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ON THE 10TH OF FEBRUARY 1945 the Manila Observatory died in terrible agony. After viewing its mangled corpse, Father Miguel Selga, S.J., its venerable Director, wrote the following touching epitaph:

> When I was a boy, at times in our class of humanities, I used to recite with some emotion, the ode composed by Rodrigo Caro on the ruins of Italy:
>
> Estos, Fabio, ¡ay dolor! que ves ahora
> Campos de soledad, mustio collado,
> Fueron un tiempo Itálica famosa. *
>
> Similar sentiments, but wrung from the depths of my soul, struck at my heart on March 7, 1945, while I contemplated with eyes filled with tears, the ruins of the Manila Observatory, and tried to distinguish among the heaps of debris . . . piled high upon this center of learning—the meteorological tower, the star-transit pavilion, the astronomical dome, the room for time-signal transmission, the seismological vault, the scientific library, the rooms of men dedicated exclusively to the progress of international culture—paraphrasing Caro, these lines came to my mind:
>
> Estos, alma, ¡ay dolor! que ves ahora
> Campos de soledad, montón de escombros,
> Fueron un tiempo cúpula famosa.

* "These fields, alas! of solitude you see, O Fabius, now, this hill of melancholy, were once upon a time famed Italy." Father Selga has paraphrased: "These fields of solitude, alas! my soul, you see, this mound of rubbish, once upon a time a famed observatory." *Editor's note.*

History of the Observatory

Just eighty years before, the Observatory had begun very humbly with the typhoon and climatological observations of two young Jesuit professors in the Ateneo Municipal in Intramuros, Francisco Colina and Jaime Nonell, aided the next year by Federico Faura, all still in their studies and not yet priests. Slowly but surely the work grew until Father Faura in 1879 had courage to issue public typhoon warnings. These warnings, together with the attention which the earthquake of 1880 focussed on the Observatory, gave rise to such strong popular acclaim of this new "public utility", that a royal decree was issued on April 26, 1884, establishing a Government Weather Bureau, with the Jesuit Fathers of the Manila Observatory at its head. At first the principal station in Manila was supplemented only by stations in Luzon, but by the time the United States in 1898 was warring with Spain, meteorological substations had been established all over the Islands. In addition the Observatory conducted under governmental aegis, seismological, magnetic and astronomical departments, the latter including the official time-service. After the Islands passed under United States control, the official status of the Manila Observatory, as the Weather Bureau or the Central Office of the Meteorological Service, was confirmed by law May 22, 1901. The service was thoroughly rehabilitated and augmented, with five Jesuit Fathers still in command under Father José Algué, as paid employees of the Government. This service, in all its departments, gradually expanded, but remained essentially as reconstructed in 1898, until the advent of World War II in 1941.

Destruction in World War II

The black pall of smoke enveloping the city of Manila on the first and second of January 1942 was but a figure of the pall that fell over the Observatory and its faithful service of over three-quarters of a century in the interests

of humanity. The Fathers of the Observatory were held virtual prisoners in their offices, and Prof. Lachica, of the University of the Philippines, was placed in charge of what little meteorological work the Filipinos were permitted to do. The Japanese themselves, after vainly trying to divert the Observatory property to their own use and to persuade the Fathers to cooperate actively with Japan, established their own weather service in the engineering building of the University of the Philippines nearby. It is interesting to note that enemy efforts to carry off the Observatory instruments to other places were thwarted by a Japanese friend of one of the Fathers. He envisioned the Fathers as forecasting the weather for the whole of the "South Seas" if the Japanese won the war!

When the main building of the Ateneo was taken over by the Japanese in July 1943 as a military hospital, the equipment of the Observatory still remained intact in one wing, under the nominal control of Prof. Lachica. So things stood until the siege of Manila brought final disaster in its train. In the last days of the siege, on February 9, 1945, the Japanese themselves were seen by reliable witnesses to set fire to and destroy utterly the astronomical building of the Observatory. It was obvious that they considered the apparatus therein as of strategic value. On the 14th of February incendiary bombs fell upon the east wing of the main Ateneo building, and in the flames perished the magnificent scientific 10,000 volume library of the Observatory, its offices and many other precious instruments and documents. The writer lost also manuscripts ready for printing or already printed but not distributed as yet, representing two or three years of work. Father Selga was still more unfortunate; he lost historical research ready for printing, the painstaking labor of ten years!

Resurrection Starts

The terrible work of destruction was complete; the Observatory was to all appearances absolutely dead. But weather forecasting is of strategic importance, and it was

not long before the first spasms of returning life began to appear. As early as August 1945, Rev. John F. Hurley, Superior of the Society of Jesus in the Philippines, wrote that Father Selga had already been approached three or four times by various sections of the American Army with reference to reconstruction. Furthermore, about the middle of July 1945 the Secretary of Agriculture of the Philippine Government announced to Father Selga his plan to have the latter organize the whole new meteorological set up and train personnel; then after two years he was to turn over the "machine" to the government. The scheme was entirely too vague, and hence the Society of Jesus was compelled to hold off from any decision. Next, around the first week of August, a practical-minded American Colonel proposed that the U.S. Army take complete charge of reorganization, bring in instruments, set up communications, train men, and, briefly, put into operation a first-class weather bureau. This was expected to take five years. He wanted to use the Jesuit Fathers in the reconstruction, and when the work was to be turned over finally to the Philippine Government, Jesuits were still to remain as a directive unit, as before the war. But, according to other information, it seems that the Philippine Government was desirous of a weather bureau run entirely by nationals, with the single exception that they were anxious to use Father Selga's vast experience for the reconstruction period only.

Thus matters stood until the passage of the Philippine Rehabilitation Act of 1946. The writer remembers, in early 1946, talking with Mr. Ralph Higgs of the U.S. Weather Bureau in Washington, who had drawn up a very ambitious reconstruction plan, to be financed by the U.S. Government. The details of the plan were discussed, but there seemed little likelihood that it could get through Congress without being brutally slashed. To the surprise of all, hardly anything was changed, and it was under this plan that the U.S. Government spent some five million pesos in reconstructing the Philippine Weather Bureau in all its branches on a scale far surpassing its

former one. These funds were used also to send *pensionados* to the States to give them a thorough meterological training. The Jesuit Observatory staff waited to see if they would be called upon to participate, but aided as they were by the splendid technical skill of American meterologists, the Philippine Government considered that it was at last in a position to realize what all must admit was a very legitimate ambition: i.e. a weather bureau run entirely by Filipino scientists.

A Private Research Enterprise

Thus ended governmental connections with the Jesuits, and it was now for the Manila Observatory to decide whether it was to continue as an institution of scientific research or to rest content with the glory of its past. There was a certain amount of irony in the situation. The Manila Observatory had functioned for over half a century as a governmental agency, working for the *public* benefit, it had suffered much during the war because of its loyalty to the *public* interests of the Islands, its seismological and astronomical and meteorological instruments and extremely precious scientific library were deliberately destroyed because of their *strategic public* value, and yet the Observatory was forced, because of legal technicalities to seek compensation for its terrible losses by filing and proving its claim before the Philippine War Damage Commission like any ordinary *private* institution. As a result, only a very modest fraction of its total losses has been recovered. It was rather discouraging, and there were not lacking men who advocated that the Observatory be left to rest in peace! But, this was not the attitude of Jesuit Superiors; they were of the decided opinion that the Observatory should rise again, even though it be at first along very simple and humble lines. After much thought it was considered best, because of the very limited funds available and for other prudential reasons, not to attempt weather forecasting in possible competition with

the government, but to start with modest seismological research. For this reason, in 1947, the writer was sent to St. Louis University to brush up under Rev. James B. Macelwane, S.J., Director of Seismology, his all too meagre knowledge of seismology and to purchase the requisite instruments.

So early February of the year 1948 found the writer back in Manila with three Sprengnether seismographs and rather vague ideas as to where to locate them. But three days later an attack of peripheral neuritis, a consequence of beriberi contracted in the Los Baños internment camp, followed by pleurisy and severe asthma forced a reluctant postponement of all projects. Providentially, it would seem, for unnecessary duplication was thus avoided. The plan had been to set up the instruments somewhere in Manila, relying on a statement made by one of the American meteorologists reconstructing the Philippine Weather Bureau, that the latter would not engage in work similar to that contemplated by the Manila Observatory. Evidently the Director of the Government Weather Bureau was not apprised of this mutual understanding, for it was learned later, just in time, that the Director of the Government Weather Bureau was obtaining from the very same firm, seismographs practically identical to those procured by the Manila Observatory, and would set them up in Manila. It was this, together with data obtained relative to astronomical "seeing" in various parts of the Islands that finally resulted in the site at the top of Mirador, Baguio City, being chosen as the future home of the Observatory. Because the Manila Observatory had to wait for funds from the Philippine War Damage Commission, however, no active steps could be taken until May 1951. It was then, too, that Rev. James J. Hennessey, S.J., Rev. Bernard F. Doucette, S.J., and the writer were exclusively assigned to the Observatory, with a temporary home at Villa Santa Rosa, Quezon Hill, Baguio.

SEISMOLOGY

Work on the seismic vault was started at the end of May 1951, but it was not until the following January that it was finished, and a start made in setting up the seismographs and auxiliary instruments. Then followed a tedious period of testing and adjusting the delicate instruments; but finally in July 1952, the Observatory commenced publishing its monthly list of recorded earthquakes. A surprising number of these quakes are local to the Islands. In the vault are three of the latest model Sprengnether seismographs recording photographically; i.e. one vertical component with period of two seconds, and two horizontal components, one of which, with period of 14 seconds, records the east-west earth motion, the other, with short period of $1\frac{1}{2}$ seconds, records the north-south motion. These are supplemented by two visually recording seismographs of U.S. Coast and Geodetic Survey type, in which most of the amplification is obtained through photoelectric cells and radio tubes. Both record horizontal earth motion, one N-S of long period of 14 seconds, the other E-W of short period of 2 seconds. The visual recorders were first installed in the seismic vault, but with completion of the main Observatory building they are now placed just outside the offices. The recorders are provided with an alarm system so that, if any large quake occurs, the records can be immediately read, and a radiogram rushed to the U.S. Coast and Geodetic Survey in Washington. The Observatory thus becomes one of a network of seismic stations throughout the Pacific Ocean region giving the very prompt quake information necessary for timely warnings against threatening *tsunamis,* or tidal waves arising from marine quakes. The seismic vault is entirely underground and of excellent reinforced concrete construction, and it very satisfactorily performs the double function of providing bedrock foundation for the seismographs and of practically constant temperature, two important requisites to keep the delicate seismographs from tilting and otherwise changing their constants.

Ionosphere Research

In the latter part of May 1951, too, work was started on the construction of the ionosphere station. The ground at the foot of Mirador near the beginning of the shrine steps was levelled by a bulldozer and a short road made to meet the Dominican Road. By the end of August the small building intended to house the instruments was finished.

The history of the ionosphere research project is quite interesting. In 1946 the writer had met Mrs. Marcella Lindeman Phillips, an international authority on the ionosphere, and the wife of General Phillips, of the U.S. Air Force, himself an eminent scientist. She was then setting up an ionosphere station in Manila between Ft. McKinley and the airport. For various reasons this project had to be abandoned, and the only ionosphere research in the Islands was carried on spasmodically by the government Radio Control Board at Tolosa near Tacloban, with visually reading instruments only. This type of work, but with superior instruments, seemed quite attractive as a profitable and important research field for the Manila Observatory and hence as early as June 1950 the writer was in communication with Mrs. Phillips in Washington inquiring about the cost of automatically recording ionosphere equipment. A very favorable turn was given the project in a letter from Mr. McNish, formerly of the Bureau of Terrestrial Magnetism, in which he offered with the approval of the Advisory Board of the Central Radio Propagation Laboratory of the National Bureau of Standards in Washington (to which both Mrs. Phillips and Mr. McNish belonged), to "set us up in business." In other words, they wished to lend the Manila Observatory a thoroughly up-to-date model of automatic ionosphere recorder (their C-2 model) for "a dollar-a-year," with the sole proviso that they be furnished with the routine data they specified. This offer was accepted, but it was not until September 1951 that the apparatus arrived, in twenty-six boxes large and small. By the end of the month the apparatus had

been provisionally installed in the station and an eighty-foot mast erected to hold the two "delta" antennae. Irritating delays, however, followed, and it was not until the end of February 1952 that a radio engineer of the Bureau of Standards came to Manila to adjust the apparatus and to set the station functioning in earnest.

Since this is a new field of research for the Observatory, a few words of explanation are needed. The principles governing the ionosphere recorder are basically the same as radar, only the latter uses much higher radio frequencies. The ionosphere comprises principally the electrically charged layers of the atmosphere about 100 and 200-300 kilometers above the earth's surface. It is these charged layers that reflect back high frequency (short wave) radio waves, and the varying heights and nature of the layers determine the day-to-day conditions of transmission and reception of radio waves. The apparatus sends short electro-magnetic impulses vertically upward, and automatically records on film the time taken for the reflection, if any, to come back to the sender. The power of this recorder can be gauged from the fact that in 15 seconds or less it can scan conditions and automatically record them over the range from one to twenty-five megacycles. The recorder contains at least one hundred radio tubes, but under the supervision of Father Hennessey and his assistant this temperamental machine (dubbed "Iona") is kept under control, and Father Hennessey is faithfully sending weekly and monthly the very valuable information promised to the Bureau of Standards.

Next in order came the erection of the Observatory building proper. The plans had long been drawn up, but unavoidable delays referring to the adjoining vacation Villa postponed the actual commencement of erection until May 5th, 1952, when the contract was signed and the digging of footings started. Slowly, it seemed, the work dragged on, but really the progress was rapid, and the Observatory wing, on the west side of the top of Mirador, was blessed on November 13, 1952. On the following day the Observatory staff moved into its new home. On the

first floor of this wing are: the Observatory reception room and museum, store rooms, record room, workshop, four offices for the four members of the Observatory staff and two rooms for visitors. The second floor contains a fine combination library and recreation room, kitchen, dining room, toilet and showers, four living rooms for the staff and one room for visitors. Last but not least is the really beautiful domestic Chapel of Our Lady of the Sacred Heart, designed by Bro. Bencze, S.J.

Astronomy Planned

But what has the Observatory to offer in astronomy? Something *in re,* much more *in spe. In re,* it must be noted that a portion of the Observatory wing, thirty feet by thirty-two feet, is of reinforced concrete construction, in contrast with the rest of the Observatory and the Villa which are of wood. The purpose is to afford a very stable support for the eight-inch thick "deck" roof of reinforced concrete (all poured in a single day), rising like a floor for a third story to the Observatory. Here it is hoped in the not too distant future to place an eight-inch refracting telescope with Ross camera, for general photographic work on the heavens, and, primarily and principally, a spectro-helioscope of modern design. The latter would be for solar work in conjunction with the ionosphere research, since it is to bursts of ultraviolet light and streams of corpuscles from the sun that we owe the main electrification of the ionosphere. Fondly it is hoped that funds from the war damage claim under Act 303 will not only aid the realization of this dream, but also provide much needed endowment wherewith to carry on work in the future. It must always be remembered that the Manila Observatory is now no longer functioning as a government bureau, but is strictly private, and receives no funds in the form of salary or otherwise from any government entity. This carries with it the onus of seeking funds to exist, but it also confers the precious blessings of independence.

In great part, therefore, the Manila Observatory has already risen again from its ruins, and already is doing research work of admitted value. On April 27, 1951 Very Reverend Father John B. Janssens, General of the Society of Jesus, wrote to Rev. Leo A. Cullum, then Superior of the Philippine Mission, of the Society of Jesus, that he was very pleased to hear of the plan to maintain the Observatory's high reputation in science and even to increase this reputation.

With the funds in prospect the Observatory may, with the purchase and erection of our astronomical instruments, be able to increase its work and round out its plans for the resurrected Observatory. In any case it will continue the pursuit of fundamental scientific research for the benefit of humanity and the greater glory of God.

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