATIONS

In reporting the subjects included in their remit, the Committee feels that the most useful procedure will be to allocate these under four general headings:—

A.—those which appear suitable for early consideration by one or more Specialist Conferences with a view to the initiation of collaborative investigations;

B.—those which, while not in the meantime suitable for consideration by Specialist Conferences, justify recommendations for appropriate action by governments;

C.—those which might more appropriately be dealt with by other Committees or Conferences; and

D.—those on which no specific action can be recommended but which nevertheless merit further study or research.

(4) COLLABORATIVE INVESTIGATIONS

As regards collaborative investigations, which formed the original remit of the Committee, the Committee recognizes that progress in many subjects could be accelerated by collaboration between institutions and workers in different parts of the Commonwealth. Such collaboration has in fact already been secured in certain branches of work through the initiative of the institutions and workers concerned. The Committee feels, however, that owing to the unequal representation of the various branches of science on the membership of the Committee, it would not be appropriate for it to recommend specific subjects for collaborative investigation. It considers that decisions regarding such collaborative investigations could be more usefully delegated to the suggested specialist conferences, at which the views of the experts from all parts of the Commonwealth would be available.

(5) SPECIFIC RECOMMENDATIONS

A. *Subjects recommended for Specialist Conferences*

(a) The Committee notes that a number of the more important subjects which have been remitted to them involve all the three main branches of agricultural science, namely, those concerned with soils, plants and animals.

It is, moreover, impressed with the need for a greater integration of these three fields of study in relation to the future development of agricultural research throughout the Commonwealth.

With this object in view,

the Committee recommends that the Standing Committee should examine the feasibility of calling, at an early date, a joint conference of specialists, at which the main objective would be to explore the problems concerned with the integration of the three main branches of agricultural science.

The following subjects which take into account the specific recommendations of the Royal Society are typical of those which might be discussed at such a conference:—

- (i) Soil conservation and land utilization.
 - (ii) The maintenance of soil fertility with special reference to the role of soil organic matter.
 - (iii) Soil deficiencies in relation to plant and animal nutrition.
 - (iv) The ecology of plants and animals of agricultural importance including the influence of climatic and soil factors.
 - (v) Grassland and pasture research.
- (b) Subject to the reservation made in para. 4 above,

the Committee recommends the following, among the various topics suggested, as being worthy of consideration by the Standing Committee for inclusion in future Specialist Conferences:—

- (i) The control of vegetation by chemical means.
- (ii) Insecticides and fungicides.
- (iii) Pests in stored products.
- (iv) Methods of collection (including the use of random sample surveys) and statistical analysis of data relating to agriculture.
- (v) Biological control of insects and weeds.

B. Subjects recommended for appropriate action by Governments

(a) The Committee has been greatly impressed by the need for securing more adequate meteorological data as a basis for bioclimatic studies. This subject was therefore remitted to a Sub-Committee whose recommendations are attached to this report.

The Committee recommends their adoption by the Conference.

(b) The Committee has considered the problem of agricultural wastes and surpluses.

It recommends that the Standing Committee should draw the attention of governments to the need for preliminary surveys of the extent of utilization and of wastage of agricultural products in the individual territories of the Commonwealth as a basis for future research.

(c) The Committee recommends

that the attention of governments should be drawn to the importance of preserving native breeds of farm livestock to serve as a source of breeding material and of defining the structural and functional characteristics of such breeds.

(d) The Committee has considered the recommendations of the Royal Society's Conference regarding the need for increased food production and in particular for the increased production of protective foods. The Committee feels that the only appropriate action which the Conference could take would be to draw the attention of governments to these recommendations.

C. Subjects recommended for reference to other Committees or Conferences

(a) The Committee considers that the feasibility of improving the collection and preservation of pancreatic material for insulin production could be more appropriately dealt with by the Food Processing and Medical Sciences Committees of the Conference, but as far as the Committee is concerned it appears to constitute one aspect of the problem referred to in B (b) above.

(b) The Committee notes that the subject of providing improved facilities for the collection of living plant materials and for the maintenance of varietal collections of economic species is already on the Agenda of the I.A.B. Review Conference.

It recommends that the I.A.B. should be asked to take the initiative in this important matter at an early date.

It further recommends that the general subject of recording the geographical distribution of plant pests and diseases should be considered by the I.A.B. Conference.

The Committee further agrees that there is need for extension of taxonomic and other biological research at museums and botanic gardens in the Commonwealth in order to supplement the study of purely economic species.

The Committee therefore recommends that the Standing Committee should look into this subject at a later stage after it has been considered by the I.A.B. Conference with a view to taking action in regard to those fields of the problem appropriate to governments and still not provided for.

(c) The Committee recommends

that the possibility of utilizing aerial survey methods for studying and estimating crop areas and for detecting locust swarms should be brought to the attention of the Committee on Mapping and Exploration by Air, if and when it is set up.

D. Subjects recommended for further study or research

The Committee recommends

that the following should be brought to the notice of the appropriate government and university authorities as subjects suggested by the Royal Society Empire Scientific Conference for further study or research:

Problems of plant physiology (Appendix 1, (a) 6 and 7).

Problems of plant genetics (Appendix 1, (a) 8).

Problems of plant pathology (Appendix 1, (a) 9 and 10).

The physiology of domesticated animals (Appendix 1, (a) 14 and 15).

The Committee recommends that the attention of the authorities concerned with financial aid to universities should be drawn to the special need for increased training facilities and fundamental studies in the last named subject.

Resolutions of Sub-Committee on Climatological Investigations

55. Discussion of agricultural and other biological topics at the Royal Society's and Official Conferences have emphasized the dependence of plant and animal behaviour on climatic factors. Current meteorological facilities do not adequately record the variations of moisture, temperature and light which most closely govern the distribution, nutrition, general ecology and production of plants and animals, human health and efficiency, and various aspects of soil formation, erosion and conservation. The following resolutions have been formulated with the object of assisting to improve this position.

(a) The Conference considers that there should be, at a suitable number of representative centres, meteorological stations equipped to measure the more important factors of moisture, temperature and light affecting biological activity in the settled and potentially valuable regions of the Commonwealth and Empire, and that the recorded data should be published annually in monthly terms, if possible accompanied by graphs based on five day or, alternatively, seven day intervals.

Attention is drawn to the following specific measures, which require in particular to be covered:—

- (i) Daily rainfall, including the rates at which rain is received.
- (ii) Maximum and minimum shade temperatures, preferably for the two distinct periods of day and night.
- (iii) Dry and wet bulb shade temperatures, recorded continuously, if possible, otherwise at the fixed hours of 8 a.m. or 9 a.m. daily.
- (iv) Evaporation from the free water surface of a fully exposed tank, with standardized dimensions, equipment and surroundings. The cylindrical 36" x 36" iron tank with guard ring as employed in Australia is considered suitable.
- (v) Maximum and minimum daily temperatures at 1", 6" and 12" below the surface of a defined soil type, with readings at intermediate depths if deemed desirable.
- (vi) Hours of bright sunshine per day.
- (vii) Total daily radiation on a horizontal surface, and, where possible, the infra-red and ultra-violet radiation separately.
- (viii) Wind miles per day, with continuous readings of wind direction and velocity where necessary.
- (ix) Continuous recordings of barometric pressure.

All instruments need to be suitably standardized and calibrated and, wherever possible, should be self-recording.

(b) The Conference further recommends that biological field research stations in general should be equipped to provide for the specific measures attached to resolution (a), with additional measures where required, and that the studies of the relationships between climatic variations and plant or animal responses should be recognized as functions of the agricultural and other biological research units concerned.

The Committee requests that the above resolutions (a) and (b) be conveyed to the meteorological, agricultural and other appropriate authorities within the Commonwealth and that, in addition, delegates of the Conference refer them to such authorities in their respective territories.

BUILDING RESEARCH

56. In the absence of the Chairman of the Committee, Dr. C. J. Mackenzie presented the report which was adopted by the Conference in the following form:—

Report of Committee

- (1) This Conference is seized of the importance of the expansion of research in the field of housing in all its aspects and of the need for the development of Commonwealth collaboration. It considers that the prime necessities are the building up of research facilities in the various parts of the Commonwealth and the making of direct personal contacts between workers. When some progress has been made along these lines, consideration might usefully be given to the holding of Specialist Conferences and/or the establishment of some *ad hoc* organization for the collection and dissemination of information.
- (2) The Conference considers that the appropriate Dominions and Colonies should be asked to supply, as a matter of immediate and urgent need, data obtained from and/or Codes of Practice founded on successful housing and industrial building projects carried out under tropical or semi-tropical conditions.
- (3) The Conference wishes to record its thanks to the United Kingdom representatives and specialists for their work in connection with the Special Committee on Building Research.

FOOD PRESERVATION.

57. In the absence of the Chairman of the Committee, the report was presented by Mr. H. R. Marston and adopted by the Conference in the following form:—

Report of Committee.

- (1) The Committee on Food Preservation set up by the Conference met on Wednesday, 17th July, 1946, under the Chairmanship of Dr. C. S. Hanes.
- (2) The Committee was impressed by the need for increased attention in various parts of the Commonwealth to research on the storage, transport and processing of food. In certain areas no food research organizations exist, and in such cases the Committee feels that the setting up of appropriate bodies would be of great value in stimulating the integration of the research institutes and other services needed in those areas.
- (3) The Committee believes that a proportion of fundamental work is essential to the health of institutes concerned with food preservation.
- (4) With the increase in the scope, variety, and amount of work likely to be carried out in the future, co-operation within the Commonwealth should be strengthened in this field. Liaison offices can assist in arranging such co-operation, but the Committee would place emphasis on increased facility for the establishment of close personal contacts between research workers by visits abroad.
- (5) The Committee recognizes that a great increase in trained personnel is needed. It feels that the attention of students should be drawn to the opportunities offered in the field of food preservation—for careers in research and industrial posts. It feels, furthermore, that consideration should be given to ways in which the training of scientists for work in this field might be improved.

FUEL RESEARCH

58. In the absence of the Chairman of the Committee, the Chairman of the Conference presented the report which was adopted by the Conference:—

Report of Committee

- (1) The Committee on Fuel Research set up by the Conference met on Wednesday, 17th July, 1946, under the chairmanship of Dr. A. Parker.
- (2) The Committee recommends that a Specialist Conference on Fuel Research should be held.
- (3) It might be convenient to hold such a Conference during or immediately following a meeting of the World Power Conference. This is likely to occur within the next two or three years.

MEDICAL SCIENCES

59. The Chairman of the Committee, Sir Edward Mellanby, presented the report, which was adopted by the Conference in the following form:—

Report of Committee

- (1) The Committee on Medical Sciences set up by resolution of the Conference, met on Thursday, 11th July, 1946, under the Chairmanship of Sir Edward Mellanby.
- (2) The Committee recommends that:—
 - (i) In each Dominion there should be a body sponsored by the Government and charged with the responsibility for the stimulation, support and organization of medical research.

(ii) This body should be composed predominantly of persons experienced in medical and scientific research and should possess an executive head of similar experience.

(iii) It should have funds at its disposal not only to support adequately fundamental and applied medical research within the Dominion and its sphere of influence, but also to maintain effective arrangements for the movement of scientists to and from other parts of the British Commonwealth and for the fullest exchange of information.

(iv) Each Dominion organization acting through its executive head should establish an effective liaison with the others so as to provide machinery for the discussion on the strategy of research on problems of wide mutual interest, for the calling of specialist conferences when required and for the movement of scientists between different parts of the Commonwealth.

(v) Each organization should maintain a part-time representative in London at its scientific liaison office or at the proposed Commonwealth Liaison Office. The representative would normally be a man of some experience engaged in research within the United Kingdom. In his official capacity he should maintain close contact with the Medical Research Council and its committees dealing with problems of medical research in the Commonwealth, and with other Dominion representatives in the United Kingdom.

(3) The Committee endorses the recommendations of the Royal Society's Conference concerning the following subjects:—

(i) The physiological and psychological factors affecting human life under tropical conditions and in industry (Appendix 1, (b) (i), omitting recommendations 6 and 7 which deal with matters discussed at plenary sessions of the Conference).

(ii) The etiology and control of infectious and transmissible diseases (Appendix 1, (b) (ii)).

(iii) The science of nutrition and special problems of the Empire, including the nutritional status of the indigenous peoples of the Colonies (Appendix 1 (c)) amended as follows:—

Preamble. Para. 1.

The Conference recognizes that the improvement of the nutritional status of the peoples of the Commonwealth is a part of general social and economic policy in the territories concerned. It urges the necessity for developing at all levels of Dominion and Colonial government a proper awareness of the nutritional needs of the indigenous peoples.

Special recommendations:—

(2) The introduction into the diet of indigenous peoples of nutritional supplements, such as iodine, calcium, iron, etc., where found necessary.

(3) Improved methods of storing, processing and distributing foodstuffs, such as better methods of milling wheat and maize, the parboiling of rice, the processing of fish, fruit and vegetables. The Conference urges the need for more food technologists in this connection.

(4) The Committee also recommends, in supporting the special recommendations on the etiology and control of infectious and transmissible diseases and the recommendation arising from the evening discussion on hormones, that they be transmitted to the United Nations Organization.

MINERAL RESOURCES AND GEOLOGY

60. The Chairman of the Committee, Professor E. S. Hills, presented the report which was adopted by the Conference in the following form:—

Report of Committee

(1) The Committee on Mineral Resources and Geology, set up by resolution of the Conference, met on Monday, 15th July, 1946, under the Chairmanship of Professor E. S. Hills.

(2) The following resolutions were adopted unanimously, for submission to the full Conference at a review session:—

(a) The Conference approves the general recommendation of the Royal Society's Conference report on its session on Subject (k) (The Need for a Co-ordinated Survey of the Mineral Resources of the Commonwealth) (Appendix 1 (k)) and, in particular, stresses the importance of making an immediate appraisal of the mineral resources of the British Commonwealth.

(b) The Conference strongly supports the special recommendation, 1 (a) to (3) inclusive, of the Royal Society's Conference report on Subject (k) (The Need for a Co-ordinated Survey of the Mineral Resources of the Commonwealth) (Appendix 1 (k)).

It recommends:

(i) That the Commonwealth organization suggested should be located close to existing geological and mineralogical institutions.

(ii) That the existing staff of the Mineral Resources Department of the Imperial Institute should form the nucleus of the suggested organization, together with officers from the Dominions and Colonies. It is considered that the new organization should be autonomous.

(iii) That a detailed discussion of the constitution, organization and affiliation of the suggested body should be referred to the committee of the Conference on the Imperial Institute.

(c) The Conference wishes to make the following additional comments:—

(i) Attention should be given immediately to the implementation of the Royal Society Empire Scientific Conference recommendation (k), 1 (b), regarding the standardization of methods of recording figures of production, trade and resources in mineral and metallurgical products.

(ii) In connection with the Royal Society Empire Scientific Conference recommendation (k), 1 (c), regarding the publication of estimates of mineral resources, it is noted that the question of publication would have to be left to the appropriate authorities.

(iii) In connection with the Royal Society Empire Scientific Conference recommendation (k), 1 (e), regarding specialist institutions for advice and investigation, it is suggested that an appraisal should be carried out of the resources of the Commonwealth in regard to geological surveys, laboratory investigations and facilities for the training of geologists. The results of such a survey would form an essential basis for estimating the optimum strength of the geological surveys of particular countries. The possibility of developing such facilities on a regional basis, e.g., for Southern Africa, should be borne in mind.

(iv) The Conference is concerned at the evidence available in the Royal Society and Official Conference Papers, indicating that in the British Commonwealth existing facilities for specialist investigations, e.g., in geochemistry and geophysics, are inadequate, and it supports the suggestion that new institutes should be formed where necessary, and that existing facilities should be strengthened for the study of minerals, rocks and natural waters.

(d) The Conference approves the special recommendation (2) of the Royal Society's Conference report on Subject (k) (The Need for a Co-ordinated Survey of the Mineral Resources of the Commonwealth) (Appendix 1), regarding the necessity for strengthening geological organizations in all parts of the Commonwealth.

(e) The Conference notes the appendix to the Royal Society's Conference report on Subject (k) (The Need for a Co-ordinated Survey of the Mineral Resources of the Commonwealth) (Appendix 1), regarding the essential

functions of a geological survey. It wishes to point out, however, that in its opinion, the essential functions of a geological survey are:

(i) To acquire fundamental geological knowledge.

(ii) To make available and to interpret to the public the results of such fundamental research.

OCEANOGRAPHY AND FISHERIES

61. In the absence of the Chairman, Dr. H. H. Brown presented the report which was adopted by the Conference in the following form:—

Recommendations of Committee

PREAMBLE

The Committee informs the Conference that it has held four very successful sessions during two days, largely attended by specialists of the Conference itself and others from throughout the United Kingdom. The Committee requests that its deliberations be published as fully as possible, and that the Standing Committee arrange for such publication.

The Committee

(1) Endorses recommendations of the Royal Society Empire Scientific Conference as given in Appendix 1, (c) 3 and 4 (b).

(2) Recommends that the Commonwealth countries should pay particular attention to the need for long-term research in Fisheries and Oceanography, especially in regard to the problems of water circulation and its fluctuations. The Committee also recommends that regional co-operation should be aimed at in the organization of such research.

(3) Recommends that wave recording stations should be established especially in Commonwealth countries bordering on the same ocean, to permit collaborative investigations of sea and swell conditions in view of their importance in studies of meteorology, coastal erosions and problems related to breakwaters, harbours, etc.

(4) Urges on the Governments of the countries bordering on the Indian Ocean the desirability of close co-operation in studying the oceanography of that ocean. It suggests that such co-operation might be greatly facilitated by the establishment of one or more Institutes of Oceanography in suitable locations jointly supported by the Governments concerned.

(5) Recommends that such oceanographic and fisheries research as is not world-wide in its nature should be co-ordinated within the regions specifically concerned, since this would lead to increased efficiency and economy in man-power.

(6) Stresses the necessity for the dissemination of information on oceanography, limnology, fisheries research and technology to the workers in these fields and especially to the isolated research workers in the Colonies and elsewhere. The Committee suggests that possible agencies which might be considered for this purpose are those of the organizations of the United Nations, the Imperial Agricultural Bureaux and the British Commonwealth Scientific Offices. The Committee further requests that the Standing Committee of the British Commonwealth Scientific Conference should examine these suggestions and devise a suitable scheme to care for the isolated scientific worker.

(7) Would welcome the establishment of a Journal for Colonial Fisheries and Oceanography.

(8) Recommends that the Standing Committee should consider the advisability of calling a specialist conference on Oceanography and Fisheries within the next three years.

RADIO AND COSMIC RAY RESEARCH

The Chairman of the Committee, Sir Edward Appleton, presented the report of the Committee and also the report of the Sub-Committee on Cosmic Rays. The reports were adopted in the following form:—

Report of Committee

(1) The Committee on Radio and Cosmic Ray Research, set up by resolution of the Conference, met on the 12th July, 1946, under the Chairmanship of Sir Edward Appleton.

(2) RADIO RESEARCH

(a) *Ionospheric Recording Stations*

From the information supplied by members of the Committee, it was noted with satisfaction that as many as 23 ionospheric recording stations are likely to continue in operation. Concerning further stations, it was decided to recommend

(i) that the Australian authorities should be asked to maintain the Cape York Station;

(ii) that, since New Zealand was unable to accept responsibility for the Suva station after 31st December, 1946, the future use of the equipment should be decided by discussion between the New Zealand and United Kingdom authorities;

(iii) that the possibility of installing ionospheric stations in Graham Land should be explored by the United Kingdom authorities;

(iv) that the possibility of installing an ionospheric station in Nairobi should be explored by the United Kingdom authorities.

It was reported to the Committee that the Indian authorities were contemplating the erection of an ionospheric station at Kodai Kanál on the magnetic equator. The Committee considered that this would be a welcome addition to the present network, in view of the solar and terrestrial studies already being made in that Observatory.

(b) *Ionospheric Recording Equipment*

The Committee decided to recommend

(i) that there should be full exchange of technical information on ionospheric recording equipment;

(ii) that the aim of the designer should be to achieve a completely automatic equipment suitable, for example, for use on Post and Telegraph sites and at Observatories, bearing in mind the increase in critical frequencies which is likely to occur during the approaching period of sunspot maximum.

(c) *Ionospheric Forecasting*

The Committee decided to recommend

(i) that the present plan of forecasting within each Dominion should be adhered to, and that a central forecasting office was undesirable;

(ii) that, in general, interchange of ionospheric data should be by air mail.

(d) *Oblique Incidence Transmissions*

The Committee decided to recommend

(i) that details of the German work on quartz crystal clocks, now available in the United Kingdom, should be circulated to other Dominion ionospheric groups.

(e) *The Future of Ionospheric Research*

It was felt by the Committee that, in about one or two years' time, a better understanding of ionospheric morphology would have been obtained, so that it would be possible to decide whether any of the recording stations had served their purpose on their present sites and might therefore be moved or disbanded. Meanwhile, active discussion of these problems should take place in each Dominion.

The Committee decided to recommend

(i) that, in about one or two years' time, a Commonwealth Conference on ionospheric work should be held, and that, in the meantime, it would be useful if each Dominion set up its own Committee to discuss locations of recorders and to exchange views with other interested organizations. At the same Conference it might be possible to decide on a standard recording equipment.

(f) *Galactic and Solar Radio Noise*

The Committee agreed to recommend

(i) that work on this subject should be encouraged on a Dominion basis and that United Kingdom information now available on this subject should be circulated.

(g) *Measurement of Ground Constants on Radio Frequencies*

The Committee agreed to recommend

(i) that the appropriate military authorities in each Dominion should be invited to collaborate in this work.

(h) *Standard Frequency Transmissions*

The Committee agreed to recommend

(i) that, within the Commonwealth, there should be organized a service of radio transmission on standard frequencies, which, together with those of the U.S.A., would suffice to meet the needs of the Empire. (The National Physical Laboratory in the United Kingdom should act as the co-ordinating body.) (Appendix I, (h):6.)

(i) *Radio Meteorology*

The Committee agreed to recommend

(i) that the papers of the United Kingdom Radio-Meteorological Sub-Committee should be circulated to the Dominions.

(3) COSMIC RAY RESEARCH

The Committee agreed to recommend

(a) that the proposals for cosmic ray research in the resolution of the Royal Society's Conference (Appendix I, p. 67), should be endorsed, and that the priorities of the two topics should be reversed, so that they read:—

(i) Further measurements of the variation of cosmic ray intensity with latitude and longitude by experiments in aircraft over a wide range of height;

(ii) Further measurements of the variation with time of the cosmic ray intensity at selected stations at sea level and on mountains. Measurements in the southern hemisphere are of particular importance.

(b) that a Cosmic Ray Sub-Committee should be formed which should co-ordinate cosmic ray research within the Commonwealth; the membership, in the first instance, being as follows:—

Professor P. M. S. Blackett, F.R.S., University of Manchester, Chairman and Secretary.

Professor H. J. Bhabha, F.R.S., Director, Tata Institute of Fundamental Research, Bombay.

Professor J. S. Foster, F.R.S., Department of Physics, McGill University, Montreal.

Professor F. E. W. Hackett, Department of Physics and Electrical Engineering, National University of Ireland, Dublin.

Professor Sir John Madsen, Professor of Electrical Engineering, University of Sydney, New South Wales.

Dr. E. Marsden, F.R.S., Secretary, D.S.I.R., Wellington, New Zealand.

Dr. B. F. J. Schonland, F.R.S., President, C.S.I.R., of South Africa.

Report of Cosmic Ray Sub-Committee

63. (1) In view of the fact that the study of fundamental physical phenomena in the vast energy range from 10^9 to 10^{10} electron volts can only be made by cosmic rays, the Committee recommends that cosmic ray research should be supported on a greatly increased scale.

(2) The Sub-Committee estimates that the total cost of the apparatus which will be required to carry out the above programme is likely to be about £25,000. The cost to any participating country would lie between £1,500 and £8,000, according to the part played in the programme.

(3) The Sub-Committee considers that about 600 hours flying time (about 150 hours in each of four countries) will be required up till the end of 1947. The Sub-Committee suggests that the flying might be done by the Air Forces of the participating countries or the Air Forces located in those countries.

REGIONAL RESEARCH IN AFRICA

64. The Chairman of the Committee, Dr. B. F. J. Schonland, presented the report which was adopted by the Conference in the following form:—

Report of Committee

(1) The Committee on Regional Research in Africa set up to consider the resolution of the Royal Society's Conference on this subject met on Monday, 15th July, 1946, under the Chairmanship of Dr. B. F. J. Schonland.

(2) The Committee adopted the following resolutions for submission to the Conference:—

(a) The Conference considers that there is a growing need for the development of long-term and highly specialized research on African problems.

(b) To this end, a body is required:—

(i) to keep under review the long-term research needs in various fields and the existing facilities for meeting them;

(ii) to determine what further facilities may be required, and to advise how best they should be organized;

(iii) to keep in touch with the various governmental authorities in order that timely provision may be made for scientific staff and their training, and for finance.

(c) This body should in the first instance be a consultative committee, representative of as many as possible of the Governments or groups of governments having responsibilities in Africa south of the Sahara.

(d) Should the above recommendations be acceptable to the Commonwealth Governments concerned, it is recommended that the first meeting of the Committee be held during the year 1947, and that the Government of the Union of South Africa be requested to consider convening it, and including in the invitations the Foreign Governments concerned.

TYPE CULTURES

65. The Chairman of the Committee, Dr. C. R. Harington, presented the report which was adopted by the Conference.

Report of Committee

(1) The Committee on Type Cultures, set up by resolution of the Conference, met on Saturday, 13th July, 1946, under the Chairmanship of Dr. C. R. Harington.

(2) The following resolutions were adopted unanimously for submission to the full Conference at a review session:—

(a) The Conference, recognizing the importance of microbiology in many branches of pure and applied science, recommends:—

(i) that a Central Commonwealth Organization should be established for the maintenance of collections of type cultures of micro-organisms;

(ii) that the attention of the United Nations Organization should be drawn to the desirability of establishing an international body of similar type to extend co-ordination to the international field;

(iii) that no existing collections of type cultures should be dispersed and that the formation of new collections should be encouraged where there is definite need for them.

(b) The Conference draws the attention of the Standing Committee to the desirability of referring to a specialist conference the question of the extent of the field to be covered by type culture collections and technical matters, such as methods of preservation (a suitable opportunity for such a conference will occur on the occasion of the International Microbiological Congress in Copenhagen in 1947). In the interim period, before a Central Organization is formed, institutes throughout the Commonwealth should be kept closely in touch through the Liaison Offices with developments in the United Kingdom in relation to type cultures.

MOVEMENT OF SCIENTISTS

66. It was recognized that one of the most potent factors in securing Commonwealth collaboration is the inter-play of ideas which can only be brought about by personal contact between scientists. In introducing the subject the Chairman, Sir Shanti Bhatnagar, referred to the discussions at the Royal Society's Conference which:—

(1) recommended an official policy for continuance and development of a system of Commonwealth Liaison Offices as being an essential part of the machinery for facilitating interchange of scientists and activities connected therewith, and directed that the attention of the Official Conference be invited to the matter;

(2) urged the need for the central compilation and publication of a list of scholarship facilities existing within the Commonwealth and proposed that the task be entrusted to whatever organization be employed for centralizing scientific information services;

(3) invited the attention of the Official Conference to the need for the adoption of a uniform superannuation scheme for the Commonwealth to facilitate transfers without prejudice to such rights;

(4) noted with anxiety the serious handicap to interchange caused by the high cost of sea and air transport and invited the Royal Society to initiate action with the appropriate organizations to remedy the position.

67. Discussion took place under the following headings:—

(i) General need for the interchange of scientists.

(ii) Student interchange within the Commonwealth.

(iii) Interchange of scientific staffs within the Commonwealth.

(iv) Movement of scientists to assist territories outside the Commonwealth.

68. During the discussion on pension rights, Professor Watson, as Chairman of the Council of the Federated Superannuation System for Universities (F.S.S.U.), gave a brief description of the system as operated at the present time. Because of the many difficulties in putting such a scheme into universal operation throughout the Commonwealth, a Committee was appointed to explore the question thoroughly and report to the Conference.

Resolutions

69. The following resolutions were passed by the Conference:—

(a) The Conference considers that the interchange of members of scientific staffs, both of research organizations, of Universities, and of government departments, between different parts of the Commonwealth, is of vital importance to the maintenance and development of scientific research.

The Conference accordingly urges government and University authorities throughout the Commonwealth to take active steps to secure the maximum of such interchange.

(b) The Conference supports the recommendation of the Royal Society's Conference urging the need for the central compilation, classification and publication of lists of post-graduate scholarships available for scientific study within the Commonwealth. Such a task would be appropriate to the proposed British Commonwealth Scientific Office in London.

(c) The Conference favours the provision of the largest practicable number of travelling fellowships for post-graduate work. In particular, the Conference advocates the establishment of Research Fellowships by His Majesty's Government and by other authorities in the United Kingdom, tenable by United Kingdom students in the Dominions and in India.

(d) The Conference recommends that the University authorities in the United Kingdom and in other parts of the Commonwealth be asked to explore the possibility of co-operation in regard to the award of post-graduate degrees, so that in approved cases, principles of mutual accrediting may be adopted for part of the requisite period of study.

(It was agreed by the Conference that this resolution should be referred to the Royal Society for action.)

(e) The Conference views with concern the increasing financial difficulties of holders of scholarships and travelling grants due to the rise in living costs. It urges governments to exempt all travelling scholarships and travel grants from income tax, and where necessary to adopt a system of adequate financial provision for travelling and subsistence allowances to avoid undue financial burden to the individual in travelling abroad for the purposes of study.

(f) The Conference favours the observance by research organizations and Universities throughout the Commonwealth of the code of standard conditions submitted to the Conference as set out in Para. 70 at the end of these resolutions.

(g) The Conference invites a committee under the chairmanship of Professor Watson to consider the practicability of providing, where necessary, and co-ordinating superannuation schemes for scientific workers throughout the Commonwealth, so as to facilitate the interchangeability of staff without loss of pension rights. (See para. 71 for recommendations.)

(h) The Conference supports the recommendations of the Royal Society's Conference that staff complements should be raised to a level sufficient to offer individuals adequate time for research, for study, and for travel leave, without, thereby, placing additional burdens on their colleagues.

(i) The Conference considers that the high cost of sea and air transport constitutes a serious deterrent to interchange of scientists, and urges on governments the need for securing special concessions for scientists travelling abroad for study, for attendance at scientific conferences, and for other similar purposes.

(j) The Conference notes the increasing demands from territories outside the Commonwealth for expert scientific advice and for the provision of training facilities in many different fields. It suggests that these requests should pass through the British Commonwealth Scientific Office, London, so that the resources of scientific manpower and of educational establishments in other parts of the Commonwealth as well as the United Kingdom can be used to the best advantage.

70. SUGGESTED STANDARD CONDITIONS FOR TEMPORARY TRANSFER OF SCIENTISTS

(a) *Applicability of Standard Conditions*

The conditions outlined below may apply whether the man temporarily transferred is to perform duties on behalf of his own country or on behalf of the country where he is attached. In the latter case, any financial adjustments should be made between the organizations or governments concerned and should have no effect on the financial relation between the man transferred and the organization sending him abroad.

(b) *Staff Status*

Any man attached to an institution overseas shall retain his full status and seniority as a member of the staff of his own organization.

(c) *Pension Status*

Temporary attachment shall not prejudice the pension rights of any man so attached.

(d) *Salary*

The salary of any man sent overseas shall be paid by the organization to which he normally belongs. This provision is not intended to interfere with any mechanism which is found convenient for making such payments.

Note: The payment of the transferred man's salary by his own organization is suggested for the following reasons:

(i) Maintenance on the payroll automatically protects the rights of the man concerned where annual promotions or salary increases are operative and obviates difficulties arising in certain types of pension or superannuation schemes, particularly those involving employee contributions.

(ii) It facilitates the return of the man to his normal employment because it involves no change in administrative status. It is likely to have a psychological effect on a man by encouraging the feeling that he still belongs to the organization which sent him abroad and for that reason he will be more likely to return.

(iii) It obviates the necessity of adjustments in the salary rate to allow for the different conditions in different parts of the Commonwealth. Necessary adjustments can be taken care of by a special allowance (see below).

(e) *Travelling and Living Expenses*

These shall be paid by the organization sending the man abroad on the scale customarily paid by that organization.

(f) *Oversea Allowances*

Where a man assumes increased responsibility on proceeding abroad or where adjustment in remuneration is desirable because of living conditions, local salary levels or otherwise, additional compensation shall be paid in the form of an oversea allowance which shall terminate automatically on return to normal duties.

(g) *Office and Laboratory Space*

The organization abroad to which any man is attached will normally provide reasonable office and laboratory space without charge.

(h) *Equipment and Materials*

The organization abroad to which any man is attached will normally provide ordinary laboratory equipment, glassware, chemicals, and other materials without charge, but special apparatus or materials will be chargeable to the organization for which the work is performed.

(i) *Stenographic and Laboratory Assistance*

Where stenographic and laboratory assistance can be provided without the necessity of hiring extra staff, the organization to which the man is attached shall normally provide these services without charge. If staff must be specially hired, the cost will be chargeable to the organization for which the work is performed.

(j) *Responsibility to Authority of Organization to which man is attached*

Any man temporarily attached to an organization abroad shall conform to the regulations and conditions in force in that organization and shall in general be subject to the authority of the head of the organization provided that such authority is exercised with due regard to the performance of the duties for which the man was sent abroad.

(k) *Privileges*

Any man attached to an organization abroad shall be accorded the same privileges in the use of libraries, membership of clubs, etc. that are accorded to regular members of the organization.

SUPERANNUATION.

71. In the absence of the Chairman of the Committee, Mr. G. B. Gresford presented the following report which was adopted by the Conference:—

Report of Committee

(1) A meeting of the Committee on Superannuation established by the Conference was held on the afternoon of Friday, 12th July, under the Chairmanship of Professor G. N. Watson.

(2) The following resolution was adopted unanimously for submission to a review session of the full Conference:—

The Conference believes that the health and progress of scientific work and the effectiveness of its application to the solution of problems throughout the Commonwealth, call for the removal of all possible obstacles to the

free movement of scientific workers between different institutions in all parts of the Commonwealth. It notes that one such obstacle in some cases is the loss of accumulated pension rights, which an officer may suffer on a change of employment. It therefore commends to the favourable consideration of Governments and through Governments to Universities and other institutions employing scientists, the modification, if necessary, of existing superannuation schemes or the adoption of new schemes, which will provide that a scientific worker leaving the employment of an institution, is able to preserve or to take with him, either under his personal control or by transfer to his new employing institution for ultimate application for his or his family's benefit, the accumulated value for pension purposes of the service he has given.

The Conference notes that this purpose and other advantages are achieved by the F.S.S.U. scheme now operating for the staffs of Universities in the United Kingdom and for the scientific staffs in the United Kingdom Civil Service, and recommends the adoption throughout the Commonwealth, of a scheme or schemes with superannuation benefits not less favourable than those of F.S.S.U.

ASPECTS OF COLLABORATION IN RESEARCH BETWEEN GOVERNMENT AND INDUSTRY

72. In his introductory remarks, the Chairman, Sir Edward Appleton, compared the organization of scientific work to a triangle, with Government Science, University Science and Industrial Science at the apices and with direct links connecting each with the other two. The Conference had previously considered the link between Government and University, but the present discussion would be concerned with the link between Government and Industry.

The three questions to be kept in mind in considering the several types of collaborative research were:—

- (i) Who decides the programme?
- (ii) Who pays for it?
- (iii) What happens to the results?

73. The main discussion centred round the question of Research Associations.

Except on a small scale, there had been no development of Research Associations in the Dominions, India or the Colonies but in the United Kingdom the movement was a healthy and expanding one, and it was felt that the time had come when similar associations could be of great importance to industries in other countries of the Commonwealth. Once established, the Associations, besides carrying out research for the industry, tended to stimulate research within the individual firms. They also performed a useful function in bringing together on their committees the chief technicians in an industry.

74. The successful work of the Research Associations could be attributed in some measure to their providing opportunities for:—

- (a) Continuity of research carried out in close contact with industrialists.
- (b) The conduct of extensive research programmes beyond the means of the single units of an industry.

- (c) Collaborative investigations with industrial firms in the course of which processes developed on the laboratory scale in Research Associations could be carried to the next stage of development in the industrial environment.

75. Concerning the publication of results, emphasis was laid on the enlightened view now taken by the Research Associations. Practically all results of scientific work were published as papers read before Societies or printed in scientific periodicals. In suitable cases results were patented but mainly with the intention of ensuring the orderly exploitation of inventions for the benefit of the industry and the country generally.

76. Although the majority of United Kingdom Research Associations, were not prepared to admit oversea firms to full membership, they were willing to consider applications for limited membership which would give such members all the non-confidential papers issued by the Research Associations. Some Research Associations do offer full membership to eligible firms in all countries of the Commonwealth, but the trend of development overseas seems to be the setting up of Research Associations within the countries themselves rather than the adoption of membership of United Kingdom Associations, which, particularly with respect to publication, frequently offer only limited privileges.

Resolution

77. The Conference adopted the following resolution:—

The Conference notes with satisfaction the growth of the Research Association movement within the Commonwealth and recommends that no departure be made from the present practice whereby Government Departments, research institutions or firms in Commonwealth countries, wishing to participate in the benefits of membership in a particular Research Association in another Commonwealth country, negotiate on a mutually satisfactory basis for membership with the Association concerned.

INFORMATION SERVICES

78. In opening the meeting the Chairman, Dr. B. F. J. Schönland, quoted Dr. Bard's reference to the value of Information Services in his paper for the Royal Society's Conference as "the life-blood of technical progress in industry". The practical application of new knowledge depended largely upon its proper assembly, publication and flow to those interested.

It was with the flow of information that the meeting was particularly concerned and that involved four agencies:—

- (i) the primary producer—author
- (ii) the secondary producer—publisher, editor, abstractor and writer of reports
- (iii) the middleman—scientific liaison officer and information centre
- (iv) the user or consumer—scientist, technologist and industrialist.

The Chairman of the Conference, in his opening address, had asked the delegates to pay particular attention to the views of the user but the potential users' market had not yet been adequately created and much improvement was necessary in the methods of supplying it. It would therefore be necessary to pay considerable attention also to the middleman.

79. The discussion at the Royal Society's Conference had been largely concerned with the methods of collecting, indexing and distributing scientific information and the following resolution had been passed:—

The Conference invites the Royal Society at an early date to convene a conference of the libraries, societies and institutions responsible for abstracting and information services, in order to examine the possibility of improvement in existing methods of collection, indexing and distribution of scientific literature, and for the extension of existing abstracting services. The Conference would pay particular regard to the cost of such services and to the need for funds from government sources for their support.

In the proposed Conference,

(1) Representatives of the appropriate authorities in the Dominions, India and the Colonies should be included, together with observers from the U.S.A.

(2) The interests of scientists as users of scientific information should be especially considered.

(3) Consideration should be given to the abstracting of Dominion journals locally, for transmission to the main abstracting bodies in the United Kingdom.

80. The main discussion centred on the various methods adopted throughout the Commonwealth for distributing information to the user with special reference to Departments and Councils of Scientific and Industrial Research, the Imperial Institute, the Imperial Agricultural Bureaux, the Food and Agriculture Organization and the various organizations for distributing information collected in Germany. Future policies were indicated and brief suggestions made for the improvement of existing services. One way in which an immediate saving of time and labour could be effected lay in taking steps to avoid duplication of translations.

Resolutions

81. The following resolutions were adopted by the Conference:—

(a) The Conference endorses the general recommendation of the Royal Society's Conference but desires to record its opinion that such a discussion should be regarded as preliminary to a wider Conference, invitations to which should be extended to the U.S.A. as well as to the operating agencies of the United Nations which are concerned with the subject.

(b) The London B.C.S.O. should organize machinery for ensuring that there is within each co-operating country a list of translations of scientific papers in languages other than English, made or contemplated throughout the Commonwealth.

82. The Conference then considered the functions of the Imperial Institute. The Director, Sir Harry Lindsay, in referring to the work of the Institute, mentioned the earlier proposals which had been made for a survey of Empire resources and welcomed the proposed setting up of a committee to discuss the future organization of the Institute. Any recommendations made by the Conference would be brought before the Board of Governors.

83. A committee was accordingly set up to consider proposals for alterations in the organization and functions of the Imperial Institute.

IMPERIAL INSTITUTE

84. The Chairman of the Committee, Mr. G. C. Monture, presented the report which was adopted in the following form:—

Report of Committee

(1) The Committee on the Imperial Institute, set up by the Conference, met on Wednesday, 17th July, 1946, under the chairmanship of Mr. G. C. Monture.

(2) The following resolution was adopted unanimously for submission to the full Conference at a review session:—

The Conference, agreeing that Commonwealth organizations to collect and disseminate scientific and economic information on the natural resources of the Commonwealth are urgently necessary, recommends the adoption, in general, of the suggestions of the Imperial Committee on Economic Consultation and Co-operation, 1933 (Skelton Committee),* pertaining to the re-organization of the Imperial Institute.

The Conference suggests the setting up of two separate organizations for dealing with:—

- (a) mineral resources, and
- (b) plant and animal products.

It recommends further, that the appropriate authorities in the United Kingdom should be approached with a view to calling a conference of representatives of the Commonwealth Governments immediately, to discuss the implementation of these recommendations and the recommendations of the Committee on Mineral Resources and Geology adopted by the Official Conference. In this connection also, it would draw the attention of the authorities involved to Recommendation (1) of the Royal Society's Conference on Subject (1). (The natural products of the Empire and the chemical industries that are or might be based on them), namely, that a standing central committee, including representatives of the United Kingdom, the Dominions, India and the Colonies, should be set up to advise on policy for co-ordination of research, both scientific and economic, into the natural products of the Commonwealth. Such advice on their own particular problems would be made available to all Commonwealth countries with the minimum of delay.

85. EXTRACT FROM REPORT OF IMPERIAL COMMITTEE ON ECONOMIC CONSULTATION AND CO-OPERATION, 1933.

(Skelton Committee)

(iii) THE IMPERIAL INSTITUTE

274. The functions of the Imperial Institute which are at present defined by the United Kingdom Act of 1925, fall into two main groups, viz. (i) intelligence and investigation work and (ii) the Exhibition Galleries.

275. The intelligence and investigation work is divided into two main branches each organized as a separate sub-division of the Institute, viz.:—

- (a) the Mineral Resources Department;
- (b) the Plant and Animal Products Department.

276. Each of these departments, which deal with wholly unrelated subjects, is somewhat analogous in function to an Imperial Bureau, more especially to the older ones such as the Imperial Institute of Entomology which conduct investigations as well as disseminate information. Indeed the Mineral Resources Department was until the last re-organization of the Institute a separate Imperial Bureau and was only incorporated with it to put a stop to the overlapping in this field, which then existed.

* Paragraph 85 of this report.

277. The whole history of the organization of scientific services during the past forty years and also the evidence placed before us indicate the difficulties in modern conditions of maintaining a single institution such as the Imperial Institute charged with the duty of disseminating information and conducting investigations in regard to a wide range of highly diverse products each calling for a high degree of specialized knowledge. Certainly no one would suggest today setting up an "Imperial" institution, responsibility for the administration of which was vested in a government department of a single part of the Commonwealth.

278. The Institute was, indeed, conceived at a time during the last century when conditions were very different from what they are now. Constant adjustments have, therefore, been necessary to meet changing conditions and it is doubtful whether this process of adjustment can continue in the future.

279. We are ungrudging in our tribute to the efficiency and value of the services of the Institute in the past. We have no doubt that this efficiency would be shown in the future also, but, in the altered conditions, we are less certain as to the value of, or need for, the services which result from it. To an increasing degree the oversea parts of the Empire are undertaking their own work in regard to investigation, information, and exhibition services. An illustration of the latter is provided by the development of exhibitions at the offices of the High Commissioners in London where facilities for displays have been provided in such a way as to make it unlikely that the oversea governments would support the Institute in the future as they have in the past.

280. Certain other work performed by the Institute is also being increasingly undertaken by the governments themselves. This means that those governments would find growing difficulty in justifying to their Parliaments continued support to the Institute. At the same time the finances of the Institute which are to-day highly precarious, would, we were informed, be critical by 1937, when the Reserve Fund will be completely exhausted (see Appendix 2, table 2). Providing there is no increase in government or private contributions, the Institute will by that year have to undergo severe re-organization or be closed down.

281. We recognize that owing to the circumstances of its origin and the length of its existence, the Institute has a sentimental value above that which can be measured in terms of concrete services rendered. We feel, however, bound to point out that if on these grounds financial support is to be given, it would be necessary for that support to be on a substantially larger scale than in recent years. Partial support would involve the re-organization of the Institute in such a way as to cut it from its past, thus weakening, if not destroying, the sentimental value that now attaches to it. Such re-organization would not, we feel, be a satisfactory solution. Failing the grant of adequate support, the most satisfactory method would be for the governments concerned to consider how such of the activities as it was desired to retain might be transferred to other agencies.

282. In that event, arrangements could perhaps be made for conducting, on behalf of the Colonial Empire, the services at present rendered by the Plant and Animal Products Department of the Institute. Those Dominions that desired to take advantage of the facilities afforded might do so on an adequate fee basis.

283. The Mineral Resources Department might be reconstituted as an Imperial Mineral Resources Bureau, if the Governments of the Empire should, after thorough consideration, recommend the re-establishment of such a body.

284. The Exhibition Galleries are even less likely to receive Dominion support in the future than the other phases of the Institute's activities.

UTILIZATION OF THE RESULTS OF RESEARCH

86. Most of the items on the agenda of the Conference dealt with measures to achieve increased co-operation in research within the Commonwealth or with the interchange of information and scientists which is basic to effective co-operation. In his introductory statement, the Chairman, Dr. C. J. Mackenzie, emphasized the fact that much of this work is in vain unless definite steps are

taken by the scientists themselves to see that the results of scientific work of potential value to humanity do not lie unused in technical papers and Government archives. The methods by which this purpose can be achieved are receiving close study in the United States where experimental attempts have shown that much can be accomplished.

87. Although ideally, practical results should be eagerly grasped and utilized by those whom they would benefit, experience shows that this is not always done. Research organizations or associated bodies must accept the responsibility for stimulating the utilization of their results.

88. Consideration of the subject was in two sections, referring respectively to patentable and to non-patentable results.

In the discussion on non-patentable discoveries it was stated that steps to meet this need were already being taken in Australia by the appointment in experimental institutions of associate research men whose main responsibility was to act as a link between research workers and those whose business it was to apply the results to daily life.

89. A proposal for establishing a Commonwealth patent had been put before the Conference by the South African delegation but they were aware of the difficulties involved and did not wish to press for more than its consideration. Similar proposals made in the past and the action taken on them were reported to the Conference.

Resolutions

90. The following resolutions were adopted:—

(a) The Conference considers that information on the methods for promoting the utilization of non-patentable scientific and technical results which have been found successful in the countries of the Commonwealth or elsewhere, would be of value to its members. Accordingly, it desires that the Committee should appoint an editor to be attached to B.C.S.O. (London) with appropriate assistance, to collect this information and to prepare a report, for circulation not later than December, 1947. The members further agree to furnish the editor with relevant information in their possession.

(b) The Conference notes with satisfaction the steps taken in various parts of the Commonwealth to ensure the maximum utilization in the national interest of patentable discoveries and urges that heads of delegations should consider the advisability of establishing machinery, appropriate to local conditions, which will fulfil this function more satisfactorily. The Conference further recommends that there should be close co-operation between any organizations established, in order that there may be the greatest possible use of patentable discoveries throughout the Commonwealth and Empire.

(c) The Conference agrees that a practical scheme for a Commonwealth patent would have several substantial advantages for technical development in the Commonwealth and Empire, but it realizes that there are technical difficulties which may well render such a scheme impracticable. The Conference notes that the matter was considered by the British Empire Patent Conference in 1922 and again by the Imperial Economic Conference in 1923, and feels that the time may be ripe for further consideration. It recommends that heads of delegations should discuss the desirability of re-examination of the whole question with their governments.

APPENDICES

1. THE ROYAL SOCIETY EMPIRE SCIENTIFIC CONFERENCE STEERING GROUP REPORTS

Explanatory note

At the Royal Society Empire Scientific Conference, which was held between June 17 and July 8, 1946, discussions took place on the following topics:—

- (a) Outstanding problems in agricultural science.
- (b) Outstanding problems in medical science.
- (c) The science of nutrition and special problems of the Empire.
- (d) Methods of mapping and exploration by air.
- (e) The improvement of scientific information services within the Empire.
- (f) The interchange of scientists.
- (g) Co-operation in the scientific field with existing and projected international organizations.
- (h) Measures to secure greater uniformity in physical standards of measurement and the use of units, terms and symbols.
- (i) The collection and interchange of scientific material.
- (j) The problems of land utilization and conservation.
- (k) Survey of the mineral resources of the Empire.
- (l) The natural products of the Empire and the chemical industries that are or might be based on them.
- (m) Needs of fundamental research.
- (n) The co-ordination of scientific work within the African Continent.

The attached recommendations representing interpretations of the general views of delegates and guests were framed by the steering groups for each of the discussions.

The recommendations fall into two groups, namely, those of a general character affecting science or scientists as a whole, and those affecting particular fields of activity. The distinction between the two groups is not rigid, but is convenient from the administrative standpoint.

Many of the general recommendations were considered at the Official Conference. Others, together with the special recommendations, will be forwarded to the appropriate bodies who would be concerned to consider the steps to be taken to implement them.

At the final session of the Royal Society's Conference it was recommended that the Council of the Royal Society be requested to prepare a considered report on the Proceedings of the Conference. Such a report should include recommendations of measures designed to promote the advance of science in the nations of the Commonwealth, to facilitate co-operation among scientists and the co-ordination of scientific research.

(a) A survey of some outstanding problems in agricultural science in the Empire

Chairman: Sir Frank Engledow, F.R.S.

RECOMMENDATIONS

1. A Conference of soil surveyors and pedologists should be set up to consider the development of soil surveys in general and to co-ordinate methods of soil classification.
2. Work is required on the structures of clays, of humus, and of the clay-humus complex, requiring advance of technique in studying finely divided material.

3. Work is required on the ion-water atmosphere surrounding colloidal bodies, including living organisms, root hair, and on the structure and binding force of the water. This should include a study of reaction in interpenetrating atmospheres.

[2 and 3 together should throw much light on the agricultural problems of soil structures, aggregation and stability to alternations of wetting and drying, anti-erosion properties, availability and fixation of plant nutrients and inhibition of uptake of one plant nutrient in the presence of another (e.g. Ca:K balance).]

4. Further study is required in the subject of soil micro-biology. This should include the relation of soil micro-organisms to soil organic matter, the availability of inorganic plant nutrients and plant pathology as well as such taxonomic work as may be necessary.

5. It is recommended that efforts should be made to evolve both methods and apparatus for studying the nature of the stress-strain relationships in soil in particular relation to cultivations.

6. Special study is required of the developmental and physiological action of the root in relation to its environment. This involves the study of

(a) the water relations.

(b) the mineral relations of the root as well as root secretions and excretions.

7. Physiological development of plants in relation to environment, especially temperature and light (intensity, duration and quality and therefore artificial and natural "shade") should be studied.

8. Investigations are required on the following problems:—

(a) quantitative inheritance

(b) incompatibility and sterility of wide crosses

(c) the induction of polyploids and the possibility of inducing desirable mutations

(d) breeding methods

9. Investigations are needed on the epidemiology of fungal, insect and virus organisms and on pathogenic species in relation to strain specialization.

10. Further investigations should be made into methods of control of fungal, insect and virus attacks, especially the possibility of breeding for disease resistance and the nature of such resistance.

11. Climatic surveys, both regional and local, are accepted as a pre-requisite to the investigation of agricultural problems. There should be provided throughout the Commonwealth and Empire a series of meteorological stations measuring daily rainfall, free water surface evaporation, relative humidity, day and night temperature of the shaded and unshaded atmosphere and the quality and intensity of daylight.

12. Both reconnaissance and detailed soil surveys should be available as a basis for ecological and physiological investigations of the field problems and concerning agriculture.

13. Ecological studies of the natural vegetation should form part of regional surveys designed to afford an integrated pattern of climatic and soil relationships. For this reason, vegetational surveys need, whenever possible, to accompany soil surveys.

14. Animal physiology on a general basis and including all the chief domestic animals should be specifically studied. This is the need basic to research on nearly all kinds of practical livestock problems, including those of pathology. The study (biochemical and microbiological) of ruminant digestion is a good example.

15. There is a dearth of men with ample knowledge of domestic animal physiology. Steps should be taken to encourage their training and their subsequent employment.

16. More knowledge is required of metabolism and enzyme systems of spermatozoa and of ova.

All through the session there was insistence on the manifest dependence of agricultural science on further developments in the basic sciences.

(b) (i) The physiological and psychological factors affecting human life under tropical conditions and in industry

Chairman: Dr. C. H. Best, F.R.S.

GENERAL RECOMMENDATIONS

The Conference surveyed certain of the results obtained during the war in the laboratories of the Medical Research Council at Cambridge and London, and in the Department of Physiology, University of Queensland. It was agreed that much of this work had a general application to many countries of the Empire. It was agreed further that facilities for developing this work, both in laboratories in the "field" and in suitably equipped centres in the United Kingdom and Dominions were desirable.

SPECIAL RECOMMENDATIONS

1. Physiological and psychological research carried out under artificial conditions for war-time purposes needs to be extended to actual conditions in the tropics and to industries in which high temperatures are encountered. This would require the establishment at suitable centres (for example, in Africa and in the Far East) of well-equipped laboratories. These should work in close contact with similar laboratories in the United Kingdom and Australia, in which the more basic research should be carried out.

2. Research on output in industry in the tropics needs to be done as data is practically non-existent. Investigation is required, also into the habitability problems of clothing, housing and transport.

3. Attention is directed to the need for improvement of instruments for the study of climatic factors.

4. An authoritative guide on standards for building (domestic and industrial) in the tropics on the lines of the reports of the Building Research Station of D.S.I.R. is desirable.

5. War-time standards of ventilating practice in the Services need to be reviewed in relation to civilian and industrial conditions in the tropics. A revision of existing scales of warmth and comfort is urgently required.

6. There is a definite need for co-ordination within the Commonwealth. This should take the form of exchange both of workers and of information. It is suggested that a co-ordinating *Empire Committee on Human Climatology* should be set up. This would include workers in physiology, psychology, industrial hygiene, the related aspects of nutrition and also representatives from the allied field of tropical animal physiology.

7. It is strongly recommended that provision be made for a number of research fellowships for *colonial* medical graduates, to enable them to carry out research in climatological laboratories.

8. The participation, by the Commonwealth countries concerned, in a co-operative study of air conditioning and the consequent engineering developments is recommended.

(b) (ii) The etiology and control of infectious and transmissible diseases

Chairman: Professor C. E. Hercus

GENERAL RECOMMENDATIONS

1. The Conference, having regard to the present state of knowledge of the ecology of infectious diseases, feels that there are grave dangers of spread from one part of the Empire to another and within certain Empire countries. Particular attention was drawn to malaria, yellow fever, schistosomiasis, trypanosomiasis, plague, cholera and diseases spread by sand flies.

2. More knowledge of the ecology of infectious diseases, their arthropod vectors, their reservoir hosts and the reasons for the persistence of infection in localized endemic areas is needed. The attention of universities and other authorities should be drawn to the need in many parts of the Empire for ecologists and entomologists, both medical and non-medical.

SPECIAL RECOMMENDATIONS

1. That an international organization should be established under U.N.O. to prevent the spread of diseases from endemic to non-endemic areas. Such an organization would:—

- (a) Control vaccination and inoculation in connexion with diseases to which these or other such precautions may be held to be applicable.
- (b) Ensure the freedom of airplanes, aerodromes, ships and other facilities for travel between different countries, from insects and other media of infection.
- (c) Secure uniformity in regulations regarding certificates required by travellers between different countries.
- (d) Devise such methods of administration as would avoid vexatious and unnecessary impediments to the movement of travellers or goods.

The Conference notes that existing regulations at airports and other transit centres are unsatisfactory owing to a shortage of trained sanitary inspectors and other medical personnel. It would draw attention to the availability of a substantial pool of junior personnel suitable for recruitment into the required sanitary service, among ex-service men and women, particularly in India and the Colonies.

2. For the prevention of the spread of certain diseases from endemic to non-endemic areas within particular countries, the Conference urges that local and permanent organizations are required for containing and controlling the diseases in the endemic areas. Particular reference is made to cholera and plague.

(c) Discussion of the present state of the science of nutrition with particular reference to the special problems of the Empire, including the nutritional status of the indigenous peoples of the Colonies

Chairman: Professor R. A. Peters, F.R.S.

PREAMBLE

The Conference recognizes that the improvement of the nutritional status of the peoples of the Commonwealth is a part of general social and economic policy in the territories concerned. It urges the necessity for developing at all levels of Colonial government a proper awareness of the nutritional needs of the indigenous peoples.

The Conference strongly supports the need for integrating the efforts of producer, consumer, technical and administrative personnel in effecting improvements in nutrition. In this connexion the suggestion put forward at the first session of the Conference of the Food and Agriculture Organization for the achievement of such integration is welcomed.

The Conference agreed upon the evidence of malnutrition in the Empire, both as to quantity and quality, and urges that measures should be applied immediately for the improvement of the present position.

Among such measures the Conference recommends the following:—

SPECIAL RECOMMENDATIONS

1. Immediate therapy of vitamin deficiency diseases, particularly B.1 for beri-beri in Malaya and Hong Kong, iodine in goitrous areas in Nigeria, calcium and vitamin D in areas where rickets occur in the Gold Coast, iron where anaemia is common, especially in British Guiana.

2. The introduction into the diet of indigenous peoples of nutritional supplements, such as iodine, calcium, iron, etc., where found necessary.

3. Improved methods of storing, processing and distributing foodstuffs, such as better methods of milling wheat and maize, the parboiling of rice, the drying of fish, fruit and vegetables. The Conference urges the need for more food technologists in this connexion.

4. Increased production of the "protective foods" through:—

(a) the control of livestock diseases; improved animal husbandry and animal breeding, especially of local strains, with the object both of increasing the productivity of the native pastoralist's herds and of developing dairy types suited for use in native mixed farming areas;

(b) increased and improved fishing operations with the following general objectives:—

(i) fishery exploration and fish catching (fishery engineering);

(ii) fish processing and technology;

(iii) fishery biology and hydrography;

(iv) development of great lake fisheries together with fish culture in fresh and brackish waters.

5. Increased food production generally by:—

(a) the greater use of fertilizers;

(b) the extension of plant breeding. More plant surveys and an increase in the number of trained plant breeders are urgently required for this purpose, particularly in the African Continent.

(d) Modern methods of mapping and exploration by air

Chairman: Dr. E. S. Moore

PREAMBLE

The Conference agreed that the use of radar would much reduce the time required for the making of maps. In view of the importance of completing the topographical mapping of various parts of the Commonwealth for the purpose of economic development, the Conference put forward the following recommendations:—

1. Research and development in radar and photographic equipment and techniques in air survey should be vigorously pursued, if the full scientific and economic advantages of these methods are to be obtained in all parts of the Commonwealth.

2. The appropriate authorities should be approached with a view to increasing the number of persons trained to conduct further research in these subjects.

(e) Scientific Information Services

Chairman: Dr. C. J. Mackenzie

GENERAL RECOMMENDATION

The Conference invites the Royal Society at an early date to convene a conference of the libraries, societies and institutions responsible for publishing, abstracting and information services, in order to examine the possibility of improvement in existing methods of collection, indexing and distribution of scientific literature, and for the extension of existing abstracting services. The Conference would pay particular regard to the cost of such services and to the need for funds from government sources for their support.

In the proposed conference:

1. Representatives of the appropriate authorities in the Dominions, India and the Colonies should be included, together with observers from the U.S.A.
2. The interests of scientists as users of scientific information should be especially considered.
3. Consideration should be given to the abstracting of Dominion journals locally, for transmission to the main abstracting bodies in the United Kingdom.

SPECIAL RECOMMENDATIONS

1. Consideration should be given to the establishment of a network of information services throughout the Dominions. Such a network would provide central focal points and for a two-way transmission of matter (either direct or through existing local centres adapted for the purpose).
2. In view of the need of the scientist for possession of individual scientific papers on his own subject, the possibility of the publication, classification and distribution of papers in separate form or as reprints should be considered.
3. The issue of occasional reviews of special branches of science, both for the specialist and for the general scientific reader, is considered desirable as a supplement to other forms of publication.
4. The extended provision of micro-film and other forms of documentary reproduction is considered important for the rapid transfer of information throughout the Commonwealth. An economic service for the purpose requires centres in the United Kingdom and in each of the Dominions.
5. The conference recognizes that the qualifications of staff in scientific information services and special libraries, call for special training and selection, and recommends the provision of facilities for increasing the number of properly trained staff.

(f) Discussion of methods of improving the interchange of scientists throughout the Empire, including a discussion on the future of the scientific liaison offices that have been established during the war

Chairman: Sir Alfred Egerton, Sec.R.S.

RECOMMENDATIONS

The Conference agrees that interchange of scientific staffs, both of universities and research institutions, is of vital importance to the maintenance and development of scientific research within the Commonwealth and Empire.

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~~Act~~ To promote such interchange the Conference strongly urges upon all the responsible authorities the urgent need for:—

- (i) adequate provision by Universities and research institutions to enable the senior and junior scientific staffs to take periodical leave for oversea visits, both short and long term;
- (ii) the raising of staff complements to a level sufficient to afford individuals adequate time for research and for study or for special leave without thereby placing additional burdens on their colleagues;
- (iii) provision of the largest practicable number of travelling scholarships for post graduate work [see also B. (ii) below];
- (iv) a system of adequate financial provision for travelling and subsistence allowances to avoid loss to the individual due to differences in living costs in different countries; this is to apply both for members of university staffs and for holders of travelling scholarships;
- (v) the provision of resources to enable the invitation of scientists from overseas for short periods to advise or for collaboration in specific research projects;

- (vi) the exemption of all travelling scholarships and allowances from income tax either in the country of origin or of reception.

B.—To the same ends the Conference further recommends:—

- (i) an official policy for continuance and development of a system of Commonwealth Liaison Offices as being an essential part of the machinery for facilitating interchange of scientists and activities connected therewith, and directs that the attention of the Official Conference be invited to the matter;
- (ii) urges the need for the central compilation and publication of a list of scholarship facilities existing within the Commonwealth and proposes that the task be entrusted to whatever organization may be employed for centralizing scientific information services;
- (iii) invites the attention of the Official Conference to the need for the adoption of a uniform superannuation scheme for the Commonwealth to facilitate transfers without prejudice to such rights;
- (iv) notes with anxiety the serious handicap to interchange caused by the high cost of sea and air transport and invites the Royal Society to initiate action with the appropriate organizations to remedy the position.

(g) Discussion of Empire co-operation in the scientific field with existing and projected international organizations

Chairman: Professor A. V. Hill, For. Sec. R.S.

RECOMMENDATIONS

1. The Conference recommends that the delegations should advise their Governments to adhere to each of the International Scientific Unions, to the International Council of Scientific Unions and to other recognized international scientific organizations.
2. The Conference recommends that scientific correspondents be appointed in Colonial territories to establish and maintain direct contact in scientific matters with the operational agencies of the United Nations and with other recognized international bodies.
3. The Conference would heartily welcome a policy on the part of the United Nations and its operating agencies to make the utmost use of all scientific bodies which are doing valuable work of an international scientific character and would stress the importance of preserving the independence of such bodies and of leaving the control of their activities to scientific men.
4. The Conference recommends that each delegation should advise its Government and the established scientific institutions of its country to collaborate closely with any organization of the United Nations concerned with the promotion of science and its applications.

(h) Greater uniformity in standards of measurement

Chairman: Dr. E. Marsden, F.R.S.

RECOMMENDATIONS

1. (a) It is considered highly desirable that early steps should be taken to eliminate the slight difference in the values of the Yard and Pound at present in use in the Commonwealth and in the United States of America.
- (b) It is recommended that discussions should be pursued with the appropriate authorities in the U.S.A. with a view to reaching mutual agreement on this question (as a basis of recommendations to Commonwealth Authorities) and that the Director of the National Physical Laboratory, Teddington, should act in this matter on behalf of National Laboratories in the Commonwealth.

The Conference suggests:—

- (i) that the reformed units should be precisely related to the corresponding metric units;
- (ii) that tentative values for conversion factors should be as follows:—
 - 1 yard = 0.9144 metre, or
 - 1 inch = 25.4 mm. exactly.
 - 1 lb = 0.453 592 37 kg. or
 - 0.453 592 3 kg.
2. The Conference advocated the adoption of the metric system in all fields of science. Examples of subjects in which an improvement in this respect is desirable are aeronautical and pharmaceutical science.
3. If textbooks and scientific data or memoirs are expressed in systems other than the metric, conversion factors or the metric equivalent should be included.
4. The Dominions and India should participate in the organization of the Convention du Metre.
5. There should be meetings at suitable intervals of representatives of the Commonwealth National Laboratories to consider:—
 - (a) the maintenance of uniformity of standards of measurements;
 - (b) general programmes of research in regard to fundamental scientific standards. The National Physical Laboratory in the U.K. should act as the co-ordinating body. The Conference emphasized the importance of mobility of workers between the various laboratories.
6. Within the Commonwealth there should be organized a service of radio transmissions at standard frequencies which, together with those of the U.S.A., would suffice to meet the needs of the Empire.
7. The United Nations Standards Organization be asked to give consideration to the question of nomenclature and symbols at the international level, taking into account, as far as is practicable, both scientific and industrial usages.
8. The Conference recorded its appreciation of the advances which have been made in the international standardization of biological materials and noted with satisfaction that much of this standardization is now brought on to a physical and chemical basis.

(i) Collection of scientific records and material, and risks involved in the distribution of plants, seeds and animals

Chairman: Sir Edward Salisbury, Sec.R.S.

RECOMMENDATIONS

1. That having regard to the limitations of space and scientific man-power we recommend a policy of rationalization in respect to research collections for taxonomy. To this end the avowed scope and objective should be publicly stated by each Institution especially as to the particular groups for which it accepts responsibility of intensive representation.
2. That, when new species are described, replicas should, where possible, be provided for major cosmopolitan collections and for those Institutions where the group concerned is intensively studied. For unique specimens microfilms, casts, etc., should be similarly provided.
3. That increased provision be made for the training of taxonomists and that an increased number of taxonomic posts be created.
4. That better facilities be provided for the collection of living material, for its reception when collected, and its subsequent maintenance.
5. To ensure early action and continuing attention for varietal collections of economic species, for genetic and breeding purposes, one organization in the Commonwealth should be specifically entrusted with the essential central co-ordination.

6. That adequate quarantine measures should be taken respecting new introductions to ensure their supervision before release and that competent diagnosticians be available. Such quarantine measures to be supplemented by a good intelligence service.

7. That information regarding the geographical distribution of pests and diseases should be made readily available.

8. That steps be taken to preserve native breeds of livestock.

9. That increased provision be made for the collection and storage of fossils.

(j) Problems of land utilization and conservation throughout the Empire

Chairman: Sir Theodore Rigg

GENERAL STATEMENT

In view of the gravity of the situation caused by the loss of and damage to the soil in many parts of the Commonwealth, the Conference attaches great importance to the carrying out of the following recommendations, with the help of trained agricultural scientists:—

(a) erosion surveys;

(b) soil surveys;

(c) investigations relating to the maintenance and improvement of soil fertility.

In addition to the above investigations, the Conference urges the importance of surveys to determine the present pattern of and trends in land use, as a basis for the maintenance of soil fertility, bearing in mind the conflict between agricultural and other interests, including mining and industry.

In view of the similarity existing between problems of soil conservation in different parts of the Commonwealth, the Conference would emphasize the importance of a continuous interchange of information and the need for periodic conferences of specialist officers engaged upon problems of soil fertility, erosion and land utilization.

(k) The need for a co-ordinated survey of the mineral resources of the Commonwealth

Chairman: Sir Thomas Holland, F.R.S.

GENERAL RECOMMENDATION

The Conference reviewed carefully the position regarding the mineral resources of the Commonwealth in relation to the serious present and threatened further shortage of many important key minerals and agreed that a much increased Empire effort is required in all aspects of geology, geophysics, mineralogy, process metallurgy and in the compilation of reliable data on which estimates of present and future supplies of minerals may be made.

SPECIAL RECOMMENDATIONS

1. That a Commonwealth Organization be established with headquarters in the United Kingdom to include the following functions, some of which are performed already by the Imperial Institute:—

(a) To act as a clearing house for information, statistical and general, on the scientific and economic aspects of the mineral resources, mineral production and metallurgical industries of the Empire.

(b) To institute, in concord with the various Governments of the Commonwealth, standard methods of recording figures of production, trade and resources in mineral and metallurgical products.

- (c) To promote the exchange of information regarding the estimation of mineral reserves and/or to publish estimates at suitable intervals.
- (d) To provide an information service dealing with publications concerning all branches of geology, mineralogy, palaeontology, geochemistry, applied geophysics, ore-dressing and production metallurgy.
- (e) To refer to suitable specialist institutions for advice or investigation, mineral problems and specimens, for the study of which facilities may not be available at the time in most parts of the United Kingdom, Dominions, or Colonies; and to advise on the extension of existing, or establishment of new, institutions as may from time to time be considered necessary to meet the requirements in these respects of the Commonwealth.

2. That systematic geological survey work being the foundation of all progress in the mineral industries, in future much stronger geological organizations are essential for work in all parts of the Commonwealth.

The Conference reviewed with approval the accompanying summary of the essential functions of a geological survey and agreed that anything short of this programme would generally prove to be an uneconomical investment of public funds.

APPENDIX TO REPORT ON SUBJECT (k)

Essential Functions of a Geological Survey

Official geological surveys should be maintained in sufficient strength to permit of:—

- (a) the development of the general geological map, which will become the guide for all prospecting activities, official and private, as well as for operations regarding water supply and engineering projects.
- (b) the preparation of a geological map by stratigraphical geologists is not possible without the constant reference of questions to specialists in palaeontology, petrology, mineralogy and geophysics.
- (c) for the development of the mineral resources of a country to the best advantage, it is important for a geological survey department to be familiar with the statistics of production, imports and exports. From the figures of such returns the department can advise its government to direct its policy to the encouragement of industries based on raw mineral supplies, for it is obviously uneconomical to export raw minerals which might be smelted or otherwise processed near their sources, and equally uneconomical to import materials and articles which might be manufactured from minerals of domestic origin.
- (d) It is essential to build up at the headquarters of a survey a reference library and a collection of reference specimens. It is equally important to maintain publications in recognized form, through the distribution of which geological officers will get the criticism as well as the appreciation of outside scientific and technical communities.
- (e) The activities of a geological survey department should be purely advisory; but as the full list of specialists and equipment required is generally beyond the capacity of smaller states and Colonies to maintain, it is desirable to federate for such advisory functions, suitable groups geographically and politically related to one another.

(1) The natural products of the Empire and the chemical industries that are or might be based on them

Chairman: Dr. J. L. Simonsen, F.R.S.

PREAMBLE

In view of the varied nature of the natural products of the Commonwealth, their wide geographical dispersal and the diverse and often inadequate facilities

in staff and equipment which may be available locally for their investigation, the Conference makes the following recommendations:

RECOMMENDATIONS

1. That a standing central committee, including representatives of the United Kingdom, the Dominions, India and the Colonies, should be set up to advise upon policy for the co-ordination of research, both scientific and economic, into the natural products of the Commonwealth. Such advice upon their own particular problems would be made available to all Commonwealth countries with the minimum of delay.

2. The Conference, whilst recognizing the desirability of centralizing research upon problems common to many parts of the Commonwealth, supports very strongly the view that research upon problems of more local interest should be co-ordinated within regions. It is anticipated that this would lead to increased efficiency and economy in man-power. The Conference regards advice upon the concentration or regionalization of the research in question as an important function of the central committee.

(m) Post-war needs in fundamental research

Chairman: Sir David Rivett, F.R.S.

PREAMBLE

The Conference wishes to draw the attention of all concerned with the guidance of fundamental scientific research to the Royal Society's "Report on the Needs of Research in Fundamental Science after the War". It would also call attention to the report on Scientific Man-Power recently issued by the Government of the United Kingdom.

The discussion at the Conference, which was of necessity limited in scope, revealed a particular shortage in the Commonwealth of scientists in such fields as taxonomy, genetics and microbiology.

RECOMMENDATIONS

1. The Conference is of the opinion that in each country of the Commonwealth the mechanism for guiding long-term research in fundamental science should be reviewed, in order to foster fertile research work in all important subjects. The systems for advice and financial assistance in this connexion should be studied carefully.

2. The needs of the future will require a great increase in the number of scientists and it is considered important that plans for extending fundamental research in any field should be supported by measures designed to increase the number of trained scientists able to carry out such plans.

3. In order to secure the proper flow of young scientists from educational establishments, it is considered of importance that the educational system of each country should be harnessed so far as may be necessary to this particular long-term need.

(n) Africa as a regional area for fundamental scientific research

Chairman: Dr. B. F. J. Schonland, F.R.S.

RECOMMENDATIONS

1. The Conference considers that there is a growing need for the development of long term fundamental research dealing with African problems on a regional, as distinct from a territorial basis.

2. To meet this need there should be formed at an early date a Commonwealth African Research Committee with the following terms of reference:—

- (a) to examine and put forward proposals for the centralization of fundamental research in African problems on a regional basis.
- (b) to plan such developments ahead so as to ensure the necessary financial support and the training of the specialist staffs needed.
- (c) to advise the governments concerned through the appropriate authorities on matters of regional development and co-operation in fundamental research.

3. The field of the Committee would in the main cover activities South of the Sahara, and foreign states with territories in this portion of Africa should be invited to be represented as observers.

AFTERNOON AND EVENING DISCUSSIONS

Geochemistry

RECOMMENDATION

Delegates attending this discussion endorse the recommendation contained in the Royal Society's Report on the needs of research in fundamental science after the war (p. 52. E. 27)—“that substantial provision should be made for quantitative spectrographic analysis of rocks, minerals and natural waters” and further to recommend that adequate facilities in one or more institutions should be provided for like investigations (both fundamental and applied) on material which might be submitted from centres (including Colonial Geological Surveys and other geological organizations) within the British Empire.

Cosmic Rays

RECOMMENDATIONS

The Conference recommends that the following investigations of Cosmic Radiation would be of great scientific value and are also likely to have important meteorological applications.

1. Further measurements of the variation with time of the cosmic ray intensity at selected stations at sea level and on mountains. Measurements in the southern hemisphere are of particular importance.

2. Further measurements of the variation of cosmic ray intensity with latitude and longitude by experiments in aircraft over a wide range of height.

The Conference recommends that the necessary organization to carry out the work should be set up in the first instance on an Empire basis, but that the question of extending the organization be raised at the next meeting of the International Union of Physics.

3. The Conference recommends that steps be taken to encourage and co-ordinate fundamental research in the field of radio waves, including ionospheric studies from stations on the magnetic equator.

The village pond in the rural economy of India

After a discussion on the above subject a further informal discussion on fishery and oceanographic problems in general was held. Thirty-six scientists concerned with fishery problems were present and the following recommendation was agreed.

RECOMMENDATION

The oceanographic and fisheries scientists present as delegates to the Royal Society Empire Scientific Conference request its Steering Committee to arrange that if possible a meeting be called during the period of the British Commonwealth Scientific Conference of these delegates, and other specialists available in this country, to discuss methods for co-operation and co-ordination of fisheries and oceanographical research within the Commonwealth, and similar matters of common interest.

The above delegates also would appreciate any facilities which could be given for a tour to centres of fisheries research in the United Kingdom following the termination of the Official Conference.

Addendum

8th July 1946.

Action on the above recommendation has already been taken.

Fish culture and malaria control

RECOMMENDATION

In view of the great possibilities of utilizing ponds for fish culture in various countries of the Commonwealth where malaria is prevalent, the Conference proposes that the attention of governments of countries so situated should be drawn to the urgent need of integrating fish culture practice with measures for malaria control.

Hormones

RECOMMENDATION

In view of the steady increase in the demand for insulin, the Conference urges that a strong recommendation be made to all the countries of the Commonwealth that every effort be made to collect, process and preserve all available pancreas. Purified insulin, which can be stored for long periods without loss of potency, will be needed on an increasing scale for the treatment of diabetes.

2. COMPOSITION OF COMMITTEES

Committees were set up by the Conference to consider the following subjects more fully and to report to the Conference:—

- (i) (a) Agricultural Sciences.
 - (b) Climatological Investigations—Sub-committee.
- (ii) British Commonwealth Scientific Offices, London and Washington.
- (iii) Building Research.
- (iv) Food Preservation.
- (v) Fuel Research.
- (vi) Imperial Institute.
- (vii) Medical Sciences.
- (viii) Mineral Resources and Geology.
- (ix) Oceanography and Fisheries.
- (x) (a) Radio and Cosmic Ray Research.
 - (b) Cosmic Ray Research—Sub-committee.
- (xi) Regional Research in Africa.
- (xii) Superannuation.
- (xiii) Type Cultures.

(i) (a) AGRICULTURAL SCIENCES COMMITTEE

Sir John Fryer (Chairman)	Agricultural Research Council (U.K.).
Dr. E. S. Archibald	Canada.
Mr. A. G. Beattie	Nigeria.
Dr. L. B. Bull	Australia.
Sir David Chadwick	Imperial Agricultural Bureaux.
Mr. J. K. Chorley	Southern Rhodesia.
Mr. R. Daubney	Kenya.
Mr. M. B. Davis	Canada.
Mr. J. C. Eyre	Palestine.
Mr. E. H. E. Havelock	Agricultural Research Council (U.K.).
Mr. G. V. B. Herford	Pest Infestation Laboratory, D.S.I.R. (U.K.).
Mr. A. Glendon Hill	East Africa.
Dr. J. C. F. Hopkins	Southern Rhodesia.
Sir Herbert Howard	Imperial Agricultural Bureaux.
Mian Muhammad Afzal Husain ...	India.
Mr. R. Johns	Leeward Islands.
Professor J. N. Mukherji	India.
Mr. H. J. Page	Rubber Research Institute of Malaya.
Sir Theodore Rigg	New Zealand.
Lt.-Col. J. G. Robertson	Imperial Agricultural Bureaux.
Dr. A. R. Saunders	South Africa.
Dr. T. M. Stevenson	Canada.
Dr. H. H. Storey	East Africa.
Sir Harold Tempany	Colonial Office.
Mr. W. R. Thompson	Canada.
Mr. H. L. Trueman	Canada.
Professor H. C. Trumble	Australia.
Dr. P. E. Turner	Trinidad.
Dr. P. S. Hudson } Dr. N. C. Wright }	Representing the Agricultural Re- search Council.

(i) (b) CLIMATOLOGICAL INVESTIGATIONS SUB-COMMITTEE

Professor H. C. Trumble (Chairman and Secretary)	Australia.
Dr. A. R. H. Goldie	Meteorological Office, U.K.
Sir Edward Salisbury	Royal Botanical Gardens, Kew.
Dr. N. C. Wright	Agricultural Research Council (U.K.).

(ii) BRITISH COMMONWEALTH SCIENTIFIC OFFICES, LONDON AND WASHINGTON

Dr. E. Marsden (Chairman)	...	...	...	New Zealand.
Dr. E. S. Archibald	...	...	...	Canada.
Mr. E. Boden	...	...	...	South Africa.
Mr. O. F. Brown	...	...	...	D.S.I.R. (U.K.).
Mr. C. Y. Carstairs	...	...	...	Colonial Office.
Mr. J. K. Chorley	...	...	...	Southern Rhodesia.
Mr. J. E. Cummins	...	...	...	Australia.
Dr. Alexander King	...	...	...	B.C.S.O., Washington.
Dr. J. G. Malloch	...	...	...	Canada.
Professor J. N. Mukherji	...	...	...	India.
Dr. B. F. J. Schonland	...	...	...	South Africa.
Dr. P. J. du Toit	...	...	...	South Africa.
Mr. H. L. Verry (Secretary)	...	...	...	D.S.I.R. (U.K.).

(iii) BUILDING RESEARCH COMMITTEE

Sir Reginald Stradling (Chairman)	...	...	...	Ministry of Works.
Dr. T. Bedford	...	...	...	Medical Research Council (U.K.).
Sir Shanti Bhatnagar	...	...	...	India.
Mr. C. Y. Carstairs	...	...	...	Colonial Office.
Mr. J. E. Cummins	...	...	...	Australia.
Professor F. E. W. Hackett	...	...	...	Ireland—Eire.
Dr. F. Y. Henderson	...	...	...	Forest Products Research Laboratory, D.S.I.R. (U.K.).
Dr. F. M. Lea	...	...	...	Building Research Station, D.S.I.R. (U.K.).
Dr. C. J. Mackenzie	...	...	...	Canada.
Dr. F. Maclagan	...	...	...	Sierra Leone.
Dr. E. Marsden	...	...	...	New Zealand.
Dr. K. N. Mathur	...	...	...	India.
Mr. G. C. Monture	...	...	...	Canada.
Sir Theodore Rigg	...	...	...	New Zealand.
Dr. B. F. J. Schonland	...	...	...	South Africa.
Sir Ewart Smith	...	...	...	M.O.W. Scientific Advisory Com- mittee.
Dr. H. H. Storey	...	...	...	East Africa.
Dr. E. T. S. Walton	...	...	...	Ireland-Eire.
Mr. F. Webster	...	...	...	Ministry of Works.
Dr. J. West	...	...	...	Ministry of Works.
Professor S. Zuckerman	...	...	...	M.O.W. Scientific Advisory Com- mittee.
Mr. J. W. Rice (Secretary)	...	...	...	Building Research Station, D.S.I.R. (U.K.).

(iv) FOOD PRESERVATION COMMITTEE

Dr. C. S. Hanes (Chairman and Secretary)	...	...	...	Food Investigation Organization, D.S.I.R. (U.K.).
Mr. E. Barnard	...	...	...	D.S.I.R. (U.K.).
Mr. R. Daubney	...	...	...	East Africa.
Dr. B. C. Guha	...	...	...	India.
Mr. L. Lord	...	...	...	Colonial Office.
Mr. H. R. Marston	...	...	...	Australia.
Dr. F. Sumbursky	...	...	...	Palestine.
Dr. J. L. Simonsen	...	...	...	Colonial Office.

(v) FUEL RESEARCH COMMITTEE

Dr. A. Parker (Chairman)	Fuel Research Station, D.S.I.R. (U.K.).
Mr. Smith Bracewell	British Guiana.
Mr. J. R. Cochrane	Australia.
Sir Jnan Ghosh	India.
Professor F. E. W. Hackett	Ireland—Eire.
Professor E. J. Hartung	Australia.
Professor E. S. Hills	Australia.
Major W. R. Junner	Gold Coast.
Dr. A. C. Monkhouse	Fuel Research Station, D.S.I.R. (U.K.).
Mr. G. C. Monture	Canada.
Dr. L. T. Nel	South Africa.
Dr. H. H. Storey	East Africa.
Dr. R. B. Randall (Secretary)	Fuel Research Station, D.S.I.R. (U.K.).

(vi) IMPERIAL INSTITUTE COMMITTEE

Mr. G. C. Monture (Chairman)	Canada.
Mr. Smith Bracewell	British Guiana.
Mr. C. Y. Carstairs	Colonial Office.
Mr. J. R. Furlong	Imperial Institute.
Professor E. J. Hartung	Australia.
Professor E. S. Hills	Australia.
Sir Thomas Holland	United Kingdom.
Dr. J. C. F. Hopkins	Southern Rhodesia.
Mr. G. E. Howling	Imperial Institute.
Dr. M. S. Krishnan	India.
Mr. B. Lane	Board of Trade.
Sir Harry Lindsay	Imperial Institute.
Dr. W. F. P. McLintock	Geological Survey and Museum, D.S.I.R. (U.K.).
Dr. L. T. Nel	South Africa.
Dr. J. L. Simonsen	Colonial Office.
Professor F. G. Soper	New Zealand.
Mr. G. B. Gresford } Dr. T. C. Roberts } (Secretaries)	C.S.I.R., Australia. D.S.I.R. (U.K.).

(vii) MEDICAL SCIENCES COMMITTEE

Sir Edward Mellanby (Chairman)	Medical Research Council (U.K.).
Dr. D. M. Blair	Southern Rhodesia.
Dr. F. M. Burnet	Australia.
Professor A. T. Cameron	Canada.
Dr. E. H. Cluver	South Africa.
Professor J. B. Collip	Canada.
Dr. B. C. Guha	India.
Professor F. E. W. Hackett	Ireland—Eire.
Dr. C. R. Harington	Medical Research Council (U.K.).
Professor C. E. Hercus	New Zealand.
Dr. F. Maclagan	Sierra Leone.
Mr. H. R. Marston	Australia.
Professor S. F. Oosthuizen	South Africa.
Dr. Wilson Rae	Colonial Office.
Dr. F. J. C. Herrald (Secretary)	Medical Research Council (U.K.).

(viii) MINERAL RESOURCES AND GEOLOGY COMMITTEE

Professor E. S. Hills (Chairman)	...	Australia.
Mr. Smith Bracewell	... ..	British Guiana.
Mr. L. J. D. Fernando	... ..	Ceylon.
Mr. G. E. Howling	... ..	Imperial Institute.
Major W. R. Junner	... ..	Gold Coast.
Dr. M. S. Krishnan	... ..	India.
Dr. W. F. P. McIntock	... ..	Geological Survey and Museum, D.S.I.R. (U.K.).
Dr. E. Marsden	... ..	New Zealand.
Mr. G. C. Monture	... ..	Canada.
Dr. L. T. Nel	... ..	South Africa.
Dr. D. N. Wadia	... ..	India.
Mr. G. B. Gresford (Secretary)	...	C.S.I.R., Australia.

(ix) OCEANOGRAPHY AND FISHERIES COMMITTEE*

Professor A. T. Cameron (Chairman)	...	Canada.
Dr. G. E. R. Deacon	... ..	Admiralty Research Laboratory, D.S.I.R. (U.K.).
Dr. B. C. Guha	... ..	India.
Professor F. E. W. Hackett	... ..	Ireland—Eire.
Professor E. J. Hartung	... ..	Australia.
Dr. J. E. Keyston	... ..	Admiralty—D.S.R.
Mr. H. R. Marston	... ..	Australia.
Dr. E. Marsden	... ..	New Zealand.
Dr. E. B. Worthington	... ..	Colonial Office.
Dr. H. H. Brown	} (Secretaries)	West Indies.
Dr. S. L. Hora		India.

(x) (a) RADIO AND COSMIC RAY RESEARCH COMMITTEE

Sir Edward Appleton (Chairman)	...	D.S.I.R. (U.K.).
Professor H. J. Bhabha	... ..	India.
Professor P. M. S. Blackett	... ..	Manchester University.
Professor J. S. Foster	... ..	Canada.
Professor F. E. W. Hackett	... ..	Ireland—Eire.
Professor E. J. Hartung	... ..	Australia.
Professor Sir John Madsen	... ..	Australia.
Dr. E. Marsden	... ..	New Zealand.
Dr. B. F. J. Schonland	... ..	South Africa.
Dr. R. L. Smith-Rose	... ..	National Physical Laboratory, D.S.I.R. (U.K.).
Dr. A. F. Wilkins (Secretary)	...	National Physical Laboratory, D.S.I.R. (U.K.).

(b) COSMIC RAY RESEARCH SUB-COMMITTEE

Professor P. M. S. Blackett (Chairman and Secretary)	...	Manchester University.
Professor H. J. Bhabha	... ..	India.
Professor J. S. Foster	... ..	Canada.
Professor F. E. W. Hackett	... ..	Ireland—Eire.
Professor Sir John Madsen	... ..	Australia.
Dr. E. Marsden	... ..	New Zealand.
Dr. B. F. J. Schonland	... ..	South Africa.

* Membership of the original committee. Invitations to attend the committee meetings were sent to a number of other interested people.

(xi) REGIONAL RESEARCH IN AFRICA

Dr. B. F. J. Schonland (Chairman)	South Africa.
Mr. C. Y. Carstairs	Colonial Office.
Sir David Chadwick	Imperial Agricultural Bureaux.
Mr. J. K. Chorley	Southern Rhodesia.
Dr. E. H. Cluver	South Africa.
Mr. R. Daubney	East Africa.
Dr. F. Maclagan	Sierra Leone.
Dr. J. L. Simonsen	Colonial Office.
Dr. H. H. Storey	East Africa.
Dr. P. J. du Toit	South Africa.
Dr. E. B. Worthington	Colonial Office.
Mr. E. Boden (Secretary)	Scientific Liaison Officer for South Africa.

(xii) SUPERANNUATION COMMITTEE

Professor G. N. Watson (Chairman)	F.S.S.U. Council.
Dr. D. M. Blair	Southern Rhodesia.
Mr. O. F. Brown	D.S.I.R. (U.K.).
Mr. J. E. Cummins	Australia.
Mr. G. R. D. Hogg	D.S.I.R. (U.K.).
Mian Muhammad Afzal Husain	India.
Sir Charles Jeffries	Colonial Office.
Mr. C. R. MacDonald	F.S.S.U. Council.
Dr. R. Newton	Canada.
Professor F. G. Soper	New Zealand.
Dr. J. Smeath Thomas	South Africa.
Dr. P. J. du Toit	South Africa.
Mr. G. B. Gresford (Secretary) ...	C.S.I.R., Australia.

(xiii) TYPE CULTURES COMMITTEE

Dr. C. R. Harington (Chairman) ...	Medical Research Council (U.K.).
Dr. C. H. Andrews	Medical Research Council (U.K.).
Dr. E. S. Archibald	Canada.
Dr. L. B. Bull	Australia.
Dr. F. M. Burnet	Australia.
Dr. E. H. Cluver	South Africa.
Professor J. B. Collip	Canada.
Professor C. E. Hercus	New Zealand.
Dr. J. C. F. Hopkins	Southern Rhodesia.
Mian Muhammad Afzal Husain ...	India.
Professor J. N. Mukherji	India.
Dr. J. L. Simonsen	Colonial Office.
Dr. P. J. du Toit	South Africa.
Mr. G. B. Gresford } (Secretaries)	C.S.I.R., Australia.
Dr. F. J. C. Herrald }	Medical Research Council (U.K.).

