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Attachment(s):
(1) "Philippines and IGY", 4.5 MB pdf, 18 pages.
(2) "spectroheliograph-at", 275 KB, pdf, 6 pages.

: Re:
: Philippines and the IGY
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Dear ISWI Participant:

As promised yesterday, I attach an 18-page document describing the activities of the Philippines during the IGY. It was written by James J. Hennessey (1909-1987), who joined Manila Observatory in 1951 and became its director in 1957 (the start of IGY). This document appears to have been issued in December of 1956.

I also attach a much shorter document that describes the spectroheliograph that was operational at MO at one time. The document comes from the blog of Dr Sugon, who plays a key part in the Sub Center that was described in yesterday's ISWI Newsletter (Vol. 3, No. 29).

If you wish any documents of historical interest to be archived at the ISWI website, please send to me. If it goes out on the ISWI Newsletter (what you are now reading), then it is automatically archived at the ISWI website ----- for eternity.

Also, at the end of ISWI, all issues of the newsletter will be burned on to a CD-ROM, if the total size is under 600 MB. If over 600 MB, then it will be burned on to DVD. In any case, a large stock of disks will be sent to UNOOSA for long-term safe keeping at the conclusion of ISWI.

Cordially yours,
: George Maeda
: The Editor
: ISWI Newsletter

interests rather than private ambitions. It is a time of research, of concerted efforts. The grandest and largest scheme of scientific cooperation ever broached is about to begin. It is a quest for treasure hidden in this earth of ours. Scientists are ready to unearth the wealth of secrets buried not alone in the hills but in the oceans, the air above and the land beneath. The search is a step in peaceful pursuits among nations. Scientific secrecy of the dreaded atomic type is supplanted by the widest world publicity of activities to unfold the secrets of our planet earth. May God prosper IGY for world harmony among all men.

CSAGI meetings of a very specialized technique of geophysical observation. It cannot be said that this technique was not thought about nor dreamed about. In fact, some very persuasive thinking and talking must have been done by scientists on the subject. For on 29 July 1955 the White House at Washington released the information that "the President has approved plans by this country for going ahead with the launching of small, unmanned, earth-circling satellites as part of the United States participation in the International Geophysical Year which takes place between July 1957 and December 1958."[11] This information was also made public by the President of CSAGI, Dr. Sydney Chapman, at about the same time.

The earth satellite program is so exciting for the geophysicists and has so stimulated imagination, both scientific and fanciful, that this topic deserves a more ample discussion. The code name for the satellite program is project VANGUARD. It does not lack pertinence for the Philippines. We will discuss it in a separate article in a forthcoming issue of *PHILIPPINE STUDIES.*

The scientific worth of the artificial satellite program is acknowledged by all who have pondered the matter. Even if the satellite had zero payload, that is, if no instruments were on board, the inert satellite would give, among other things, "unprecedented precision" in the determination of the earth's figure, and the density of the upper atmosphere. If it carries instruments, not only geophysical conditions and atmospheric phenomena but also cosmic radiations and solar influences can be studied. If science in the past sixty years gives us anything at all, it tells us that more new information will be had, more new problems will be exposed by the project than are even dreamed about before the event. Data answering a simple problem open up a multiplicity of new problems.

Meanwhile, IGY is near at hand. Nations are cooperating on a world-wide basis in an enterprise that emphasizes common

[11] Symposium on the U. S. Earth Satellite Program, *Proceedings of the IRE* 44 (June 1956) 741-767.

earth. But the CSAGI did recommend that gravity measurements be made where distant expeditions, for example to the polar regions or to isolated islands, were planned. Besides, it strongly recommended that measurements of variations in gravitational acceleration be carried out simultaneously at different locations.

At the present time the extent of Philippine participation in the project has not been announced. In connection with these gravity measurements it is interesting to note that the reporter for this section of CSAGI is the scientist who made a thorough gravimetric study of the Philippines before the war. The older Philippine scientists will recall his work here. Father Pierre Lejay, S. J., then at Zikawei, Shanghai but now of Paris, France was selected for the Special Committee of the International Geophysical Year because of his position as President of the International Scientific Radio Union, a position he has held since 1952. His present major scientific interests are more in radio than in gravity studies.

The above much-abbreviated digest of the IGY projects suffers from the shortening process. There have been many omissions. One section especially has been neglected in this discussion, namely that on Geographical Distribution. Various regions of our globe have been singled out for careful study. It is well known that both polar regions are to be under intensive observation. "Operation Deepfreeze" into the Antarctic has already been widely publicized. Philippine stations will make their most important contributions to the Equatorial Belt studies. Besides these two polar regions and the Equatorial Belt, there are certain selected regions along Meridian lines: a) the 80°—70°W line; b) the 10°E line; and c) the 140°E line. The Philippines being in the last region will thus participate in two of the six special geographical regions.

III

In the four years from 31 April 1950 when the proposal of the IGY was first made until October 1954 no account of its consideration, no report of its planning was given in the

11. ROCKETS

Rockets provide a means of carrying suitable measuring instruments into the upper atmosphere. Observations of many geophysical and solar phenomena which are impossible from the ground or even from balloons can be made by direct observation in the rocket carriers. Depending on the kind of rocket that is used, the program has two parts: a) the use of small rockets which can be launched from balloons or aircraft and b) the use of the larger rockets of the Veronique or Aerobee type. The scientific results of rocket exploration have proved of great worth in the work that has already been done with them. Much more remains to be learned. Rocket research calls for a large scientific budget so that it is anticipated that few nations will participate in this program. The United States, France, Britain, Australia and Japan are among the nations planning to intensify rocket research.

12. SEISMOLOGY

Studies of earthquakes have been conducted for many years on an international scale. The tidal wave warning system depending on cooperation from many widely separated stations has been in operation for some time since the war. The Manila Observatory at Baguio has been in this system for about three years. The IGY affords an opportunity for setting up seismic stations at new advantageous locations. An improved knowledge of the physics of the earth's interior is expected. The Philippines with the stations of the Weather Bureau and of the Manila Observatory will contribute to the success of this venture.

13. GRAVITY MEASUREMENTS

Originally this investigation (and likewise seismology) was not given a separate classification in the working groups of the CSAGI. The reason for the omission was the fact that the acceleration due to gravity is, to a first approximation, a constant at a given location. This tends to remove interest in the simultaneous determinations at different places on the

hopes that their science will blossom in a rapid and intensive growth due to the global accumulation not only of cosmic ray data but also of other geophysical data. At the time of the second meeting of CSAGI in October 1954 the Philippines did not propose a program in this field.

8. LONGITUDES AND LATITUDES

The more precise determinations of those coordinates for the participating observatories will result in: a) improvement of the determination of terrestrial time; b) more precise determination of irregularities of the earth's motion; c) an improvement in star catalogues. This project depends upon the existence of standard astronomical observatories associated with the International Time Office. More than thirty observatories will participate in this project.

9. GLACIOLOGY

This group will make measurements on the extent, characteristics and behavior of glaciers and snow cover in all parts of the world. Since there has never been an authentic record of snow in the Philippines no active part is being taken in this work. The results of the world survey may have significant importance even in the tropics due to influences on climate changes.

10. OCEANOGRAPHY

Ocean waters flow in complicated patterns which affect the climate of land areas. But the ocean currents also have their day to day vagaries. These are not too well known especially in the southern hemisphere. The water circulation, waves, sediments and crustal structure of the oceans will be studied during IGY. At stations in Manila, Cebu, Legaspi, Davao, Tacloban and Jolo, tide data will be collected continuously. These will supply information about the seasonal variations of sea level and the degree of salinity of the sea water.

6. SOLAR ACTIVITY

The IGY will coincide with the period of maximum activity of the sun. There are present indications that the maximum of activity during this eleven year cycle may be high in comparison with the maxima of other cycles. Sunspots will surely be abundant. Flashes of intense light from the sun, (solar flares) will be numerous and intense. Charged particles, too, will pour into the earth's atmosphere from the sun. All of this solar activity will produce profound observable changes on the earth: auroras, magnetic and ionospheric storms and disturbances, cosmic ray enhancement, and perhaps changes in our ordinary weather. By photographic and visual means, by land or rocket technique, studies will be made of: a) sunspots — their number, size, position; b) magnetic fields and polarities of sunspots; c) solar flares; d) the solar corona— seen by so many people in Manila during the total eclipse of 1955; e) solar ultraviolet emission and radio emission.

In the Philippines it is hoped that the spectrohelioscope— a highly specialized instrument for analyzing the sun—will be installed at the Manila Observatory in Baguio before the IGY begins. The instrument is now in process of being built. Mr. Hans Arber, who obtained excellent photographs of the solar corona in Manila during the eclipse of 20 June 1955, is expected to continue his observations with new and improved equipment.

7. COSMIC RAYS

Cosmic radiation is now considered to consist of streams of electrically charged particles, chiefly protons and some helium nuclei. These particles come into our atmosphere at times with energies and velocities incomparably in excess of any energies which can be produced in even the greatest atom-smashing devices. The geophysical year endeavor will seek definite answers to such questions as these: a) What is the primary cosmic radiation which comes into our atmosphere? b) What physical process will account for the fluctuations in the intensity of cosmic rays? Cosmic ray physicists have high

Because of its geographic position the Philippines has not presented a schedule for active sharing in auroral and airglow studies.[9]

5. THE IONOSPHERE

The upper atmosphere from sixty to five hundred kilometers above the solid earth is the ionosphere. Within this range there are a number of regions in the rarified atmosphere containing concentrations of electrified particles. Layers of charged particles with electrons in the leading role, serve as "reflectors" for short radio waves which penetrate to them. During the IGY about one hundred stations will be engaged in taking radio observations of the density of ionization and the height of the layers. IGY gives first priority to observations of this type but other studies will be made, for example, a) the manner in which radio waves are absorbed by the ionosphere; b) movements of ionization within the ionosphere; c) ionospheric scatter of radio waves both in the forward and backward direction; d) atmospheric and terrestrial radio noise observation; e) solar radiation in the high atmosphere; f) scintillations due to the passage through the ionosphere of waves from a radio star; g) meteor observations.

In the Philippines the Baguio ionospheric station of the Manila Observatory will continue its regular observations, though its program will be increased in accordance with the CSAGI recommendations. Already this station has supplied the requisite data about its fixed characteristics. New methods of handling the observed data are used to conform to the world pattern. A table of solar zenith angles appropriate to the latitude and longitude of Baguio has been presented to the CSAGI section leader. Since Baguio is located near the geomagnetic equator, data obtained at this Philippine station are expected to play a significant role in the international aspect.[10]

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[9] Sydney Chapman, "The Aurora in Middle and Low Latitudes" *National Bureau of Standards Report* No. 5004, 15 August 1956.

[10] J. J. Hennessey, S.J., "Ionospheric Research at the Manila Observatory" PHILIPPINE STUDIES, III (June 1955) 164-185.

Some of the studies to be made in this science are: a) magnetic storms in which rapid marked changes in the earth's magnetic field are noted; b) magnetic pulsations of the earth's field some of which are local and others world-wide; c) the daily magnetic variations.

The geographical distribution of magnetic stations has been planned to give good world-coverage. This is now felt to be adequate with the supplementation of USSR stations. The work of the magnetic station at Muntinglupa will be the Philippine contribution to this phase of the IGY. This is a valuable link in the chain of observational data.

4. AURORA AND AIRGLOW

The high atmosphere emits light, observable at night and during twilight, of two distinct kinds. One of these, called aurora polaris, is generally visible only in magnetic latitudes of about 60° and more, except during magnetic and ionospheric storms, when the aurora becomes visible in lower latitudes. The aurora often has distinct forms such as arcs, rays and draperies which may move and often change their shapes during intervals of minutes. The other type of high atmosphere luminosity, called the airglow, is emitted all over the world; though it is sometimes patchy, it does not have the definite forms often shown by auroras nor does it vary in intensity as rapidly or greatly as does the aurora. The airglow of the twilight sky is called the twilight airglow. The airglow and aurora occur also in the sunlight sky (daytime aurora and the day airglow) but are imperceptible, owing to the brightness of the sky, except at considerable heights in the atmosphere, above which the scattering of sunlight is weak compared even with the rather faint emission of the aurora and airglow.

Both these phenomena are complex. Their further investigation is an important part of fundamental aeronomic research, and bears on practical problems such as radio communication. A great effort will be made during the International Geophysical Year to study these phenomena more systematically, accurately and completely than ever before.

of typhoons and hurricanes so that they can be predicted in their causes? A network of observing stations is to be completed so that definite sections of the globe will be studied from pole to pole. From 2,000 to 2,500 land-based stations, along with weather ships and even stations aboard whaling fleets, will be called on to give surface weather conditions. Special stations will function to obtain data on the upper air. In areas where there are no weather stations, automatic weather buoys are expected to be set up to obtain weather information. Some other aspects of the weather to be given serious investigation in the IGY program are: horizontal and vertical distribution of ozone; solar, terrestrial and atmospheric radiation; measurements of the earth's albedo obtained by observing the earth-light on the moon; global cloudiness as an aid to a general analysis of radiation; visual observations of noctilucent and mother-of-pearl clouds; thunderstorms; measurements of solar ultra-violet radiation. As the items in this list can be studied under diverse aspects the work in meteorology alone is a large order. The Philippines as reported in the second meeting of the CSAGI will continue the operation of its stations at Zamboanga, Laoag and Cebu. These stations of the Philippine Weather Bureau, along with its other stations and with the assistance of Clark Field, give an advantageous spread in the northern equatorial belt, a definite aid to the world meteorological picture.

3. GEOMAGNETISM

It is well known that a compass needle swings around so that it seeks the earth's North magnetic pole. Likewise a magnetic needle suspended so that it is free in a vertical circle comes to rest, in general, not in the horizontal plane but with a certain angle of dip due to the earth's magnetic field. More refined instruments using similar techniques can measure the magnitude of the forces involved in each of these motions, the horizontal and the vertical. From appropriate measurements it is possible to associate these and other magnitudes and directions with the earth's magnetic field at any one time and place. A global study of the magnetic field will give an integrated picture of the earth's magnetism.

lar World Days will be days of concentrated observation at stations of all types participating in the IGY. Special events such as launching of rockets should be scheduled to coincide with Regular World Days. Special efforts are planned in most branches of IGY work during intervals of outstanding solar, geomagnetic, ionosphere, auroral and related activity. To ensure that such disturbances shall be as fully observed as possible, a plan for "Alerts" and Special World Intervals (SWI) has been formulated. The SWI should average about four days each month. Procedures have been developed for informing stations of all nations about the World Days and the Special World Intervals.

The basis for giving the "Alerts" or announcements for World Intervals, (that is, times when observers are to keep themselves and their instruments in special readiness for observation), will be the appropriate state of the sun. When the condition of the sun shows a likelihood of solar activity inducing magnetic, auroral or ionospheric disturbances observers are to be especially vigilant lest a loss of much valuable information ensue. As an illustration of this, one thinks of the valuable information that might have been obtained if more observers had been on the alert for the great solar flare of 23 February 1956.[8] The working group on World Days has arranged for the wide distribution of data about the total solar eclipse of 23 October 1957, the annular eclipse of 19 April 1958 and the total eclipse of 12 October 1958. Neither of the total eclipses is visible in the Philippines. Lists of occurrence of meteor streams have also been announced.

2. METEOROLOGY

The Working Group in this section has made recommendations for global observations of the weather and weather elements. An increase in knowledge of the meteorology of the tropics and of the upper air in all latitudes is intended. Large-scale processes of the general atmospheric circulation will be investigated. Will this yield sufficient global understanding

[8] J. J. Hennessey, S.J. "The Dellinger Effect" PHILIPPINE STUDIES, IV (Ignatian Number, 1956) 299-317.

A third meeting of CSAGI was held again at Brussels in September 1955, a little more than two years after the first meeting. The national committees made their reports and recommendations and at the end of this meeting the CSAGI felt that the work of planning the program of the IGY was substantially complete. With the planning phase ended, CSAGI could direct its main efforts to promote the execution of the program and to the planning of the most effective ways of publishing, distributing and analysing the IGY data accumulated during and after 1957-1958.

II

The preceding is a brief account of the history, organization and membership of the world-wide enterprise for the IGY. The program for implementing the investigations as planned in the three meetings—the first and third at Brussels and the second at Rome—deserves our attention. At these meetings working groups under their respective leaders for different categories organized their subject matter. A brief consideration of the subject matter of each of these groups will help us to understand the vastness of the research to be carried on during the eighteen months. The number and variety of the geophysical sciences and the problems which remain to be explored are impressive, while they show the little that is known about our planet earth in comparison with matters yet to be discovered.

Reports were given on the following subjects: 1) World Days 2) Meteorology 3) Geomagnetism 4) Aurora and Airglow 5) Ionosphere 6) Solar Activity 7) Cosmic Rays 8) Longitudes and Latitudes 9) Glaciology 10) Oceanography 11) Rockets 12) Seismology 13) Gravity Measurements. Let us look briefly at the content of these subjects, though such a brief glance must necessarily be partial and selective.

1. WORLD DAYS

This division of the IGY does not pertain so much to a particular geophysical science as to all of them at once. Regu-

countries expressed an interest in IGY and since then a few have formed national committees.[7]

The participation of the USSR was welcomed as one of the countries with national committees. After the adoption of the CSAGI resolutions the representative of the USSR, Professor V. Beloussov, was invited to speak. He announced the USSR participation. He believed that countries of vast area (China, India and USSR) should be represented in CSAGI. The reply of the President of the CSAGI sheds some further light on the nature of this body and of the IGY in general. The President, Dr. Sydney Chapman, expressed his gratitude to Prof. Beloussov for his speech and emphasized that the IGY

> has expanded beyond all expectation, and the adherence of the USSR, just noted, fulfills one of our earnest hopes, cherished from the outset of our work. At an early stage in the formation by ICSU of the Special Committee, it was hoped that we should obtain the direct participation of the USSR in our central planning, through the appointment of USSR nationals as representatives of one or both international bodies associated with CSAGI, to which the USSR already adhered—that is to say, of the International Astronomical Union and the World Meteorological Organization; but the steps taken by these bodies in this direction led to no result, and members of other nations were appointed as the representatives of these international bodies. It may be that ICSU will find it appropriate in some way to achieve that earlier objective so that USSR nationals may be added to CSAGI; but I should point out that the members of CSAGI have been chosen on a functional, not a national basis—they represent international bodies concerned with particular branches of science, and not the nations of which they are members. All the nations participating in the International Geophysical Year were invited to send one or more representatives to assist CSAGI in the central planning, and the large attendance at these meetings here in Rome has been a fine response to that invitation; their help has been invaluable. Their aid has been rendered with single-minded devotion to science and to the great objective towards which we are working; and the presence or otherwise of a fellow national on CSAGI itself has not affected the co-operation in the slightest. In this way the advice and participation of India have been freely rendered and gratefully received, and the same applies to all other nations adhering to the International Geophysical Year, and will equally apply in future to present and prospective member nations.

[7] IUGG Newsletter, Jan. 1953-March 1956 but especially March 1955, pp. 46-182; September 1955, pp. 409-488; March 1956, pp. 5-94.

The basic structure of the program of activities was outlined. Since much has been added subsequently to the framework proposed at that time, further consideration is given the program as developed and published up to the time of writing this account.

The Philippines formed its national committee and its composition was announced to the world in the Newsletter of the IUGG for July 1954. The Philippines, then, saw early the importance of IGY and gave it its prompt support. The members as reported are:[5] President, Dr. Jose M. Feliciano, Department of Geology and Geography, University of the Philippines, Quezon City.[6] Members: Prof. Ramon Abarquez, Bureau of Mines, Manila; Rev. Charles E. Deppermann, S.J., Manila Observatory, Baguio; Director Andres O. Hizon, Bureau of Coast and Geodetic Survey, Manila; Dr. Joaquin Maranon, Institute of Science & Technology, Manila; Dean Crisostomo Ortega, College of Engineering, University of the Philippines; Director Casimiro del Rosario, Weather Bureau, Manila; Mr. Arsocio Sison, Philippine Geodetic and Geophysical Institute, c/o Bureau of Coast and Geodetic Survey, Manila; Dr. Deogracias V. Villadolid, Bureau of Fisheries, Manila.

The special committee for the international geophysical year (CSAGI) held its second meeting in October 1954 at Rome. It was reported then: "By June 1953, 23 nations had formed national committees" but by October 1954 this was extended to 36 member-nations with national committees. These nations are: Argentina, Australia, Austria, Belgium, Brazil, Canada, Czechoslovakia, Denmark, Finland, France, Germany (Federal Republic), Germany (Democratic Republic), Great Britain, Greece, Iceland, India, Ireland, Israel, Italy, Japan, Mexico, Morocco, Netherlands, Norway, New Zealand, Pakistan, Peru, Philippines, Spain, Sweden, Switzerland, Tunisia, Union of South Africa, USA, USSR, Yugoslavia. Other

[5] IUGG Newsletter, July 1954, p. 369.

[6] The Philippines lost the services of one of its foremost scientists with the death during the year of Dr. Feliciano. Dr. Casimiro del Rosario, Director of the Philippine Weather Bureau, succeeds to the office of President.

national Council of Scientific Unions at its meeting in Brussels "the initial proposal" for a Third Polar Year. The enthusiastic acceptance led to the adoption of the recommendation by other scientific unions. A special committee was formed. This is now known as CSAGI, an abbreviation of the longer name *Comité Spécial de l'Année Géophysique Internationale.* Besides the strictly scientific bodies which welcomed the proposal, UNESCO was generous in financial assistance.

As reported in the Bulletin of Information or Newsletter of the International Union of Geodesy and Geophysics (IUGG) its Brussels meeting of 20 August 1951 approved the membership of the Philippine Republic in the IUGG. (Incidentally this same body also decreed that two other countries would cease to be members). Another resolution of this 1951 meeting of the IUGG was the recommendation that the year 1957-58 be designated an International Polar Year.[3]

By the summer of 1952 the first sparks of the idea had caught fire as it was kindled and fanned in meetings of the learned world. Proposals became more expansive: The Polar (Arctic and Antarctic) regions should be studied but not as the exclusive beneficiaries of this year of investigation. The equatorial and southern latitudes needed the same careful consideration. To achieve this, the International Committee of Scientific Unions (ICSU) determined in October 1952 to extend the name of this project to the International Geophysical Year (IGY) or its French equivalent *Année Géophysique Internationale* (AGI).[4] The adoption of the new name signified that not only the investigators but also the regions were international and world-wide. Appeals were sent out to the various member countries to form national committees. These were to arrange the program of national participation in the work of the designated period of 1957-1958. The special committee (CSAGI) held its first plenary meeting at Brussels in July 1953. The resolutions of this meeting were published in both French and English in the IUGG Newsletter for October 1953.

[3] IUGG Newsletter, January 1953,pp. 78, 81.
[4] *Nature* 172 (1953) 327.

science (*rerum cognoscere causas*, as the British Physical Society has it echoing the Roman poet) one needs to be concerned with more than the material object itself. Extra-terrestrial events are important for an understanding of events on the earth.

For the growth of the geophysical sciences observatories on a worldwide scale and of an international scope are necessary. This is clear from even a few examples. In meteorology the air masses can sweep over continents and oceans. Typhoons, hurricanes and in general cyclones are no respecters of political frontiers. To know the planetary pattern of cosmic ray activity requires investigation on both sides of the equator. Radio waves which travel through the ionosphere can circle the globe. To understand ionospheric disturbances information must come from many well positioned stations on our planet.

The growth and development in knowledge in the geophysical sciences has been so rapid that an interval of fifty years between such world-wide enterprises was considered too long. In the spring of 1950 Dr. L. V. Berkner proposed to a group of geophysicists in Maryland that this type of international cooperation in scientific investigation be held twenty-five years after the Second Polar Year. This selected time would be especially fortunate and fruitful because it would coincide with the expected peak or maximum of the eleven year sunspot cycle.

To be successfully reduced to action this proposal needed to be adopted by some international scientific organization. The first such organization to hear the proposal was the Mixed Commission on the Ionosphere. This Commission is composed of members from the following unions: *Union Radio-Scientifique Internationale* (URSI); International Union of Geodesy and Geophysics (IUGG); International Astronomical Union (IAU); International Union of Pure and Applied Physics (IUPAP). The presentation of the suggestion was made to the Mixed Commission at its meeting in the summer of that same year, 1950. After offering the suggestion before the Mixed Commission Dr. Berkner brought to the attention of the Inter-

I

The IGY is sometimes referred to as the longest year in the world for it begins 1 July 1957 and ends with December of the following year 1958.[2] Our principal interest throughout this present discussion is a presentation of the program of investigation of this period. That program should indicate why scientific imagination is in full flow and why world scientists are surging to the attack of the stimulating unanswered problems. But, first, let us take a backward glance at the origin of the idea of this cooperative venture.

In 1882-1883 several nations concurred in a geophysical study of both polar regions but this research centered more actively around the North pole than around the South. In accordance with the scientific knowledge and interest of the late nineteenth century, stations were established to take observations on the weather, the earth's magnetic field and the aurora. This interval of about twelve months was known as the International Polar Year and later as the First Polar Year. The results of the First Polar Year were very encouraging, with the discovery of the zones of the aurora and the laying of the foundations of a world picture for terrestrial magnetism. Yet the results were incomplete with the urgency of many other new questions and problems concerning the polar regions. Fifty years later (1932-1933) a Second Polar Year sought additional information in the same polar regions. Extension was made to include the recently born science of ionospheric physics. By the end of the year this science had grown into a "strapping" youngster.

The geophysical sciences include many well established sciences, comprising not only the study of the solid earth, its oceans and atmosphere but also the solar, stellar and cosmic influences which affect the earth. To serve the function of

[2] Resolution 4 of the Third Meeting of CSAGI states: "The CSAGI declares that the operations of the International Geophysical Year will commence at O h U.T. on 1 July 1957 and will continue for 18 months, terminating at 24 h U.T. on 31 December 1958. A ten-day test interval, commencing at O h U.T. on 20 June 1957, will precede the beginning of the IGY." (IUGG Newsletter, March 1956, p. 33). Zero hour Universal or Greenwich time is 9 a.m. in the Philippines since the Philippine Time zone is eight hours or 120°E.

The Planet Earth:

General Program and Philippine Participation in the International Geophysical Year

JAMES J. HENNESSEY

THIS year (1956) is the centenary year of the birth of J.J. Thomson, called the father of electron physics. As a professor and as a researcher his contributions to the advance of theoretical and experimental physics find their place in the permanent history of the science. His pupils from the Cavendish school carried on his work and at one time they held a large fraction of the physics professorships around the world. For J. J. Thomson "the two great qualities of a physicist that really mattered were originality and enthusiasm; and although he rated originality extremely high, it was enthusiasm which stood at the top."[1] According to this standard many high calibre physicists and geophysicists are expected to be developed in the next two years, for enthusiasm is at a high level for the geophysical sciences. Attacks on problems which were hitherto at best only dreamed about are underway in an effort which goes by the general title of the International Geophysical Year. We shall speak of this as IGY.

[1] *Physics Today* IX, No. 8 (August 1956) p. 23. G. P. Thomson, the son of J. J. Thomson received the Nobel prize in physics in 1937. The father was awarded the Nobel prize (1906) for showing the particle characteristics of the electron; the son for showing the wave characteristics. A symposium was held this year (1956) at the University of Maryland to commemorate the hundredth birthday of the father.

From

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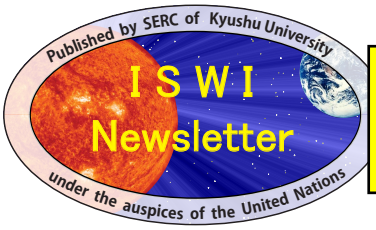
Padre Faura's Notebook Reflections from the Manila Observatory's Ionosphere Building



This pdf circulated in Volume 3, Number 30 on 15 March 2011.

Magnetic dip equator and electrojets »

6 Jun

Spectroheliograph at Manila Observatory: Miller and Hennessey

Posted June 6, 2009 by Quirino M. Sugon Jr in Uncategorized. Tagged: Charles E. Deppermann SJ, James J. Hennessey SJ, Manila Observatory, spectroheliograph. 3 Comments

The spectroheliograph at the Manila Observatory is not anymore used. It is housed in another building, a few meters from here. It was used before to study sunspots. I think it would be a good idea to revive the spectroheliograph, in connection with the ionospheric work and climate change.

I downloaded pdf copies of two journal articles on the spectroheliograph in its glorious days:

[1] Richard A. Miller, "New spectroheliograph at Manila Observatory," *Applied Optics* **4** (9), 1085-1087 (1965). [Abstract]

[2] J. J. Hennessey, ""Solar work at the Manila Observatory," *Solar Physics* **9**, 496-501 (I969). [front page]

Here is a description of the spectroheliograph by Hennessey (1969, pp. 497-498):

> In t963 the first major solar instrument put in operation at this site was the vacuum spectroheliograph. This was specially designed for Manila. A pair of 16-inch coelostat mirrors directs sunlight to the 12-inch objective mirror of an off-axis Gregorian system with a choice of either an 8-inch or a 3-inch secondary mirror. All optics are of fused quartz. The entrance slit of the vacuum tank serves a dual function. Part of the light beam is reflected to a Halle Lyot-type filter. This passes only Hc~ light needed for the visual patrol and for photography. Secondly, the light beam entering the slit passes to an off-axis 11-inch parabolic mirror at the bottom of the 17-foot vacuum tank, then to the Bausch and Lomb replica diffraction grating. From the six-by-eight-inch grating with 15 000 lines to the inch, the selected spectral light is reflected down the tank to a second off-axis 11-inch parabolic mirror and thence to the exit slit at the top of the tank. The seals at the entrance and exit slits are similar field lenses. This system can be used either as a spectroheliograph or as a spectrograph. In daily routine use hydrogen and calcium spectroheliograms are taken. The Halle filter serves well for the monitoring of solar features.
>
> All controls for the automatic operation of the various parts of the instrument are near at hand for the observer. The building, too, is designed to present the optimum environment for the operation of this equipment (Figure 2). The Observatory acknowledges the assistance of the U.S. NASA under Grant NsG-288-63 for part of the cost of this spectroheliograph.

Here is that of Miller (1965, p. 1085)

A combination solar spectroheliograph and spectrograph, newly installed in the Philippines at 8-h East longitude is described. The rotatable vacuum spectrograph follows an Ebert design, consisting of a plane grating and two mirrors. These off-axis mirrors are figured sections of one single mirror form and function as collimating and camera mirrors. The spectrograph system matches the f/24 Gregorian-type telescopic quartz mirror system of 30.5-cm clear aperture, fed by 41-cm coelostat mirrors. The grating drive is wholly within the tank. Spectroheliograph scans are with fixed slits but with a moving image and moving plate or filmholder. Slit jaws are of stainless steel and form slits 76 mm long. Dispersion is 2.75 A/mm in the first order. An 8.3-cm X 10.8-cm plateholder receives the spectrogram or spectroheliogram image. Visual monitoring and 35-mm photographs of the solar image at the entrance slit are made through an Ha Halle monochromator. A typical spectrogram and spectroheliogram are shown.

Some historical trivia:

James J. Hennessey, S.J. (1909-1987) joined the Manila Observatory 1951 and succeeded Charles E. Deppermann (1889-1957) as director in 1957.

Richard A. Miller (1917-1974) came to the Observatory in 1957. He studied at Fordham University and University of Michigan.

Source:

Agustín Udías Vallina, Agustín Udías, *Searching the heavens and the earth: the history of Jesuit observatories* (Springer, 2003), p. 156.

3 responses to this post.

1. 

   Posted by Paolo Cauton on September 16, 2009 at 2:58 pm

   Sir,

   I'm quite affected, to say the least, that "The spectroheliograph at the Manila Observatory is not anymore used."

   Back in 1994-1995, I was part of a very small team that worked to put it back together again. There was I and Jonas Domingo from AdMU PhysicsCE 95, and Cio who was an upper class man from Chemistry. We were under the guidance of Fr. Dan McNamara S.J.

   It was actually the 2nd in the list of my possible thesis subjects suggested by Fr. Dan, the first one being "Ocean Thermal Energy Conversion."

   Most of the piecing things together was done by Cio, it was almost done by the time I and Jonas got on board

to do its calibration as part of our thesis. From what I understand, the splitter mirrors were new then and different from the original specs thus needing to recalibrate. It was very memorable and tiring moment because we have to do the work at night. Even the thermal printers used to take images of the Sun in various wavelengths was also tested and functioning.

Further work was done on the specroheliograph by batch 96 which replaced the aging 2-phase motors as well as computer controls.

I guess it needs a good experiment again to bring back its former glory. It will be good to have it in tip-top shape by 2012 in time for the Venus transit.

Just my thoughts,
Paolo Cauton
A/S PsCE 95

Reply

- 

  Posted by Quirino M. Sugon Jr on September 17, 2009 at 9:54 am

  Hi Paulo, if I remember right, you are physics senior when I was in freshman at Ateneo, but I may be mistaken. I studied physics at the Ateneo from 1992-1997. I used to hang out at the ASG (Atene Science Guild) in Colayco (now replaced by Manny V. Pangilinan building). My friends call me ‘Pope’.

  The Physics and the ECCE became separate departments. There is no more Ps CE, only Ps-ACS (Applied computer systems). CE is now a separate course offered by ECCE. We used to have at most 20 students per batch during our times. Now, i think it is lower for physics, even combining ACS and Materials Science tracks. And Fr. Dan is now assigned in Ateneo de Davao, though he goes here once a month. Being a theoretician, fixing the spectroheliograph is not my expertise. Maybe i have to ask for DOST funding.

  Reply

2. 

   Posted by Paolo on January 11, 2010 at 11:27 am

   It would be good to have it up and running again before 2012 in time for the last 21st century transit of Venus (June 5-6). Next transit will be in the year 2117.

   Reply

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Fr. Federico Faura, S.J.

June 2009

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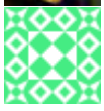 Al Angeles on PAGASA is selling its meteorol…

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