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THE PURPOSES OF THE WORLD METEOROLOGICAL ORGANIZATION

"(a) To facilitate world-wide co-operation in the establishment of networks of stations for the making of meteorological observations or other geophysical observations related to meteorology and to promote the establishment and maintenance of meteorological centres charged with the provision of meteorological services;
(b) To promote the establishment and maintenance of systems for the rapid exchange of weather information;
(c) To promote standardization of meteorological observations and to ensure the uniform publication of observations and statistics;
(d) To further the application of meteorology to aviation, shipping, agriculture, and other human activities; and
(e) To encourage research and training in meteorology and to assist in coordinating the international aspects of such research and training."

From the Convention of the World Meteorological Organization, Article 2.

THE CONSTITUENT BODIES OF THE ORGANIZATION

(a) The World Meteorological Congress which meets at least once every four years;
(b) The Executive Committee, which meets at least once annually;
(c) Regional Associations made up of Members of the Organization the networks of which lie in or extend into one of the six meteorological Regions of the world. They meet as often as necessary to ensure compliance with the policies of the Organization.
(d) Technical Commissions composed of experts in the various meteorological fields which meet at least once every four years.

THE SECRETARIAT

The Secretariat of the Organization is located at Campagne Rigot, Avenue de la Paix, Geneva, Switzerland.
As in most other natural sciences, progress in meteorology has depended on our increasing ability to measure various physical quantities. Without accurate instrumental observations it would be quite impossible to operate a modern meteorological service or to investigate such phenomena as the tropopause and the jet stream. The use of meteorological instruments has in fact become so common that we may be inclined to forget the imperfections of some of our present instruments and to place too much reliance on their readings.

These matters were certainly not overlooked at the second session of the WMO Commission for Instruments and Methods of Observation, a report of which appears on p. 146. Many decisions were taken which will lead to further studies on how to improve our instrumental techniques.

Careful maintenance is of course essential for obtaining the best performance of all types of instruments and this applies especially to meteorological instruments, which are exposed to much more severe conditions than most physical instruments. The picture on the cover shows instrument mechanics in a workshop of the Pakistan Meteorological Service.

The purpose of the WMO Bulletin is to provide a summary of the work of the World Meteorological Organization and of developments in international meteorology of interest to Members of the Organization and others concerned with the application of meteorology to human activity.

The WMO Bulletin is published quarterly in two separate editions: English and French. The price is 1 Swiss franc per copy, including postage. Annual subscriptions (4 Swiss francs) and all other correspondence about the Bulletin should be addressed to the Secretary-General, World Meteorological Organization, Campagne Rigot, Avenue de la Paix, Geneva.

Signed contributions do not necessarily represent the views of the Organization.
INTERNATIONAL CO-ORDINATION OF METEOROLOGICAL ACTIVITIES

SECRETARY-GENERAL'S ADDRESS TO THE TWENTY-FOURTH SESSION OF THE UNITED NATIONS ECONOMIC AND SOCIAL COUNCIL

The Economic and Social Council of the United Nations (ECOSOC) holds a session each year in Geneva, at which inter alia the annual reports of the specialized agencies are considered. The executive heads of the specialized agencies are invited to make statements before the Council at this session. The statement of the Secretary-General of WMO to the twenty-second session last year was reported in the October 1956 issue of the WMO Bulletin (Vol. V, No. 4, p. 131).

The need for co-ordination between the specialized agencies and other international bodies is a subject to which much attention is given at each session of ECOSOC; the economic aspects of the activities of the specialized agencies are also of evident interest to the Council.

Thus in his address to the twenty-fourth session in July 1957, the Secretary-General selected, as his main subject, the co-ordination of meteorological activities and made reference also to the economic aspects of meteorology and to the Annual Report. The substance of this address is given below.

In my remarks to the Council a year ago, I made specific reference to a number of activities of the World Meteorological Organization on which collaboration was taking place with the United Nations and other international organizations, the object being to demonstrate to the Council that WMO’s activities as a specialized agency were being co-ordinated as far as possible with those of other international bodies — both governmental and non-governmental. I will again make reference to such activities in my remarks today, since the need for co-ordination is ever-present and is specifically stressed in the resolution adopted at the end of the Council’s debate on this item last year.

I should perhaps first mention that the co-ordination of activities with other international bodies, both governmental and non-governmental, constitutes only one aspect of the work of WMO. The other aspect is the provision of services and assistance in various forms to facilitate the development and the day-to-day operation of national meteorological services, and in order to ensure that a balanced picture of WMO’s activities as a whole is presented to the Council, it may be useful if I take this opportunity of saying a few words about these latter activities, especially as they are of an essentially co-ordinating character. They are also of economic significance on the national level, since a knowledge of its climate and weather is essential to the economic development of every country; so that the assistance given by WMO in this field is of an indirect, though none-the-less real, economic benefit to the countries of the world.

HOW WMO HELPS METEOROLOGICAL SERVICES

It has long been recognized that a national meteorological service cannot operate efficiently in isolation and international collaboration and co-ordination has been accepted as a sine qua non in the field of meteorology since national meteorological services, as we know them, first began to be developed. It was as long ago as the year 1878 that an international organization was first established to
provide the machinery for the necessary co-ordination in this field. This International Meteorological Organization (IMO) has operated continuously and successfully since that date, changing its title and status in 1951 when it became the World Meteorological Organization (WMO) and a specialized agency of the United Nations.

Weather forecasting

Indeed the international character of weather may almost be taken as axiomatic, but it may nevertheless be of value if I demonstrate the need for co-ordination between the countries of the world in this field by a few simple examples.

The basis of all weather forecasting is the weather map on which are plotted weather reports from a network of meteorological stations. Such maps are prepared in most countries every six hours (and sometimes more frequently) and the information on each map must relate to the same hour of observation. Thus standard hours of observation have to be adopted throughout the world and agreement on this important question is obtained through the machinery of WMO. Then again weather maps generally cover large areas, often whole continents or even hemispheres of the globe; thus a rapid exchange of information on an international and inter-continental basis is required and complicated international telecommunication schedules have therefore to be adopted to ensure the swift and co-ordinated interchange of all this information. These schedules are in operation continuously night and day throughout the world and agreement on such matters is likewise obtained through WMO.

It would, however, be impossible to exchange all this meteorological information if plain language were to be used, both on account of the length of the messages and the differences in languages between different countries. Thus figure-codes are used for this purpose by international agreement and these codes are known and understood in all countries of the world. The development of such codes is also a WMO responsibility.

Looking to the future in this same field, the successful experiments on the use of electronic computers for weather prediction now being conducted in one or two countries may well call for radical changes in existing international procedures and in this case the co-ordinating function of WMO will be essential to this important development.

Co-ordinated procedures are also in force throughout the world to ensure that weather information such as storm warnings, hurricane warnings etc. are available to merchant shipping in all sea areas of the globe. Internationally agreed procedures for the collection of the weather reports from ships at sea by appointed land stations are also in force; these are other examples of WMO's co-ordinating activities in this same field.

Standardization of procedures in other fields such as aeronautical meteorology, agricultural meteorology and climatology are still further examples.

Other national activities

To promulgate information about interchange of meteorological reports, about meteorological codes, about shipping broadcasts, etc., WMO issues a number of technical publications with amendments as necessary. These technical publications are used extensively on a routine basis in practically all countries of the world.

Thus WMO and its predecessor IMO have been acting for nearly 80 years
as a co-ordinating machine between national meteorological services and it is, in fact, these activities which alone constituted the raison d'etre of the old IMO for the 73 years of its existence from 1878 to 1951, when WMO came into being.

Activities of this kind involve a constant and perhaps rather unspectacular routine which is recorded year by year in the WMO Annual Report. Such information will in general be of little direct interest to other international organizations and would not therefore figure prominently in a review of co-ordination between international organizations. For reasons already explained, however, I felt that some reference to such activities in my remarks might be useful and of interest. Full details of the latest activities in this field will of course be found in the Annual Report for 1956 now before the Council.

It might perhaps also be added that under the system of operation developed by the old IMO and continued by WMO, the technical strength of the organization rests mainly with the national meteorological services, whose experts serve on the various technical commissions, working groups and other bodies, upon whose activities all major decisions of the Organization are based.

The system is therefore efficient in the sense that the Organization is in effect able to call upon experts in all branches of meteorology from all parts of the world. The system is also economical as this expert advice is given at no cost to the Organization and the development of a large technical Secretariat has not been necessary.

As a corollary to this, it follows that the general increase in the technical activities of the Organization which is recorded in the Annual Report for 1956 is an indication of the continued goodwill and active co-operation of the directors of national meteorological services and the governments they represent. I need hardly say that this is an extremely gratifying and important feature.

HOW WMO HELPS INTERNATIONAL ORGANIZATIONS

I would now like to leave what might be called the internal co-ordinating function of WMO or the co-ordination on the national plane and turn to those aspects of WMO's activities which have a more direct bearing on the work of the United Nations and other international organizations, that is to say, co-ordination on the international plane. In this field of activity the Organization applies the same procedures and methods of operation as are applied in meeting the requirements in the other field which I have just described. That is, technical advice on any problem is sought from experts serving mainly in national meteorological services, generally operating on the system of small working groups or panels of experts.

Hydrology

One important field in which WMO is collaborating with the United Nations and other agencies is that of hydrology and water resources. This is also a field which has engaged the attention of this Council on many occasions and on which the Council has adopted several resolutions. WMO has taken part in the inter-agency meetings on this subject which have been undertaken following decisions of this Council and is actively participating with the United Nations in the inquiry into national hydrological services now in progress. The WMO has also arranged a water resources
regional seminar under the WMO Technical Assistance Programme, which will take place in Yugoslavia later this year. WMO is also participating in the water resource survey to be conducted in certain Latin American countries under the auspices of the Economic Commission for Latin America. In all this work the Organization is guided by the views of a small panel of six world recognized experts operating on the voluntary basis I have already described.

International Geophysical Year

As an example of WMO’s co-ordination with non-governmental organizations we may take the International Geophysical Year. Delegates are no doubt aware that the International Geophysical Year is the name given to a world-wide scientific observational programme, in which most countries of the world are participating. This programme commenced on 1 July 1957 and will continue until 31 December 1958. The expeditions to the Antarctic region and the projected use of earth satellites in connexion with this programme have attracted much public attention.

A large part of the programme of the IGY relates to meteorology and associated subjects and by agreement with the various non-governmental organizations connected with this work, in particular the Special Committee of the International Council of Scientific Unions, WMO has accepted responsibility for the programme in meteorology and related subjects and various brochures and reports on this programme have recently been published by WMO. A special centre has been set up in the Secretariat which will collect all relevant observational records from all parts of the world and will make this important and unique scientific information available expeditiously and economically to all countries of the world. This centre is being operated on a self-financing basis — that is to say, the expenses of running the centre will be met from the sale to governments, universities, research institutes, etc. of the reproduced data and will not therefore be a charge on the WMO budget. This work will constitute one of the major items of WMO scientific activity in the next two years.

I should perhaps stress that the information derived from the programme of the International Geophysical Year will yield substantial beneficial effects to the science of meteorology and to other scientific disciplines. This, in turn, should enable workers in these fields to give increased assistance, by the application of their specialized knowledge, to many of the world’s social and economic problems. While it is thus essentially a scientific programme (and it might be added, the most comprehensive project of its kind that human endeavour has so far envisaged) it will, in due course, no doubt have important practical benefits.

ICAO, UNESCO and FAO

I would not wish to leave this section on WMO’s collaboration with other international organizations without reference to the close and constant collaboration with the International Civil Aviation Organization (ICAO) on many problems relating to aeronautical meteorology and, in particular, the standardization of meteorological procedures for civil aviation. As I believe is generally well known, such procedures have reached a very high degree of development.

I would like also to mention briefly WMO’s collaboration with the United Nations Educational Scientific and Cultural Organization (UNESCO) in
the arid zone research programme and in other fields of common interest and with the Food and Agriculture Organization of the United Nations (FAO) in the joint efforts being made to combat the scourge of the desert locust.

**Technical Assistance**

I would now like to turn to the WMO Technical Assistance Programme. I mentioned in my remarks before the Council last year that WMO has no regular technical assistance programme and for work in this field it relies entirely upon its participation in the United Nations Expanded Programme of Technical Assistance. The situation in this respect is still unaltered and, by virtue of WMO's four-yearly budget system, no regular programme can be envisaged until 1960 at the earliest. The decision on this matter will of course rest with the next Congress which is scheduled for 1959.

I also stressed in my remarks last year the importance which the Organization attaches to its participation in the Expanded Programme and developments in the intervening period have strengthened further this view. WMO's problem now is to operate a programme with funds which are sufficient to meet only a small portion of the known requirements. Thus a fuller knowledge of the weather and climate, which is needed in many ways in economic development, is still denied to many countries. Nevertheless, much useful work is being done under the auspices of the Expanded Programme covering a wide range of meteorological activities.

In this connexion, I would like to mention an example of co-ordination which is both effective and economical. I refer to the arrangement between the Technical Assistance Administration (TAA) and WMO whereby the former accepts responsibility for all administrative and accounting work associated with WMO's participation in the Expanded Programme leaving WMO to confine its attention to the scientific and technical aspects. In this way the necessity of recruiting administrative staff in the WMO Secretariat is obviated and the programme operates successfully with only a small technical staff. The success of such an arrangement is, of course, dependent on close co-operation and understanding between TAA and WMO and I am happy to say that such co-operation and understanding has at all times been fully and readily forthcoming from TAA and it is appropriate that I should record our appreciation of the assistance given by the Director-General of TAA and his staff.

To conclude his statement, the Secretary-General referred to various resolutions made by ECOSOC and the UN General Assembly which contained specific requests to the specialized agencies. He described briefly the steps taken by WMO to comply with these resolutions and was able to show that everything possible was being done to fulfil the wishes expressed by the resolutions.

**MEMBERSHIP OF WMO**

The Government of the People's Republic of Albania deposited on 29 July 1957 an instrument of accession to the World Meteorological Convention with the Department of State at Washington, under the provisions of Article 3 (b) of the Convention. Albania thus became a Member State of WMO on 28 August 1957.

WMO now has 97 Members: 75 States and 22 Territories.
THE opening of the International Geophysical Year on 1 July 1957 was appropriately heralded by a burst of solar activity and a severe magnetic storm which were duly announced to observing stations all over the world by the ALERT warning system. For meteorologists the IGY began a few minutes before midnight on 30 June 1957 when several hundred radiosonde balloons were launched to measure the temperature, pressure and humidity to heights of up to 30 km. For the man in the street special sound and television programmes were broadcast in many countries and popular articles appeared in the daily press. A leaflet outlining WMO's contribution to the IGY was prepared in the WMO Secretariat and has since been widely distributed. In lighter vein, at least one group of meteorologists — those attending the sessions of the Commissions for Aerology and for Instruments and Methods of Observation — toasted the beginning of the IGY at midnight in a café on the Champs Elysées to the accompaniment of special IGY versions of popular songs. There can be no doubt that the IGY has got off to a good start.

ICY Meteorological Data Centre

The first IGY meteorological observations are arriving at the IGY Meteorological Data Centre in the WMO Secretariat and plans for reproducing them on microcards are well advanced. It is now anticipated that the essential IGY meteorological data will require a total of 18,500 microcards and orders for complete sets of these cards are invited. The price quoted is $5,990 per set but as this price is based on certain assumptions about the total number of sets ordered it can only be guaranteed for orders placed before 1 November 1957. It has been estimated that the corresponding price for a set of the same data in printed volumes would be higher by a factor of at least five.

Further details of the WMO microcards are given in IGY Meteorological Data Centre Report No. 7, Microcards of IGY Meteorological Data. Two further reports have been issued recently by the Centre: Report No. 5, Ozone and Radiation Observations and Report No. 6, Revised Instructions for Completing Forms No. 2 and No. 2(b) during the IGY. Reports on auroral observations (No. 10) and atmospheric chemistry (No. 8) and an additional report on radiation observations (No. 9) will probably have been distributed by the time this issue of the Bulletin has been published. Copies of any of these reports may be obtained free on request from the WMO Secretariat.

Auroral observations

An important part of the auroral programme during the International Geophysical Year is the synoptic study on a world-wide scale of the morphology of auroral displays. In 1956 the Special Committee for the International Geophysical Year (CSAGI) requested the help of meteorological services in making the necessary auroral observations, and about 40 countries have since informed the WMO Secretariat that a special watch for aurora will be maintained during the IGY at a selection of their meteorological stations. The total number of these stations amounts to about 900, and in view of this magnificent response the CSAGI reporter for the auroral programme has now requested the
assistance of the IGY Meteorological Data Centre in preparing and distributing standard forms for the auroral observations and instructions for completing the forms.

In compliance with this request, WMO standard forms and instructions for visual auroral observations have now been prepared in collaboration with Mr. Bennet McInnes of the Balfour Stewart Auroral Laboratory, Edinburgh University. Mr. McInnes visited the WMO Secretariat on 30 August 1957 to settle the final details. It should be stressed that these forms are only intended for use at meteorological stations in countries where no national auroral forms have been prepared and that the completed forms should be sent to national auroral reporters—not to the IGY Meteorological Data Centre. These and other details are dealt with in Centre Report No. 10.

Although the visual auroral observations are not part of the meteorological programme of the IGY, meteorological observers at the stations called upon to observe the aurora will no doubt take the same care in this work as they do with their normal meteorological observations. Anybody who has seen a fine display of aurora will already know what an exciting event it is and it is believed that keeping a watch for aurora will prove to be an interesting addition to the usual programme at meteorological stations. All observers can be assured that their observations, even if they have only to report that no aurora is visible, will be an important scientific contribution to the success of the IGY.

Atmospheric chemistry

The IGY meteorological programme includes measurements of the chemical composition, acidity and conductivity of precipitation and of the carbon dioxide content of the air. Following a recommendation from the WMO Working Group on the IGY, the President of WMO decided that these observations should be entered on WMO standard forms, which should then be collected and published by the IGY Meteorological Data Centre. Four standard forms have now been devised and are being distributed with the necessary instructions in Centre Report No. 8.

From information available in the WMO Secretariat, it seems that atmospheric chemistry observations will be made at more than 150 stations during the IGY. The number of such stations may be increased following a recommendation to this effect by the Commission for Aerology (see p. 137).

Radiation observations

As mentioned in the last issue of the Bulletin (p. 96), there are more than 700 IGY radiation stations, that is stations that will be measuring at least one component of the earth’s radiation balance. These stations will be entering their observations on WMO standard forms. The basic form for daily sums of the total radiation of sun and sky, the diffuse sky radiation, the direct solar radiation and the radiation balance of long-wave and short-wave radiation was distributed with IGY Meteorological Data Centre Report No. 5. In view of the great value of radiation measurements for many of the IGY investigations, it has since been decided that five additional radiation forms are necessary and these have now been prepared in collaboration with the Radiation Commission of the International Association for Meteorology. These forms are for hourly sums of the various components of the radiation balance, for monthly totals of these hourly sums, and for instantaneous values of the
intensity of direct solar radiation. These new forms are fully described in Centre Report No. 9.

Return of instruments launched during the IGY

Following a request from CSAGI, the WMO Secretariat asked Members to endeavour to make arrangements for returning to the countries of origin any instruments launched during the IGY which might be found on their territory. Seventy Members have now informed the Secretariat that suitable arrangements have been made and that the instruments will be returned free of customs duty. To facilitate the identification of such instruments WMO has issued a recommendation indicating the layout and contents of a label which should be attached to all instruments which must be returned to the country from which they were launched.

Fourth Antarctic Conference

Most of the 22 IGY meteorological stations planned by the nine countries sending expeditions to Antarctica are now in operation. The whole Antarctic IGY programme was reviewed at the fourth Antarctic Conference, held in Paris from 13 to 15 June 1957, at which WMO was represented by Professor J. Van Mieghem and Mr. V. Sundaram. Various decisions were taken to improve the communications between the stations in Antarctica with special attention to reception of synoptic data at the Weather Central (Little America).

The question of prolonging the IGY Antarctic programme for an additional year was also discussed. On the one hand it was argued that the cost of such an extension would be low compared with the initial costs of setting up the stations and that the scientific value of an additional year's data would be considerable. It was realized, however, that the governments concerned had already made substantial contributions to the IGY and no information was available as to the likelihood of additional funds being granted. As there was some doubt about the competency of the Antarctic Conference to make a final decision on the matter, it was decided to recommend that the International Council of Scientific Unions (ICSU) should appoint a scientific committee to examine the merits of further investigations in the Antarctic and to make proposals to ICSU on the best way to achieve such a programme.

World weather charts

Representatives of the Federal Republic of Germany, the Union of South Africa, the United States of America and of the WMO Secretariat met in Paris on 14 and 15 June 1957 to settle the final details of the IGY world weather charts project; Professor J. Van Mieghem, chairman of the WMO Working Group on the IGY, was also present. The meetings were held at the headquarters of the Météorologie Nationale, at the kind invitation of the director, Mr. André Viat.

The IGY world weather project, as agreed at the meeting, consists of the preparation and publication of a series of synoptic charts for mean sea level and the 500 mb surface for 1200 GMT each day throughout the IGY. The publication will be in three parts:

Part I - Northern hemisphere: 20°N to the North Pole (to be prepared by U.S.A.).

Part II - Tropical zone: 25°N to 25°S (to be prepared by the Federal Republic of Germany).

Part III - Southern hemisphere: 20°S to the South Pole (to be prepared by the Union of South Africa).
There may in addition be a third daily map in Part II containing such elements as 24-hour isallobars, 850 mb streamlines and 24-hour rainfall amounts.

The maps will be prepared from the checked data published on the microcards to be issued by the IGY Meteorological Data Centre. As the first microcards containing ships' observations and observations from isolated surface stations will probably not be available until the latter half of 1958, the maps cannot be started before then. It therefore seems unlikely that the complete series will be published before 1960.

One copy of each volume of the publication will be sent free to all meteorological services and to the main university meteorological departments. A charge will be made for additional copies.

Full agreement was reached about such technical details as the data to be plotted, the methods of plotting and of drawing isopleths, the format, projections and scale to be used and the method of analysis. To avoid any discrepancies in the overlapping sections of the maps, it was recommended that the analysts should meet soon after they have started to prepare the maps and should then decide what subsequent procedure should be followed to ensure full co-ordination.

That it was possible to attain unanimous decisions on the technical aspects of this major project is a good illustration of what might be termed "the IGY spirit", thanks to which countries have shown themselves willing to make considerable sacrifices in order to contribute to the success of the IGY.

O. M. A.

METEOROLOGY — A THREE-DIMENSIONAL SCIENCE
SECOND SESSION OF THE COMMISSION FOR AEROLOGY

In his presidential address at the second session of the Commission for Aerology (CAe), held in Paris from 18 June to 5 July 1957, Professor J. Van Mieghem presented a historical review of the development of aerology which he entitled *Conquest of the third dimension*. Had the address been given at the end instead of at the beginning of the session, some of the decisions taken would have had to be mentioned, for the session itself undoubtedly added a new chapter to the story.

The session was held at the same time as the second session of the Commission for Instruments and Methods of Observation (see p. 146) and items of common interest to the two commissions were discussed by a joint working committee, under the chairmanship of Dr. L. M. Malet (Belgium), before the final decisions were taken separately in plenary. CAe also set up two other working committees, one to deal with questions of a basically theoretical nature (chairman : Dr. R. C. Sutcliffe (United Kingdom), secretary : Dr. M. A. Alaka) and the other to consider the more practical matters (chairman : Mr. J. Fulks (U.S.A.), secretary : Mr. O. M. Ashford). Apart from the opening meetings to deal with the essential formalities, only two plenary meetings proved to be necessary for giving official approval to the proposals of the working committees.
Current research

One of the functions of CAe is to maintain a continuous review of current research in the physics and dynamics of the atmosphere and several of the agenda items can be considered as falling under this heading—numerical forecasting, the jet stream, mountain waves, the modification and control of clouds and hydrometeors and turbulent diffusion in the atmosphere. Each of these questions was the subject of reports by special working groups established at the first session or between the two sessions, and these greatly facilitated the discussions.

Numerical forecasting

A working group under the chairmanship of Dr. A. Eliassen presented a report on the density of upper-air networks required for numerical forecasting. The main conclusions may be summarized as follows:

(a) In extra-tropical latitudes a network of stations 500–600 km apart is adequate for numerical forecasting of isobaric surfaces if both height and wind are observed. For stations observing height only the network should be closer (300–350 km between stations).

(b) There is some indication that the required density of stations increases with latitude but no measure of the required increase is yet available.

(c) A decrease in density may be permissible over the subtropical anticyclones, but there is at present no reliable estimate of the decrease which would be permissible.

In view of the current rapid progress in numerical methods of analysis and forecasting, the commission felt that

Jet stream

The commission had before it a comprehensive report from a working group under the chairmanship of Dr. C. W. Newton giving a descriptive survey of recent literature on the jet stream. Following a recommendation of the commission, this report will shortly be published as a WMO Technical Note.

In 1956 the commission adopted by postal ballot a definition of the term
jet stream for use in aeronautical meteorology (see Bulletin, Vol. V, No. 3, p. 103). As a result of further discussion, it was found possible during the second session to recommend a revised definition suitable for general application. This new definition reads as follows:

A jet stream is a strong narrow current, concentrated along a quasi-horizontal axis in the upper troposphere or in the stratosphere, characterized by strong vertical and lateral wind shears and featuring one or more velocity maxima.

Normally a jet stream is thousands of kilometres in length, hundreds of kilometres in width and some kilometres in depth. The vertical shear of wind is of the order 5-10 m/s per km and the lateral shear of the order 5 m/s per 100 km. An arbitrary lower limit of 30 m/s is assigned to the speed of the wind along the axis of a jet stream.

International Geophysical Year

The meteorological programme of the IGY had of course been largely completed before the session, but there were several matters relating to the IGY which C Ae had been requested to consider. In the first place the commission noted with great interest a statement by the representative of the International Astronomical Union, Dr. J. Rösch, concerning the plans to determine the earth's albedo by photometric measurements of the earthlight on the moon. There will be a world-wide network of 11 or more stations specially equipped for these observations and the results should be of great value to the meteorologist. The commission supported a proposal that the observations should be collected and processed at the Pic du Midi Observatory in France.

Attention was called to several important gaps in the IGY meteorological network and although it was realized that it was too late to set up any new stations for the beginning of the IGY, the commission adopted a recommendation urging Members to take steps to fill in the gaps before the end of the IGY. This recommendation was subsequently approved by the President of WMO on behalf of the Executive Committee and has been distributed to all concerned.

IGY Meteorological Data Centre

Arising from the discussions about the IGY and about another item on aerological publications, several members spoke of the difficulties in obtaining aerological data for research purposes under the present system whereby the whole responsibility for publishing the data is left to individual meteorological services. It was suggested that the simplest and most economical solution would be to have the data collected on standard forms and published by a permanent world meteorological centre, such as that established in the WMO Secretariat for the IGY meteorological data.

The commission therefore recommended to the Executive Committee that the IGY Meteorological Data Centre should be continued after the IGY on a permanent basis, preferably without any break in its programme. It was proposed that the Secretary-General should be directed to study the practical and financial aspects of the question, one of which is that if a permanent centre is established it would no longer be essential for services to publish individually their daily upper-air observations.

Definition of tropopause and of significant levels

Among the data to be published for each upper-air observation are those referring to the tropopause and to other significant levels. Provisional definitions of these terms had been adopted at the first session of C Ae, and it was found desirable to revise them in the light of experience gained
in the meantime. The new definition of tropopause is as follows:

(a) The first tropopause is defined as the lowest level at which the lapse rate decreases to $2^\circ C/km$ or less, provided also the average lapse rate between this level and all higher levels within 2 km does not exceed $2^\circ C/km$.

(b) If above the first tropopause the average lapse rate between any level and all higher levels within 1 km exceeds $3^\circ C/km$, then a second tropopause is defined by the same criterion as under (a). This tropopause may be either within or above the 1 km layer.

On the question of significant levels, the commission considered that they should be selected for publication purposes in such a way that it would be possible to reproduce from them a graph of a given ascent without using the data for the standard isobaric surfaces. As this is a fairly new concept of significant levels, it was felt that it would be better to postpone preparing a final set of rules for selecting significant levels until the IGY data had been studied from the point of view of determining what levels are really significant to the physical meteorologist. Provisional rules were therefore proposed for the selection of significant levels during the IGY and for routine publication purposes until definitive rules can be established.

The recommendations relating to the definition of the tropopause and the selection of significant levels for the IGY have both subsequently been distributed after having been approved by the President of WMO on behalf of the Executive Committee.

**Standard isobaric surfaces**

The increasing interest of the aeronaut in the stratospheric parts of the third dimension is demonstrated by the attitude of CAe to the standard isobaric surfaces for which data should be published. In 1953 the commission recommended that these surfaces should be extended upwards to include the 150 and 100 mb surfaces, but now it has become evident that the increased number of soundings to even greater heights justifies a demand for additional standard surfaces. CAe therefore proposed that data for the 70, 50, 30, 20 and 10 mb surfaces should also be published. The recommendation dealing with this item also suggests some changes in the lower standard isobaric surfaces and makes a distinction between the surfaces for which data should be published and those for which data should be included in the regular meteorological transmissions.

**Atmospheric chemistry and ozone**

Under the leadership of Professor Van Mieghem, CAe has become increasingly aware of the need for WMO to be actively interested in certain branches of meteorology which at present fall outside the range of what might be termed routine synoptic observations. Attention was devoted during the session to several of these matters, including atmospheric chemistry and ozone.

Prior to the session it had been decided that, with the agreement of the International Ozone Commission of the International Association for Meteorology (IAM), the IGY ozone data should be collected and published by the IGY Meteorological Data Centre. CAe felt that this international collaboration in ozone work might be extended and that WMO might accept some of the responsibilities which have hitherto been assumed by the International Ozone Commission. It was recommended that this should be arranged through formal discussions with the International Union of Geodesy and Geophysics (the parent body of IAM). A CAe working group was also set up to prepare recommendations...
concerning the requirements for ozone networks and observing programmes and for the publication and synoptic transmission of ozone data.

The commission recognized the scientific and practical value of microchemical analysis of air samples, and recommended that samples for this purpose should be taken over as extensive an area as possible during the IGY. It was also decided to set up a working group to evaluate the methods which may be used and the networks of observing stations which would be necessary for large-scale investigations of the nature, number, size and distribution of condensation and ice nuclei and of the chemical composition of air and precipitation.

Physical functions and constants

As the commission responsible for the standardization and tabulation of physical functions and constants, CAe passed three recommendations proposing the adoption by WMO of the absolute thermodynamic Kelvin temperature scale, the thermodynamic Celsius temperature scale and the international temperature scale of 1948. One consequence of these recommendations, if adopted by the Executive Committee, will be that the designation degrees centigrade should be replaced in future for meteorological purposes by degrees Celsius, thereby bringing meteorological usage into line with that of physicists.

These recommendations had been brought forward by a working group, under the chairmanship of Professor P. A. Sheppard, charged with the revision of IMO Publication No. 79 (see Bulletin, Vol. 1, No. 3, p. 78). The commission recommended that the revised edition of this publication, incorporating the changes proposed by the working group, should be issued as an introductory chapter of the International Meteorological Tables.

Other questions

A fuller account of the session, giving the decisions made during the session, including the texts of the 14 resolutions and 18 recommendations, of which it has only been possible to refer to a few in this brief report, will be published in the near future.

The commission recognized the great value of the work accomplished by its previous working groups and decided to establish twelve new groups, the terms of reference of which are given in the resolutions.

At the closing meeting, Dr. R. C. Sutcliffe (United Kingdom) and Dr. W. L. Godson (Canada) were elected president and vice-president of CAe. Tribute was paid to the inspiring leadership of the retiring president, Professor J. Van Mieghem; he will continue to be closely associated with CAe as the chairman of a newly established working group charged with the preparation of specifications and guidance material for climatic atlases of the free atmosphere.

In addition to the business meetings, participants were able to exchange views on recent developments in the more informal (but still relentlessly hot) atmosphere of a series of scientific symposia. In spite of the heat wave which prevailed during most of the session, delegates and their wives were also able to enjoy a number of excursions and social functions organized by the Météorologie Nationale, whose director, Mr. André Viaut, had taken great pains to provide every possible facility for ensuring the success of the session. The vote of thanks offered at the close of the session by the president to him and his staff, and to the French Government, was heartily applauded by all present.

O. M. A.
THE HAMBURG COMPARISONS OF LONG-WAVE RADIOMETERS

The study of meteorological radiation processes has developed in steps which show clearly distinguishable characteristics. In the first decades of this century the direct solar radiation was the predominant interest. Later on the climatological and geophysical importance of the diffuse sky radiation was recognized and, though sky radiation has always a smaller actual intensity than direct solar radiation, it was realized that its climatological sum reaches practically the same amount as the vertical component of direct solar radiation. For practical purposes the total radiation of sun and sky is now generally measured on a horizontal surface.

Theorists have always pointed out the importance of the invisible long-wave radiation exchange between the ground and the atmosphere; it could be shown that the day and night average of these radiation fluxes reaches the same dimensions as the total solar radiation. But for a long time it was only possible to measure the nocturnal radiation exchange in the absence of solar radiation, and this only under special conditions.

DEVELOPMENT OF RADIATION INSTRUMENTS

An important development in recent years is that the value of measuring the actual balance of short-wave and long-wave radiation fluxes to and from the earth has led to the construction of different types of instruments. As a generally accepted model of a radiation balance-meter was not available, the desire to obtain a better knowledge of the radiation and heat economy of the earth and the atmosphere led the radiation specialists of many countries to develop their own instruments for this special purpose, so that by 1956 there existed almost 20 different instruments for measuring the radiation balance or the long-wave radiation exchange. The scientific details have been described to some extent, but many of them were only known approximately, and only inexact opinions existed as to their principle, accuracy, reliability and value.

At the Radiation Conference in Rome, 1954, the Radiation Commission of the International Association of Meteorology (IAM) decided therefore to undertake empirical comparisons and theoretical investigations of all such available instruments, and to invite all interested colleagues to participate personally in these comparisons. Thanks to the kind invitation of the Meteorological Service of the Federal Republic of Germany, it was possible to carry out the comparisons at the Observatory of Hamburg-Fuhlsbüttel, the director of which, Professor Dr. R. Schulze, together with his collaborators, provided all the necessary facilities to the participants.

The comparisons took place over two periods (1 to 15 September 1955 and 15 to 30 May 1956), partly with the same and partly with different instruments. The comparisons and the physical discussions on the different instruments were conducted by Professor Schulze, Hamburg, and Dr. Courvoisier, Davos, with the collaboration of the secretary and the president of the Radiation Commission. Sixteen different models were tested and 23 radiation specialists from 10 countries participated in these first comprehensive comparisons of radiation instruments.

The details of the compared instruments and the final results have been
published in two reports in German amounting to 250 mimeographed pages; interested institutes may obtain copies from Professor F. Möller, secretary of the Radiation Commission of IAM.

the practical point of view. Sixteen different instruments for measuring the radiation balance or the effective downward fluxes were examined; some important instruments (such as the


(Meteorologisch-Geophysikalisches Institut der Universität, Mainz, Germany).

A first brief summary was given by Professor Möller himself in the WMO Bulletin (Vol. VI, No. 1, p. 13); he described the general aspects of the problems and the procedure of the comparisons and discussions at Hamburg.

SUMMARY OF RESULTS OF COMPARISONS

In the following paragraphs the final results of the Hamburg comparisons are summarized especially from classical models of Albrecht and Sauberer and some new Russian models) were not available and could not therefore be tested and classified.

Although for measurements of the direct or diffuse solar radiation the receiver surface can be protected against wind effects without difficulty by a glass or quartz cover, this is not possible for long-wave terrestrial or atmospheric radiation, for which glass and quartz are not trans-
parent; for this purpose high molecular chemical compounds are necessary, such as polyethylene (Lupolen-H) or KRS 5. The troublesome effects of air convection can, on the other hand, be eliminated from unprotected surfaces by powerful artificial ventilation or by electrical heating. A great number of different designs result from these various possibilities.

A first classification of the compared instruments is based on the quantity which is to be measured:

I. *Radiation balance-meters* measure the balance of all short-wave and long-wave radiation fluxes directed downwards and upwards; the sign of the components and their balance is positive if they represent a profit for the heat economy of the ground and vice versa;

II. *Infra-red balance-meters* measure the balance of the long-wave radiation fluxes of terrestrial and atmospheric origin;

III. *Effective pyranometers* measure the balance of all short-wave and long-wave radiation fluxes falling on and going out from a black receiver surface directed upwards.

IV. *Infra-red effective pyranometers* measure the balance of the long-wave radiation fluxes falling on and going out from a black receiver surface.

A further classification can be made on the basis of construction as follows:

(A) Instruments for spot readings or records of individual measurements;

(B) Instruments for continuous registration of instantaneous intensities;

(C) Instruments for continuous registration of hourly and daily totals;

(D) Instruments for integrating one or more components or the total amount of the radiation balance.

Finally a very important practical distinction can be made on the basis of availability:

(a) Instruments available commercially;

(b) Instruments possibly available from the scientific institute at which they were developed;

(c) Instruments of which a replica can be made by a good physicist on the basis of a published description;

(d) Instruments whose reproduction cannot be recommended on account of the difficulties involved.

Further distinctions could be drawn according to the accuracy of the instruments as found by the comparisons. No attempt is made to do this in the present article; unsatisfactory instruments are left out completely.

**CLASSIFICATION OF INSTRUMENTS**

According to the distinctions and designations explained above, the instruments compared at Hamburg can be placed in the following categories. It may be noted that in some details this classification does not agree entirely with the published reports; subsequent developments have been taken into account when preparing this present list.

(a) **Instruments available commercially**

Radiation balance-meters:

- Gier and Dunkle (I, C)
- Schulze (I, C)
- Wagner (I, C)

Effective pyranometers:

- Angström (IV, A)
- Georgi (III, A)
- Gier and Dunkle (III, C)
- Schulze (III, C)

(b) **Instruments possibly available from the institutes where they were developed**

- Courvoisier (I and III, A)
- Suomi-Franssila (I, C)
(c) **Instruments suitable for reproduction**

Hofmann (I, C)

Kew Observatory (I, C)

Kreitz (II and III, C)

Sonntag (I and III, A)

(d) **Instruments not suitable for reproduction**

Hinzpeter (IV, C)

Schoen (I, D)

Skeib (I, B)

As the instruments enumerated under (a) and (b) are the only ones which are readily available, some further details about these particular models may be of interest:

(i) The Gier and Dunkle radiation balance-meter is available in two models:

(ii) A net exchange radiometer for recording the radiation balance;

(ii) A total hemispherical radiometer for recording the effective radiation. (*Supplier*: Beckman and Whitley, 985 San Carlos Avenue, San Carlos, California, U.S.A.).

(2) The Schulze radiation balance-meter is covered by a polyethylene (Lupolen-H) hemisphere and records separately the radiation balance of the upper hemisphere and the ground as well as their difference. (*Supplier*: Dr. B. Lange, Hermannstrasse 14, Berlin-Zehlendorf, Germany).

(3) The Wagner radiation balance-meter records the total net radiation by means of the compensation principle. (*Supplier*: Dr. J. Rosenhagen, Ohlsdorfer Strasse 49, Hamburg, Germany).

(4) The Ångström compensation pyrgeometer gives individual measurements of the long-wave radiation exchange by night in calm conditions. (*Supplier*: Swedish Meteorological and Hydrological Institute, Stockholm, Sweden).

(5) The Georgi Universal Radiometer gives instantaneous values of all the different components of the radiation balance by successive measurements. It was developed especially for measurements on expeditions and for microclimatology, but it is not suitable for replacing a recording apparatus at fixed stations. (*Supplier*: Dr. J. Rosenhagen, Ohlsdorfer Strasse 49, Hamburg, Germany).

(6) The Courvoisier radiation balance-meter, developed at the Davos Observatory, Davos-Platz, Switzerland, is especially suitable for instantaneous measurements of the upper and lower components of the radiation balance and of their difference; it is recommended for use as a standard instrument but not for daily routine work.

(7) The Suomi-Franssila radiation balance-meter, developed at the Central Meteorological Institute, Helsinki, Finland, is a recording apparatus for total radiation balance.

**PROBLEMS OF INSTRUMENT DEVELOPMENT**

The measurements of the long-wave radiation exchange and of the short-wave and long-wave radiation balance give rise to many experimental problems. The constructor of such instruments has to deal with the qualities of the absorbing blackening of the receiver surface, with the window material and/or with the artificial ventilation. The observer, on the other hand, is concerned with the standardization and the installation of the instrument and with the question as to what kind of reference surface the radiation balance has to be measured above. All these problems are discussed in detail in the two mimeographed Hamburg reports as well as in the Radiation Handbook on *Radiation Instruments and Measurements*, which will be published by CSAGI as an instruction for radiation investigations during the IGY.
The Hamburg comparisons of long-wave radiometers and radiation balance-meters represent a very satisfactory success of international cooperation in the field of meteorological radiation research; they have led to a thorough knowledge of the problems arising in such investigations and to a better understanding of the various constructions. But these first comparisons represent only a beginning, and the criticism expressed during the gathering may have given rise to some improvement in the original designs. The Radiation Commission of IAM does not therefore yet feel competent to publish formal recommendations on the reliability and the value of the different instruments. For anybody wishing to purchase a radiation instrument of the type dealt with in this article, the commercial availability (a) and possibly (b) will of course be an important consideration. From the list given above it will be possible to select a suitable instrument, depending on whether it is required for instantaneous values or for continuous recording (A, B, C or D) and on whether it is for a fixed station or for an expedition. It should perhaps be stressed that all these instruments must be operated under the direct supervision of a competent physicist.

Anybody wishing further advice is invited to write to the president or the secretary of the Radiation Commission. It is to be hoped, and there cannot be any doubt about it, that the occasion of the International Geophysical Year will increase the interest for the study of long-wave radiation processes in the atmosphere and of the radiation balance of the ground.

W. Mörikeper
Chairman of the Working Group on Radiation Measurement of CIMO and President of the Radiation Commission of IAM

The 24th session of the Air Navigation Commission of the International Civil Aviation Organization had decided to set up a working group known as PIA, to be responsible for examining and developing the concepts put forward in Recommendation 19 of the third Air Navigation Conference, for reporting on the implications of the application of the concepts so developed in the fields of meteorological air traffic and communications services. It was also instructed to indicate the manner in which the developed concepts, if internationally agreed, would affect the present standards and procedures. Mr. A. H. Nagle was designated as WMO representative on this group and will be assisted by a working group of the Commission for Aeronautical Meteorology composed of meteorological experts nominated by Members to participate in the work of PIA. Details of these questions will be found on page 149, under Aeronautical Meteorology.

The Secretariat has prepared a working paper on surface and upper-air synoptic networks, accompanied by charts, for the second ICAO SAM/SAT
Regional Air Navigation meeting, which is to open in São Paulo on 22 October 1957.

ICAO has drawn WMO's attention to the difficulties arising in the field of meteorological service to air navigation from decisions taken during the second session of Regional Association I, concerning the hours of upper-air observations. The question is being studied by the Executive Committee now in session.

INTERNATIONAL CARGO HANDLING CO-ORDINATION ASSOCIATION

The third general technical conference of the International Cargo Handling Co-ordination Association (ICHCA) was held in Hamburg from 1 to 4 July 1957. This association, which was founded in 1951 for the purpose of discussing, and finding remedies for, the problems of cargo handling and the faster turn round of ships in ports, now has about 700 members in 56 countries. WMO was represented at the conference by Mr. Helge Thomsen, president of the Commission for Maritime Meteorology (CMM).

The conference consisted of a series of symposia during one of which several speakers stressed, with respect to the handling of fruit, the importance of the correct climate of the hold, of the rôle played by weather during the process of loading and unloading, and of the need for a knowledge of weather conditions during the growth, harvest and transportation of fruit. Mr. Thomsen drew attention to the work carried out by the CMM on the problem of cargo ventilation, and distributed a report referring to the findings of the working group set up by the first session of the Commission for Maritime Meteorology to study the application of meteorology to the carriage of goods at sea.

INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE

The third International Congress on Irrigation and Drainage met at San Francisco, California, from 1 to 4 May 1957. It was preceded by a two-day inter-society Conference on Irrigation and Drainage, and was followed by demonstrations of irrigation methods at the University of California Davis campus, and by two week tours to places in California of irrigation and hydrologic interest. Over 450 representatives from 42 countries attended the conference. WMO was represented by Mr. J. van de Erve, Western Area Hydrologic engineer of the U.S. Weather Bureau.

The principal business of the congress was the discussion of technical papers; in the interest of saving time, the papers themselves were not presented at the meetings but they were all available in printed form. The principal subjects were: canal lining, soil-water relationship in irrigation, hydraulic structures on irrigation and drainage systems, and interrelation between irrigation and drainage.

The congress was held to stimulate and promote the development and application of the science and techniques of irrigation and drainage in the engineering, economic and social aspects. This was the first time that the WMO had been represented at a congress of the International Commission on Irrigation and Drainage. In his remarks during a technical session on soil-water relationship in irrigation, Mr. van de Erve referred to the active interest and projects of WMO relating, among other matters of common interest, to the standardization of the observation and measurement of all forms of precipitation and to the development of methods and instruments for measuring evap-
oration, evapotranspiration, soil moisture and temperature. He also drew attention to the WMO Panel on Water Resource Development, which would be prepared to collaborate with the commission in any study relevant to the terms of reference of both organizations.

That the WMO had a definite interest and part in the work of this congress was demonstrated by the repeated references to heavy losses of water by evaporation, and the great benefits that would result from reduction of evaporative losses. It was pointed out that more efficient use of land and water is a pressing problem. As much as 60 per cent of the water may be lost en route to the land. Losses through seepage may show up as recharge of ground water, but evaporation is a total loss. Chemical methods of reducing evaporation were discussed by several speakers.

A revision to the constitution of the International Commission on Irrigation and Drainage was adopted whereby flood control and river training were added to the purposes and objects of the commission. While not covered on the floor of the congress, flood forecasting with its precipitation forecasting, observing and reporting, is an integral part of flood control.

The fourth International Congress of the Commission will be held in Madrid, Spain, in 1960.

INTERNATIONAL RADIO MARITIME COMMITTEE

The 21st technical meeting of the International Radio Maritime Committee (CIRM) was held in Oslo on 20 and 21 June 1957. WMO was represented by Mr. Helge Thomsen, president of the Commission for Maritime Meteorology (CMM).

A number of programmes of a specific radio-technical nature were formulated and referred to study parties with members drawn from the radio companies represented at the meeting. These questions had little or no direct bearing on meteorology. The agenda also contained an item requiring consideration of a number of recommendations adopted by the Commission for Maritime Meteorology at its second session which gave rise to discussion of the possibility that the collection of the additional information required might lead to overloading of the radio facilities of the various ships concerned. It was felt however by the meeting that the passing of the messages would serve such an important purpose that every endeavour should be made to support the work which was, directly or indirectly, of benefit to the ship owners.

Recommendation 22 (CMM-II) (The possibility of issuing weather bulletins for shipping in code) was of interest to CIRM since there had been cases where the committee had been asked to take up this matter with administrations transmitting in languages other than English. After discussion on Recommendation 24 (CMM-II) (Representation of WMO at the next ordinary administrative radio conference of the ITU) it was felt that re-wording of the last paragraph of the recommendation would obviate any possible misinterpretation of its meaning. This amendment has been introduced in the abridged final report of CMM-II by a corrigendum.

The meeting agreed that, since the aims of WMO in relation to maritime radio matters coincide with the aims of CIRM in this field, close contact should be made before and during the administrative conference with the object of rendering each organization as much assistance as possible.
THE SECOND SESSION OF THE COMMISSION FOR INSTRUMENTS
AND METHODS OF OBSERVATION

Whether simultaneous meetings on subjects like aerology and instruments are in some way related to uncomfortably hot spells of weather remains still to be investigated, but the fact is that delegates attending the second session of the Commission for Instruments and Methods of Observation (CMO), held in Paris from 18 June to 6 July 1957, were reminded of the weather during the first session in Toronto in 1953. The high temperatures did not, however, seem to affect adversely the attendance at the session, at which 36 Members were represented by delegates, and 2 Members, 4 non-Members and several international organizations by observers.

In the ornate setting of the Palais d'Orsay, Mr. A. Viaut, as President of WMO and as representative of the French Government, addressed a formal welcome to the participants, at the first plenary meeting which was held jointly with the Commission for Aerology. On behalf of WMO, the Secretary-General, Mr. D. A. Davies, expressed his appreciation to the French Government for its hospitality.

It is probably rare in the history of international meetings for the opening speeches to be illustrated by slides, but it was a real pleasure for everybody present to listen to the president of Caé, Professor J. Van Mieghem, giving an illustrated talk on the Conquest of the third dimension, followed by the president of CIMO, Mr. A. Perlat, describing by means of slides the possibilities for observing clouds by aerial photographs taken regularly from aircraft flying at a height of 10 km and from free balloons reaching 30 km.

Consideration of the 34 technical items of the agenda was divided between three working committees whose chairmen were Mr. W. A. Grinsted, Mr. A. Hauer and Dr. L. M. Malet, respectively. The third of these committees was established as a joint committee of the two commissions to deal with all questions related to aeronautical measurements.

These committees were assisted by Dr. K. Langlo, chief of the Technical Division, and Miss U. M. Banister of the WMO Secretariat, who were also responsible for the minutes of the seven plenary meetings.

The commission passed in all 12 resolutions and 18 recommendations and made a number of other decisions which were noted in the minutes for subsequent inclusion in the report of the session.

Standardization of meteorological observations

The meeting agreed that there was little prospect of obtaining general agreement on the most desirable characteristics of instrumental performance and methods of observation, but felt that it was highly desirable to lay down minimum acceptable standards of accuracy for observations, which should be included in the WMO Technical Regulations.

The commission took a more active approach to these questions than at the first session at Toronto. Rather
than wait unduly for the requirements of accuracy to be laid down by the users, it was considered preferable to prepare proposals for such minimum acceptable standards of accuracy for observations. These proposals were included in a recommendation containing proposed amendments to the WMO Technical Regulations.

Hydrometeorological measurements

There seems to be a general trend in meteorological circles towards a greater interest in hydrometeorological measurements. The commission therefore expressed a clear desire that WMO should do more to provide guidance and information on such measurements with particular reference to methods of measuring snow cover and the water content of snow. In conclusion it was agreed that it would be useful to have a chapter on instruments and methods of observation at present used in hydro meteorology included in the CIMO Guide to international meteorological instrument and observing practice. A working group under the chairmanship of Mr. L. O. Raab (Sweden) was established to carry out this task.

Interim international reference precipitation gauge

One of the more important decisions of the commission was probably the recommendation that WMO should adopt the Snowdon gauge with an Alter shield as the interim reference precipitation gauge. This question had been studied by a working group whose proposals were strongly supported by the commission and were adopted with minor amendments.

It was recommended that one of these gauges should be installed at one or more of the main precipitation observatories in each country with a view to determining reduction factors to bring the national precipitation records to a uniform international standard.

In reply to a request from the Executive Committee Panel on Atomic Energy, the commission further recommended that this reference gauge, made of more suitable material and provided if necessary with a deeper container, might be appropriate for adoption as an international standard sampling gauge for monthly measurements of radioactivity of precipitation.
Radiation and upper-air measurements

Considerable attention was devoted to problems connected with radiation and upper-air measurements and a number of recommendations were adopted on these subjects.

The fruitful work of the radiation centres existing in many countries and of the Working Group for Radiation established by Regional Association I (Africa) was noted with satisfaction. Members without a radiation centre were recommended to consider the creation or designation of a centre of this kind to provide all necessary facilities for ensuring the comparability of the radiation measurements in the country. It was further recommended that Members should arrange for recalibration of their national sub-standard pyrheliometers with one of the primary sub-standards.

With regard to upper-air measurements, the results of the world comparison of radiosondes at Payerne, Switzerland, in 1956 and of other radiosonde comparisons were discussed at great length. The commission prepared two tables containing in a condensed form the results of the Payerne comparison and recommended that use might be made of these tables on a trial basis by the synoptic meteorologists, in order to determine whether they contribute to the achievement of uniformity in aerological work throughout the world.

Working groups

In his presidential report Mr. Perlat paid tribute to the chairmen and members of working groups for the considerable and efficient work they had accomplished between the first and second sessions of the commission. He also pointed out that the majority of the members of these groups were not members of the commission and that each of these groups was effectively a panel of specialists on a specific meteorological question.

The commission decided to establish eleven working groups covering the following fields: instruments for hydrometeorological purposes, use of radar in meteorology, automatic weather stations, international comparison of precipitation gauges, snow measurements, instruments and methods of observation on aerodromes, hygrometry, evaporation measurements, radiation measurements, comparison of aerological instruments and measurement of atmospheric electricity.

Other questions

In the course of the session seventeen lectures with subsequent discussions were arranged on the following main subjects: instrument development, use of radar in meteorology and measurement of radiation.

These lectures were a considerable asset to the session. They contributed greatly towards a better understanding of the problems and gave an interesting view of the present activities in the development of instruments and of observational methods in various parts of the world.

A number of firms had accepted an invitation to exhibit some of their meteorological instruments and equipment. Their display gave a valuable picture of the modern tools now available for research and routine work in meteorology.

At the end of the session Mr. A. Perlat, ingénieur en chef (France) and
Dr. L. M. Malet (Belgium), were re-elected president and vice-president of the commission.

Votes of thanks were passed to all those responsible for the success of the session, particular mention being made of the generous hospitality offered by the host country and by the French Meteorological Service.

K. L.

AERODYNAMICS OF THE TECHNICAL COMMISSIONS

AEROLOGY

INSTRUMENTS AND METHODS
OF OBSERVATION

Accounts are given elsewhere in this issue of the Bulletin of the second sessions of the Commission for Aerology (p. 134) and of the Commission for Instruments and Methods of Observation (p. 146) held recently in Paris.

Abridged final reports of these two sessions are being prepared in the Secretariat, and the necessary formalities for the establishment of the new working groups are being carried out.

Decisions of the two commissions embodied in resolutions and recommendations of the sessions are being considered by the Executive Committee during its ninth session (Geneva, 24 September to 15 October 1957).

AERONAUTICAL METEOROLOGY

Certain draft amendments to chapter 12 of the WMO Technical Regulations, which have been prepared jointly by WMO and the International Civil Aviation Organization (ICAO), have been submitted to members of the Commission for Aeronautical Meteorology for their approval. These proposed amendments relate to the introduction of the term "SIGMET information" for data on swell and state of sea in observations for forced landings at sea, and to the downgrading or cancellation of meteorological messages carried over Aeronautical Fixed Telecommunication Network (AFTN) channels. The voting indicates a majority in favour of these drafts, which will therefore be submitted, as a recommendation of CAeM, to the Executive Committee at its ninth session.

A second ballot in progress concerns the adoption of a draft resolution proposing the establishment of a working group on operational control, which will advise the WMO representative on the PIA panel (a panel for co-ordinating procedures respecting the supply of information for air operations). This panel is a body established by the ICAO for the purpose of examining and developing the concepts presented in Recommendation 19 of the third Air Navigation Conference.

Aeronautical climatological summaries

The first annual Consolidated statement on preparation of aeronautical climatological summaries by WMO Members — July 1957 has been distributed to all concerned. This statement, issued in compliance with the provisions of paragraph 1.6 of part 4 of chapter 12 of the WMO Technical Regulations, has been prepared on the
basis of information supplied by Members. It is presented in the form of tables showing the name of the country and of the station or aerodrome, the type of summary, the month and time for which summaries are available, the period of record and the total number of observations on which the summaries are based. The statement contains information relating to 230 stations in 32 countries and territories. Mimeographed copies may be obtained free of charge from the WMO Secretariat.

BIBLIOGRAPHY AND PUBLICATIONS

At the invitation of the French Government the Commission for Bibliography and Publications will hold its second session in Paris, beginning on 5 November 1957. The session is expected to last two to three weeks.

A provisional agenda and explanatory memorandum were distributed at the end of June 1957. The agenda includes the following items: World Meteorological Bibliography, Guide to Meteorological Library Practice, Meteorological Lexicon, Polyglot Meteorological Vocabulary, the classification of meteorological material, the general form of meteorological documents and summaries, the exchange of publications and other meteorological documents, the present state of progress in various countries and activities in the meteorological field of bibliography and publications, and the reproduction of meteorological documents.

The Working Group on Terminology held a preliminary meeting in Paris from 2 to 6 September 1957 in order to prepare a draft of the Meteorological Lexicon.

CLIMATOLOGY

Six of the eight working groups established by the Commission for Climatology at its second session have now been fully set up and are therefore able to start tackling the various problems allocated to them for study. The membership of the Working Group on Microclimatology has not yet been completed. The Working Group on the Guide to Climatological Practice will act at the call of the president of CCl.

The president of the Commission for Climatology, Mr. R. G. Veryard, was designated to represent WMO at the Congress of the International Society of Biometeorology and Bioclimatology, held in Vienna from 23 to 27 September 1957.

MARITIME METEOROLOGY

During the second session of the Commission for Maritime Meteorology it was decided to prepare a preliminary album containing the photographs which will be used to illustrate the International Ice Nomenclature. The preparatory work on this album was kindly undertaken by the Seewetteramt, Hamburg, where the negatives were collected and a list of titles made in English, French, Russian and Spanish.

Prints of 82 photographs, together with the list of titles, are now available (price: 30 DM) from: Fotohaus Friedrich Kunze, Stephansplatz 2, Hamburg 36, Germany.

SYNOPTIC METEOROLOGY

The main activity of the Commission for Synoptic Meteorology is preparation for the second session of the commission, due to begin on 21 January 1958 in New Delhi.

Other matters under study include synoptic codes for the tropics, rules for using the codes for special phenomena and seminars on weather forecasting.
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CURRENT PROGRAMME

In the last issue of the Bulletin (Vol. VI, No. 3, p. 92) a general account was given of the place of WMO activities in the United Nations Expanded Programme of Technical Assistance. It now seems appropriate to present a more detailed review of the current WMO programme in this field. Implementation of the 1957 programme is now well advanced and a brief description is given of each project in the following paragraphs.

WMO REGION I (AFRICA)

British East Africa

Mr. C. I. H. Aspliden (Sweden) has continued with the plotting and preliminary analysis of meteorological synoptic information in preparation for a close study of the correlation between meteorological factors and locust events. A specific period has been selected for study, viz. May 1954 to June 1955. In order to ensure that the information used is entirely reliable Mr. Aspliden has visited most of the countries where relevant original synoptic records are stored and, with the helpful co-operation of local meteorological services, has been able to microfilm the data required for this work. The subsequent plotting of the synoptic information has involved a very considerable amount of effort and a number of trained local plotters has been made available to Mr. Aspliden by the East African Meteorological Department which has also supplied all secretarial facilities needed by the expert.

Detailed analysis of the resulting charts presents a formidable task and it is hoped that assistance from a second expert will be provided later this year.

Egypt

Dr. W. Haude (Federal Republic of Germany) has resumed his interrupted mission in Egypt and is continuing to advise the government on agricultural meteorological matters generally and to train local staff in this work. Dr. Haude’s mission is expected to be completed this year.

In accordance with the advice given earlier by the WMO expert, Mr. D. D. Clark (U.K.), the Government of Egypt has made the necessary local preparation for the establishment of an instrument laboratory and workshop. An expert is now being sought who will be required to install the equipment and to train local staff in its use and in the maintenance and calibration of meteorological instruments generally. It is expected that this expert will take up duty in Egypt before the end of 1957.

Libya

Dr. C. Lea (U.K.) has continued as acting director of the Libyan Meteorological Service and Mr. K. N. Plard (France) has been appointed to take over the training mission vacated by Mr. H. El Salawy (Egypt) who returned to his parent service at the end of 1956.

A fellowship has been awarded to Mr. A. T. Sherif who will proceed to Cairo for training under the Egyptian
Meteorological Service. He is expected eventually to take over instructor duties with his parent service in Libya.

Morocco

A new project for the training of local assistants has been authorized in Morocco by the executive chairman of the Technical Assistance Board (TAB) to be financed, in 1957, from the Working Capital and Reserve Fund. An expert is now being sought for assignment to the Government of the Sherifian Empire to take up this important project.

Sudan

An expert in agricultural meteorology is being appointed as adviser to the Government of the Sudan and will initiate a mission at the Gezira experimental farm near Khartoum later this year. In addition a quantity of specialized meteorological equipment is being made available to the government in connexion with this same mission.

A fellowship has been awarded to Mr. O. E. T. Osman for forecasting studies in the United Kingdom.

WMO REGION II (ASIA)

Afghanistan

The WMO mission in Afghanistan has been in operation for over two years with a team of two experts. The senior expert, Mr. H. I. Anda (Norway), completed his second year of assignment before his recent tragic death and succeeded in laying down a very sound foundation for the development of the meteorological service. A replacement for Mr. Anda is being appointed. In the meantime the instrument expert, Mr. S. Likhmachev (U.S.S.R.), who forms the second member of the Afghanistan team, has made very marked progress in the development of an instrument division and in the establishment of reporting stations. Mr. Likhmachev's work, following on from that of Mr. H. Treussart (France), has made a most important contribution to meteorology in Afghanistan and thereby also to other countries in the area.

The director of the Royal Afghan Meteorological Institute, Dr. A. Khalek, took advantage of a fellowship under the Expanded Programme to study administrative methods and other meteorological matters with the kind assistance of the director-general of the India Meteorological Department.

Burma

Mr. M. L. Maung and U Ba Kyi, two members of the Burma Meteorological Department, continued their studies in the United Kingdom under WMO fellowship awards.

China

Fellowships have been approved to Messrs. Hung-Hsi Liu and Hysue-Yi Liao, members of the meteorological service, for study in hydrometeorology and radiometeorology respectively.

Hong Kong

Mr. T. Y. Chen of Hong Kong Royal Observatory is studying tropical meteorology and hurricane forecasting in the United States of America under a WMO fellowship award.

Iran

The unfortunate death of Dr. S. Pramanik (India) left the Iran mission without a meteorological adviser and Mr. Jacques Cochemé (Mauritius) was appointed to fill the post temporarily until a permanent appointee could be selected. Mr. Anda, whose untimely death is reported on p. 158, had been
appointed to continue the work in Iran and steps are now being taken to seek another expert to assist the director in the development of the service in Iran.

A fellowship for forecasting studies in the United Kingdom has been granted to Mr. R. Lavi.

Iraq

Mr. J. Skaar (Norway), a radiosonde expert, has been assigned to the Government of Iraq to advise upon the development of its upper-air reporting network. He is engaged in the installation of equipment which has been provided by the government and will train local staff in its operation and maintenance.

Provision is also made for a fellowship award for overseas training.

Pakistan

A hydrometeorologist is being assigned to advise the Government of Pakistan in the development of its hydrometeorological work and is expected to take up duty in Karachi later this year.

Fellowships have been awarded to two officers of the Pakistan Meteorological Service, Messrs. Kazi G. Mowla and Saiyid A. Husain, for study in forecasting.

Thailand

The only assistance delivered to Thailand during 1957 consisted of an extension of fellowships which had been awarded in 1956 to officers of the Thai Meteorological Service for overseas study.

WMO REGION III (SOUTH AMERICA)

Brazil

The executive chairman of TAB authorized the expenditure of $20,000 from the Working Capital and Reserve Fund to initiate a meteorological mission in Brazil during 1957 and steps are now being taken to implement the project.

Chile

Meteorological equipment is being provided to Chile in furtherance of the recommendations made by Mr. P. M. Austin Bourke (Ireland), who recently conducted an advisory mission on the control of crop diseases. When all the equipment is available in Chile an expert will be sought to supervise its installation and train local staff in its use and in the interpretation of the resulting records.

Ecuador

Dr. W. Zimmerschied (Federal Republic of Germany) has been engaged
in an advisory capacity with the Government of Ecuador since November 1955. He is advising generally on the improvement and organization of the meteorological service in Ecuador with particular reference to aviation needs. His work has recently resulted in the establishment, by the government, of a top level technical meteorological council which represents a major step forward in the integration of meteorological effort in the country. Dr. Zimmerschied's mission will continue throughout 1958.

Peru

A WMO mission was initiated in Peru in 1956 to advise the government generally on the development of its existing meteorological service with special reference to the requirements of aviation. The mission was taken up initially by Dr. W. Rudloff (Federal Republic of Germany). Dr. Rudloff unfortunately finds it necessary to terminate his duties during 1957 but will be replaced by another expert now being recruited.

Uruguay

Funds have been approved from the Working Capital and Reserve Fund for the initiation of a substantial meteorological mission in Uruguay during 1957 and it is expected that the mission will be started shortly.

WMO REGION IV
(NORTH AND CENTRAL AMERICA)

Dominican Republic

Editorial work has now been completed on the report of the Hurricane Seminar held last year in the Dominican Republic and the collected papers are expected to be printed soon.

Provision has been made for the appointment of an adviser to the Dominican Republic to continue the work started by Dr. F. Huerta (Spain) and Mr. E. R. Miller (U.S.A.) in 1955. Unfortunately it has not yet been possible to recruit a suitable expert but it is hoped that the mission will be resumed later this year.

Haiti

Provision had been made for the appointment of an adviser to Haiti during 1957 but, at government request, this project has been deferred until a later date.

Nicaragua

Dr. O. Vannini (Argentina) was appointed during 1957 to continue the advisory work in Nicaragua initiated by the late Dr. A. Crespi (Argentina). Dr. Vannini is proceeding with the establishment of meteorological stations using equipment supplied under the Expanded Programme.

WMO REGION V (SOUTH-WEST PACIFIC)

Indonesia

Provision is contained in the 1957 programme for fellowships to provide overseas training for members of the Indonesian Meteorological Service. So far no nominations have been forthcoming from the government.

WMO REGION VI (EUROPE)

Iceland

Following the survey of Dr. A. Angström (Sweden) in 1956, provision was made for two expert assignments in Iceland and the first of these has now been implemented.

A climatological expert, Mr. E. Hovmöller (Sweden), proceeded to Iceland during September 1957 to advise the government in the development of its
climatological services. To initiate the second project, an instrument expert will be provided to Iceland during 1958 to assist in the installation of a laboratory and workshop and to train local personnel in instrument maintenance and calibration. In connexion with these missions a quantity of meteorological equipment has been made available to Iceland under the technical assistance programme.

**Israel**

A fellowship has been made available to Mr. Gideon Steinitz of the Israeli Meteorological Service for advanced study overseas.

Dr. J. Neumann of the same service is continuing his studies in the United Kingdom.

**Jordan**

A meteorological expert is being sought for advisory duties with the Jordan Government and it is expected that an appointment will be made this year in line with the provision contained in the 1957 programme. This project will be a continuation of the mission filled until late 1956 by Mr. Jacques Cochemé (Mauritius).

A fellowship has been awarded to Mr. M. T. Assaf who is taking up forecasting studies in the United Kingdom.

**Lebanon**

An expert has been appointed to conduct advanced forecast training, in Beirut, of senior meteorologists with the Meteorological Service of Lebanon. He will take up his field duties late this year.

**Syria**

Mr. L. Håland (Norway) has taken up duty with the Syrian Meteorological Department to advise upon the development of its observational network in general and particularly upon upper-air reporting.

In addition fellowships have been made available to Messrs. A. Masry
and M. M. Delsi of the Syrian Meteorological Department for study in the United Kingdom.

**Turkey**

Mr. M. Demirtas of the Turkish Meteorological Service is receiving training in hydrometeorology in the United States of America under a WMO fellowship award.

**Yugoslavia**


**REGIONAL PROJECT**

**Latin America**

Dr. R. Schröder (Federal Republic of Germany), a hydrometeorologist, has been appointed by WMO to work with a water resources survey team under the general direction of the UN Economic Commission for Latin America. This project is sponsored jointly by WMO and the UN Technical Assistance Administration.

**INTER-REGIONAL PROJECT**

Arrangements are well advanced for the seminar on hydrologic forecasting which, at the kind invitation of the Yugoslav Government, is being held in Belgrade starting 28 October 1957.

**FUNDS**

The Technical Assistance Committee originally authorized a total expenditure of $285,000 to cover the 1957 programme of technical assistance under WMO. Subsequent allocations by the executive chairman from the Working Capital and Reserve Fund have increased this sum so that the total financial authorization to WMO for 1957 now stands at $332,000.

As has been reported in earlier issues of the Bulletin, the TAB, after strong representation from WMO, agreed to increase the moneys available to the Organization for its 1958 technical assistance activities by a sum of $40,000, over and above the share which would normally have been available.

**PLANNING THE 1958 PROGRAMME**

In order to obtain a clear picture of the demand for technical assistance under WMO, the Secretary General circularized all meteorological services early in 1957 and, as a result of his inquiry, there is seen to be a clearly demonstrated need for assistance in 1958 exceeding $800,000 in value. It will be appreciated that the resources available to WMO are inadequate to meet this demand and assistance has to be directed into the most urgent and rewarding channels; continuation of existing projects must necessarily take priority.

Because of the serious inadequacy of funds available to WMO during 1958, only a very limited amount can be directed into regional projects despite the fact that these form an important avenue of technical assistance in the field of meteorology.

Formal government requests have now been received for the 1958 programme and it would seem likely that a sum of approximately $300,000 will be required for the field programme which, together with administrative and operational services costs, will probably bring the total WMO technical assistance budget for 1958 to a sum exceeding the $332,000 authorized for 1957.
OBITUARY

PROFESSOR C. G. ROSSBY

Professor Carl Gustaf Rossby died suddenly from a heart attack on 19 August 1957. He was born in 1898 in Stockholm where he also completed his university training. During leave of absence from the Swedish Meteorological and Hydrological Institute, he spent some years as an assistant, and also studied under Professor Vilhelm Bjerknes in Bergen. In 1926 he went to the United States of America for a visit but stayed there to work at the Massachusetts Institute of Technology. There he established a meteorological department, which he directed till 1939. For two years he was assistant director and scientific adviser with the United States Weather Bureau and in 1941 became professor at the University of Chicago. After

where he spent some years as an assistant, he also studied under Professor Vilhelm Bjerknes in Bergen. In 1926 he went to the United States of America for a visit but stayed there to work at the Massachusetts Institute of Technology. There he established a meteorological department, which he directed till 1939. For two years he was assistant director and scientific adviser with the United States Weather Bureau and in 1941 became professor at the University of Chicago. After

6 years there he was called back to Sweden as professor at the University of Stockholm and scientific adviser at the Swedish Meteorological and Hydrological Institute. Thereafter he spent part of his time in Sweden and part of it in the United States.

Dr. Rossby was an outstanding scientist in meteorology and oceanography and pioneered research in many branches of these sciences. He published early papers on thermodynamics and friction in the atmosphere and the ocean. His most valuable contributions were perhaps his demonstration of the importance in dynamical and synoptic meteorology of the variation with latitude of the Coriolis force and his theory of long circumpolar waves. Together with Professor E. Palmén, Rossby proved the existence of the jet stream, and his work on the conservation of absolute vorticity became the basis for present numerical forecasting methods. In recent years he also took up studies of atmospheric chemistry. His activity as a scientist was remarkable, but those who knew him personally admired equally his ability to stimulate people to carry out research and to co-operate with other workers in their own or in related fields.

At the International Meteorological Institute, which he created in Stockholm with support from UNESCO, he gathered specialists from the whole world for seminars and for informal discussions of important scientific questions. Advanced students and experts from more than 20 foreign countries worked for long periods at the institute. The results of their activity has often been published in the geophysical
Dr. Rossby also took an active part in the work of the International Union for Geodesy and Geophysics (IUGG), in which he was president of the International Association of Meteorology of IUGG, and in the planning and preparation for the International Geophysical Year. During the last year he showed an increasing interest in the work of WMO and only recently visited the WMO Secretariat in Geneva (from 18 to 22 July 1957) for informal discussions with the Secretary-General on several questions of mutual interest.

Dr. Rossby was certainly one of the world’s most prominent scientific meteorologists and his ability to stimulate the enthusiasm of his students and colleagues was outstanding. Through his charm and his personality he also infected many who previously had little appreciation of the science of meteorology and its potentialities. The meteorological world suffers a great loss by his untimely death.

A. Nyberg

PROFESSOR H. U. SVERDRUP

Norway lost one of its great men when Dr. H. U. Sverdrup died suddenly on 21 August 1957.

Professor Sverdrup worked for some years as assistant to Professor V. Bjerknes and from 1917 to 1925 he was in charge of the scientific work on the Maud Expedition. From 1926 to 1931 he was professor in meteorology in Bergen and directed the scientific work on the Nautilus Expedition in 1931. Professor Sverdrup was director of the Scripps Institution of Oceanography of the University of California from 1936 to 1948 and at the same time professor in oceanography at the university.

In 1948 he returned to Norway to become director of the Norsk Polarinstitutt and was also appointed professor in geophysics at Oslo University.

Professor Sverdrup was the author of a large number of scientific papers in the field of meteorology and oceanography. He co-operated very actively in international endeavours to improve knowledge of the arctic and antarctic regions, particularly in connexion with the second Polar Year and the International Geophysical Year.

He was a member of a number of working groups of the International Meteorological Organization and president of the Polar Commission from 1947 to 1951.

Professor Sverdrup’s large number of friends all over the world will remember him for his fine character, his tolerance, helpfulness and proficiency in all he undertook.

H. I. ANDA

We regret to report the tragic death at the early age of 51 of Mr. H. I. Anda in an air disaster at Copenhagen on 15 August 1957. Mr. Anda was returning to his home in Copenhagen after the completion of his mission as a WMO technical assistance expert in Afghanistan. He had been appointed to a further technical assistance assignment under WMO in Iran.

Mr. Anda was a science graduate of Oslo University and had served as a meteorologist not only in his native
country, Norway, but also in Sweden, Egypt, Iran and several other countries. He was well-liked by his colleagues and had the personality and drive which are so essential for technical assistance work. In his latest job in Afghanistan he had accomplished a great deal in the face of immense difficulties and he would have undoubtedly made a further valuable contribution to world meteorology in Iran.

**ACTIVITIES OF REGIONAL ASSOCIATIONS**

**ASIA**

The president of Regional Association II decided, after consulting the Members of his Region, to submit for their approval certain draft resolutions giving effect to recommendations passed during the first ICAO Pacific Air Navigation meeting. These draft resolutions concern surface and upper-air observation networks, the replacement of pilot-balloons by electronic equipment, the heights of upper-air soundings, and the introduction of weather reconnaissance flights in areas for which upper-air data are inadequate. Voting is still in progress.

**SOUTH-WEST PACIFIC**

The president of Regional Association V decided, after consulting the Members of his Region, to submit for their approval certain draft resolutions giving effect to recommendations passed by the first ICAO Pacific Air Navigation meeting.

These draft resolutions deal with surface and upper-air observation networks, the replacement of pilot-balloons by electronic equipment, the heights reached during upper-air soundings, hourly observations on remote islands and the setting up of atmospherics networks. Voting is at present under way.

**SOUTH AMERICA**

The Secretariat is at present preparing the documents necessary for the second session of Regional Association III, which is to open in Caracas on 4 December 1957. The agenda and explanatory memorandum have already been distributed.

One of the major tasks, just completed, was the preparation of charts of the surface and upper-air networks in the Region. These charts, which will be examined during the session, show in particular the new synoptic networks in Argentina.

**EUROPE**

The president of Regional Association VI decided to submit, for the approval of Members of his Region, some resolutions and recommendations resulting from recommendations passed by the RA VI Working Group on Meteorological Transmissions. These proposals relate mainly to the organization of teleprinter and RTT links, exchanges over the North Atlantic, the organization of communications with ocean weather stations, and the transmission of CLIMAT messages and of upper-air data. The voting is not yet completed.
VISIT OF THE CO-ORDINATOR OF CSAGI

Vice-Admiral Sir Archibald Day, co-ordinator of the Special Committee for the International Geophysical Year, visited the Secretariat on 11 June 1957 in order to see the IGY Meteorological Data Centre and to have informal discussions about the exchange of data between the different IGY centres and about various other related topics.

VISIT OF PROFESSOR W. BLEEKER

The president of the Commission for Synoptic Meteorology, Professor W. Bleeker, visited the Secretariat on 23 July 1957. The arrangements for the second session of CSM were amongst the main topics discussed with the Secretary-General and members of the Technical Division.

NEW BUILDING FOR THE SECRETARIAT

Since 1957, when the Secretariat of the World Meteorological Organization moved from Lausanne to Geneva, it has been housed in a barrack-type building which was offered temporarily by the Canton of Geneva (see picture on the cover of Bulletin, Vol. I, No. 1).

The question of a permanent building for the Secretariat was discussed as early as First Congress, but the realization of this project has always been delayed by various difficulties.

As a result of its growth during the last six years, it has become increasingly difficult for the Secretariat to perform its functions adequately in this temporary building both on account of its unsuitable nature and of its inadequate size. Last year it became necessary to rent three flats in the neighbourhood of the Secretariat to house the Technical Assistance Unit and the International Geophysical Year Meteorological Data Centre, and store-rooms have also had to be rented in other parts of the town. This dispersal of accommodation has proved to be very inconvenient.

After various possibilities of constructing a permanent building for the Secretariat had been carefully investigated, the Executive Committee in January 1957 agreed that the offer of the Canton to construct this building in the Avenue Giuseppe-Motta near the Place des Nations should be put before the Members of the Organization for their final approval. After a postal ballot the Members approved the proposal by a very large majority. Negotiations are now proceeding with the Canton authorities for the construction of the building which should be completed in 1959 or 1960.

The building will consist of a main part, containing offices, and an annex containing the library and a conference room large enough for the sessions of the Executive Committee. The total useful space will be approximately 2,360 sq. m. The building may be either rented from the Canton or purchased by the Organization.
METEOROLOGICAL PHOTOGRAPHS

The photographic archives of the WMO Secretariat now contain a series of photographs illustrating the activities of the Organization in various parts of the world as well as different aspects of meteorology and its applications. A selection of these photographs has appeared in past issues of the WMO Bulletin.

These photographs are widely used for exhibitions and various publications containing articles about WMO or the IGY. Copies are also provided on request to associations, groups or lectures, and the Secretariat will be glad to comply so far as possible with any such requests received from meteorological services or individuals.

Most of these photographs have been specially commissioned whilst others were supplied by meteorological services. To enable this collection to be improved still further, the Secretariat would be glad to receive from meteorological services or individuals negatives of any good photographs on agricultural or maritime meteorology.

RECENT WMO PUBLICATIONS


By its Resolution 19(I), Congress decided that the closest co-operation should be established between WMO and other international organizations, wherever matters of mutual interest exist, and the Executive Committee was authorized to negotiate working arrangements or informal agreements as might seem desirable with such organizations.

Between 1951 and 1955 the Executive Committee approved working arrangements with four specialized agencies of the United Nations and one non-governmental international organization, and also created a consultative status for non-governmental international organizations. This action was confirmed by the Second Congress in Resolution 6 (Cg-II).


This publication is available in English and French at present; the Russian and Spanish versions will be published in due course.


This report, published in English and French, contains the texts of the 34 resolutions and 10 recommendations adopted at the session, together with
a list of participants, the final agenda, a general summary of the work of the session and a list of the documents published before and during the session.

Annexes to the report include the recommended network of surface and upper-air observing stations for the region, the network of radiation stations and tables showing the frequencies and the contents of subcontinental broadcasts.

A general account of the second session of RA I will be found in an earlier issue of the Bulletin (Vol. VI, No. 2, p. 53).


Following the normal pattern of such reports this publication, in English and French, contains the texts of the 10 resolutions and 9 recommendations adopted, the final agenda and a general summary of the work of the session, together with lists of participants and of documents.

Among the annexes to the report are the proposed amendments to the WMO Technical Regulations relating to climatology and the principles and draft plan for a world climatic atlas (annexed to recommendation 45 (54-CCI)).

A general account of the session will be found in the WMO Bulletin, Vol. VI, No. 2, p. 59, and the address of the president of CCl at the opening meeting was given in Vol. VI, No. 1, p. 2.

International List of Selected and Supplementary Ships. 1957 edition. WMO/OMM -- No. 47.TP.18, Pp. 493. Price: Sw. fr. 10.—.

The third edition of this bilingual publication has been brought up-to-date according to information, valid on 1 January 1957, received from the directors of meteorological services concerned.

A slightly revised layout has been employed which results in a reduction in size without however omitting any of the data required by Regulations 2.6.1.6 and 2.6.1.7 of the WMO Technical Regulations.

Annals of the International Geophysical Year

The Annals of the International Geophysical Year, the official journal of the Special Committee for the International Geophysical Year, is being published by the Pergamon Press (London, New York and Paris). The Annals will give information about the preparations and programmes of the IGY, and in due course the progress and some of the main results.

The first volume to be published is Volume III -- Instruction Manual for Ionospheric Studies in the International Geophysical Year, which can be obtained from the publishers at the price of £6 ($17.00). Among other subjects to be dealt with shortly are aurora and airglow, cosmic radiation, geomagnetism, nuclear radiation, ozone observations, seismology, latitudes and longitudes. It is estimated that four to six volumes, of about 400 pages each, will be published during 1957 and 1958.

The book contains the papers and recommendations of the International Arid Lands meetings held in New Mexico in April-May 1955. These appear in the same order that they were given in the meetings and are probably the most extensive series to be published on the whole spectrum of arid zone problems. The contents of the papers reflect very well the integrated approach to arid zone problems which was the theme of the meetings.

This approach is introduced by a discussion of the broad view of arid zone problems in three papers by leading experts in the arid zone as a whole. A series of seven papers on the Variability and predictability of water supply follows. These papers take up the general problems of evaluating the available supplies of airborne, surface, and underground water resources. An eighth paper summarizes the topic.

Having evaluated the potential water resources, a first step toward the improvement of arid lands is Better use of present resources. This subject is discussed in seven papers and a summarization. One of the interesting features of this section is a paper which stresses the importance of archaeological studies in the arid zone. The climatologist who studies long term fluctuations in climate could learn much through closer collaboration with archaeologists.

Following the discussion on the possibilities for exploiting available water resources, the next section of the book naturally treats the subject Prospects for additional water sources. This is discussed in seven papers: three on demineralisation of waters, three on artificial augmentation of precipitation, and one on the economics of water supply. Although the papers are optimistic on the possibilities of augmenting water supply by artificial means, it is apparent that the most significant progress has been made in demineralization. This method seems to be the most promising at least for the foreseeable future.

The final section of the book completes the theme by discussing the Better adaptation of plants and animals to arid conditions. The topic is covered by seven papers and a summary. By previous standards this section may appear to some to have slighted a well-known topic. Others, however, will welcome a treatment where the water resources of both air and ground have been given their proper weight.

Following the technical papers is a series of 34 recommendations made in conferences of some 70 experts following the main meetings. These are clearly not the results of prolonged compromising, but are the strong clear views of scientists on what should be done to accelerate and improve the arid zone research and development programme. They may well be the most important part of the book.

Meteorologists will find the papers on Variability and predictability of water supply of most interest. The two papers of J. Tixier and C. C. Walla go to the heart of the problem of climatological prediction by discussing the need for determining the probability of occurrence of critical precipitation amounts. The probabilities of critical values and not averages of climate elements are the minimum essential for planning arid zone development. It is unfortunate that such results are not available more generally for the arid zone. The three papers on artificial augmentation of precipitation in the section on Prospects for additional water sources will also be of interest although the meteorologist will find little new material here. Meteorological factors are also mentioned, of course, in many other papers of the book.

The book may be recommended to meteorologists as giving a broad and well proportioned discussion of arid zone problems. If it could be the beginning of a new "emphasis placed upon integrated

Meteorologists who have read the scholarly contributions by Professor van de Hulst in The Atmosphere of the Earth and Planets (edited by G. P. Kuiper) will welcome this book by the same author devoted to scattering problems. In particular, this volume deals with "the dispersion and attenuation of a beam of light traversing a medium, if the individual particles are far apart and if their scattering properties are known". Thus the effects, produced by densely-packed scatterers, of mutual interactions or of multiple scattering are not presented in any detail, although rather complete bibliographic references are given to studies along these lines.

The book is divided into three parts. Part I deals with basic scattering theory, part II with special types of particles and part III with applications. In part I the emphasis is on physical considerations, definitions and basic properties of light and light extinction. In part II the emphasis is on mathematical considerations, derivations and computations of scattering functions. In part III the emphasis is on the use of scattering as a research tool in the investigation of particles, with particular reference to the fields of chemistry, astronomy and meteorology. The usefulness of the book is further enhanced by extensive cross-references and bibliographic lists. Thus, a research worker who contemplates a project involving either the theoretical or the practical aspects of light scattering will find more than adequate guidance in this book.

Meteorologists will be interested in the very complete treatment of the Mie theory of scattering in part II, and in the discussion of the many meteorological problems for which this theory is required. A chapter is devoted to the optics of a raindrop, in which rainbows and glories are given special attention. It will probably be a surprise to most readers to learn that a completely satisfactory theory of glories has not yet been produced and that no explanation based on geometrical optics is tenable.

The chapter in part III devoted to meteorological applications presents a balanced review of what is now a very extended field, embracing particles ranging in size from molecules to raindrops and wavelengths over the spectral range from the ultraviolet to the micro-wave region. Haze extinction is treated in considerable detail, particular attention being paid to the recent (1954) and extensive studies by Volz. Radar meteorology is the other major topic of this chapter, and once again it is apparent that the author is not only aware of the most recent work in this field but is in a position to assess the status of such work in a critical fashion.

This book was obviously not intended as a text-book, but rather as an authoritative reference work on a specialized field. The author has fulfilled this aim in an extremely able manner, not only by his clear and lucid style and his appeal to both mathematical and physical lines of reasoning but also by the provision of excellent diagrams, tables and illustrative examples. The book is also not without humour — both intended and unintended (the section title Surface Waves in the Literature probably falling into the latter category).
document dealing with complicated interdisciplinary problems.

The book contains six main chapters, following an introductory chapter which immediately gives the reader the right picture of the scope and importance of the subject. (One third of the land area of the earth is within the tropics and about thirty per cent of the world's population lives there.)

A chapter on Tropical Climates gives in a condensed form a review of the significance of the various climatic elements and a summary of the various methods of climatic classification.

In the following chapters the author poses four times the basic question — "What effects may climate have upon attempts to increase productivity in the tropics?" — in relation to each of the four fields of crop production, animal production, human efficiency and industry.

The answers to this question are reviewed in the last chapter which contains a number of conclusions of great interest to governments, international organizations, private foundations or private businesses, dealing with problems related to the development of tropical countries.

One of the general conclusions is that "Numerous and important though the climatic influences are, non-climatic factors exercise equal, if not greater, influence upon the economic situation in the tropics."

The author and the Council of Foreign Relations are to be congratulated on this interesting and inspiring book which certainly merits a very wide distribution.

K. L.

*Fortschritte in der meteorologischen Forschung seit 1900* (Advances in meteorological research since 1900). By Bernhard Neis, Frankfurt am Main (Akademische Verlagsgesellschaft) 1956. 238 pages; 21 figures; 19 portraits. Price: DM 28.—

This book developed from a course of lectures on the history of modern meteorology, given by the author in the Free University of Berlin. Bernhard Neis was a mathematician, physicist and teacher when, in 1940, at the age of almost 60, he entered the meteorological service, where he devoted himself to research leading to the publication of a series of works relating to the field of theoretical meteorology.

The concept of this book, which was published after the author's death, is an exact expression of his personal outlook. Quoting a number of parallel developments in our knowledge of physics, he deals in particular with those examples of progress in meteorological research which result in the evolution of meteorology into an exact natural science and are designed to express the established relationships in mathematical form.

Although indications are sometimes given of the time sequence of specific discoveries, the book constitutes in no way a chronological historical treatise. On the basis of pedagogical concepts, the author divides the material into four main sections. The first section explains the main ideas behind meteorological research at the beginning of the twentieth century and the general trend of their development in the course of the next 50 years. The second section, entitled *Phenomenology and aerology of the atmosphere*, deals with our knowledge of the relative conditions prevailing in a calm atmosphere and in an atmosphere in motion and their deduction from synoptic and upper-air observations. The third section, which is the fullest, views weather as a process of transformation of the energy radiated by the sun, and a short fourth section deals with practical meteorological problems relating for example to weather forecasting and to the collection and processing of climatic data.

The choice of material within each individual section in a book of this type is naturally determined by the personal outlook of the author. His aim is to indicate in what fields definite knowledge has been obtained and what questions and problems are still awaiting solution.

The author himself points out that his book is not intended as a text-book, but rather as an aid and guide in the study of available text-books. This is facilitated by references at the end of each chapter. The work includes a series of figures and 10 portraits of leading meteorological research workers.

H. S.

This "study in the foundations of dynamics" is the latest in a long line of such expositions, notable expositors of the more recent past being Kirchhoff, Mach, Poincaré and Karl Pearson. The treatment is essentially historical, showing how man has sought to make the concept of force—and mass—explicit and usable, and so to create the science of mechanics, and how, from the time of Newton, man has worried at this Newtonian concept, attempted to eliminate it (Mach), transform it (Einstein) and generalize it (modern nuclear and field theory). The author makes no novel contribution himself to the story, aligning himself roughly with the operational point of view of the writers named above, which is the point of view of most modern physicists who have given thought to the matter.

There is of course no meteorology as such in this book, but many meteorologists must have pondered the problem and may well wish to know of this latest treatment. The writing is clear though somewhat ungainly.

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CALENDAR OF COMING EVENTS

World Meteorological Organization

1957
28 October - 16 November Inter-regional Training Seminar on Hydrologic Forecasting and the Water Balance, Belgrade, Yugoslavia
5 - 23 November 2nd session of the Commission for Bibliography and Publications (CBP), Paris, France
4 - 21 December 2nd session of Regional Association III (South America), Caracas, Venezuela

1958
21 January - 14 February 2nd session of the Commission for Synoptic Meteorology (CSM), New Delhi, India

Other International Organizations

22 October (4 weeks) 2nd South American - South Atlantic Regional Air Navigation Meeting (ICAO), São Paulo, Brazil
24 October - 12 November Indian Ocean Science Association (PIOSA), 3rd Congress, Tananarive, Madagascar
2 November (3 weeks) 9th Conference of FAO, Rome, Italy
15, 16 and 18 November 2nd session, International Consultative Committee for Marine Sciences (UNESCO), Bangkok, Thailand
18 - 23 November Expert Committee on Air Pollution, World Health Organization, Geneva, Switzerland
18 - 29 November 10th Technical Conference of IATA, Miami, U.S.A.
18 November - 9 December 9th Pacific Science Congress, Bangkok, Thailand
4 - 10 December 3rd Regional Technical Conference on Water Resources Development, ECAFE, Manila, Philippines
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This quarterly journal is available to all who are concerned and interested in precision electrical instruments.

The October issue includes two main items:—

1. 'The D-729 Phasemeter and Some Applications' by A. Cooper, B.Sc., A.M.I.E.E.
2. 'The Analysis of Muscle Potentials by Means of a Muirhead-Pametradawave Analyser' by A. Nightingale, M.A., F.Inst.P., Physics Department, Guy's Hospital Medical School, London.

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