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Geographical Work in the Philippines

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valleys in the Nyasa mountains, lying between 3000 and 4000 feet, were among the most fertile and the best watered I have ever seen in Africa. There the climate is fresh and bracing, and might be quite suitable for European occupation. The valleys of the Luambala and the Msalala rivers appear exceptionally fertile, increasingly so as higher elevations are reached.

Our expedition met with the greatest kindness and assistance from all the Portuguese officials of the province, who went out of their way on all occasions to make things easy and pleasant for us. Carriers were enrolled, and gaps caused by desertions filled up for us, whenever we came in to a post, with a promptitude which, considering the difficulties, was little short of marvellous.

We eventually paid off our last contingent of porters at Fort Maguire—now a heap of ruins—and, after a short visit to Mtengula, where there is a particularly neat and efficient Portuguese post, we came down by lake steamer to Fort Johnston.

GEOGRAPHICAL WORK IN THE PHILIPPINES.

By WARREN DU PRÉ SMITH, Ph.D., F.R.G.S., Chief of the Division of Mines, Bureau of Science, Manila.

It might be said that America entered the great Eastern game by mere chance. She came to the Philippines looking for a hostile fleet, which she put out of the way, but at the same time she found a conglomeration of alien peoples on her hands, left like a foundling on the doorstep. She took them in, and at the same time took hold of the hardest problem she has had to solve since 1861. When America began her work in the Philippines she declared that she would teach the Filipinos the art of governing themselves according to her own standard. This, I dare say, is the boldest move ever made by any nation at any time within the history of colonization. What that scheme entails, or in how far the Filipino has been taught these new ideas, is not within the province of this paper. One thing, however, is pretty clear, that America besides being the teacher has been also a learner, and I predict that when all is balanced up it will be found that America and the Americans will have received the greater benefit.

In this article I shall discuss one of the most important phases of America's work in the Philippines. It is only one phase, but it is perhaps the most important of all the material undertakings as it is the basis for so many other kinds of enterprises. It would not be just to begin with the American *régime*, omitting all the enterprising work of the Spaniards and the English.

Up to 1521 the Philippine islands remained a *terra incognita* to
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MAP OF THE PHILIPPINE ISLANDS, 1654.

Western peoples, although the Chinese traded here long before the coming of white men. In that year the intrepid Magellan began his long cruise around the world; he touched first Borneo, then Cebú, one of the lesser islands of the group. Magellan landed and unwisely took part in a feud then raging between the people of Cebú and the inhabitants of Mactan, and on a spot now marked by a beautiful coral monument, in a coconut grove by the sea, he met his death. His good ship *Elcano* and what was left of the valiant crew sailed away to complete the first circumnavigation of the globe, to announce to the world the death of a hero, to tell of the wonderful isles of the East.

I shall not attempt to mention all those who have done exploratory work in the Philippines, but only the most important names and works. The British Admiralty, in accordance with its policy of developing commerce, has done considerable work in these waters, particularly along the coast of Paragua island, and has published a series of general and harbour charts of the islands. One of the earliest of the British explorers in this region was William Dampier, who discovered the Batanes islands in 1687. He called them the Bashi islands, after a native drink of that name. One of the earliest works in the English language pertaining to the geography of the Philippines was 'The Indian Directory, Directions for sailing to the East Indies, China, Australia, etc.," by James Horsburgh, F.R.G.S. In the years 1843-46, Captain E. Belcher, R.N., commanded H.M.S. *Samarang* on a voyage through the Eastern seas, where important explorations were made. He visited the Philippines. In 1883 occurred the cruise of the yacht *Marchesa*. This was commanded by Lieut. R. Powell, R.N. The narrative was written by F. H. H. Guillemard, M.D. The most important contribution from this voyage was a map of Cagayan Sulu, a small island in the Sulu sea, noted for its volcanic craters and hot springs. The *Challenger*, which visited the Philippines in the latter part of the year 1874, did not do much work of a geographical nature. Most of the time was spent in making zoological collections along the shores of the islands. Another hardy Briton to touch the Philippines was one Captain Thos. Forrest, who has left a record of 'A Voyage to New Guinea and the Moluccas, etc., in the *Tartar* galley.' He was in the employ at that time of the East India Company. The voyage extended over the period from 1774-76. In this book I have found some old prints of what are probably among the earliest charts of the shores of Mindanao. In 1880 the British survey ship *Flying Fish* was still engaged in coast survey work in the vicinity of Paragua and Borneo.

Of the long procession of navigators and geographers sent out from Spain in the three hundred years of that country's dominion, the first in point of seniority is Urdaneta, who was Legaspi's navigator. It will be remembered that Legaspi founded the city of Manila in 1571. Coming now to a discussion of the Spanish work, we find a long and

most interesting story, and one that reflects very great credit upon that nation of magnificent explorers. As elsewhere, we find the missionaries in the lead. There have been in the Philippine islands, at one time or another, six great religious orders, namely, the Franciscans, the Dominicans, the Augustinians, the Recoletans, the Capuchins, and the Jesuits. Each of these bodies has contributed to the mass of valuable geographical knowledge, information which would have been much more tardy in coming forth were it not for these intrepid apostles of Christianity. Of all these perhaps the most active have been the members of that great body, the Society of Jesus, which has left its impress all over the world. For a long time we were indebted to this body for almost all the reliable

EXPLORING PARTY (BUREAU OF SCIENCE) ON THE SUMMIT OF MOUNT APO, JAN. 1907,
9610 FEET.

information regarding the mysterious and wild island of Mindanao, which had been practically under their entire control for years. When the American Government came to take an inventory of its new possessions, the Jesuits had a large collection of maps of the islands. These were turned over to the United States and published under the title 'Atlas de Filipinas.' This atlas contains thirty maps, of which eleven were executed by Enrique d'Almonte, one by Enrique Abella, one by the hydrographic commission, and three by the Jesuits. The remainder were compiled from various sources, the British Admiralty charts, etc. I am fortunate to be able to reproduce here a copy of one of the earliest maps of the Philippines. In the light of what we now

know, it is very much of a curio. This map is now in the library of the Dominican monastery in Manila.

Of all those engaged in map-making during the Spanish *régime*, D'Almonte stands out as the foremost. His maps, in most cases not based on any accurate control, are, for the character of the country traversed, the extent and execution, simply wonderful. Certainly no other one man in the Philippines, either before or since, has accomplished so much. Don Enrique D'Almonte was attached to the Mining Bureau with the title *auxiliar facultativo*, which simply means scientific assistant. He and Don Enrique Abella y Caseriego, the chief of the *Cuerpo de Ingenieros de Minas*, constantly worked together, D'Almonte as topographer, and Abella as mining engineer and geologist. Knowing, as I do, the natural difficulties of the country, the extremely savage people that exist in some parts of the islands, the very trying climatic conditions, I must regard D'Almonte as one of the great explorers of the twentieth century. I do not know if he has ever received fitting testimony of appreciation from his fellow-geographers in other parts of the world. If not, this tardy recognition should be soon forthcoming.

Before passing on to an account of French research, I must call attention to the magnetic surveys made in Mindanao by the Jesuits. One very important feature was discovered, namely, that there is a very close connection between the magnetic inclinations and the Agusan valley, one of the principal tectonic lines of the island.

I shall allude very briefly to the subject of French exploration in the Philippines for the very good reason that that nation has done very little along this line in the Philippines. The two most important contributions that I have been able to find are: First, a map entitled "Les Isles Philippines, Moluques et de la Sonde," by M. Sanson d'Abbeville, published in Paris in 1654. This is the earliest map of these islands I know of. A copy of this map is now in the archives of the Dominican monastery in Manila, and I am fortunately able to reproduce it here. The second, and probably the most important contribution, is that of Dr. J. Montano, who visited the Philippines and travelled rather extensively in the islands during the years 1879-81. Dr. Montano spent a large part of his time in Mindanao, and he with the then Governor of Davao, Rajal, made the first ascent of Mount Apó of which we have any record.

When I ascended Mount Apó in 1907, I found near the summit a clay tablet bearing the inscription —

"La Unica Expedicion á Volcan Apó
1880
Montano y Rajal."

Dr. Montano was also one of the first white men to make the entire trip from Davao up the Tagum river, over the divide, and down the long

VIEW OF THE GOLD COUNTRY OF LUZON (ANTIMOK VALLEY).

Agusan river to Surigao. He also made many very valuable anthropological, ethnological, social, and economic studies which have been published by the Department of Instruction of the French Government.

The work being done under the American *régime* is rather heterogeneous. The following bureaus and departments are at present engaged in mapping, for one purpose or another, various portions of the public domain: the United States Army; the United States Coast and Geodetic Survey; the Bureau of Constabulary; the Bureau of Lands, and the Division of Mines of the Bureau of Science. The basal work, and therefore necessarily the most accurate work of all, is that done by the Coast and Geodetic Survey. In order best to show what that organization has done, I shall include here some extracts from a memorandum which Mr. E. F. Dickins, Director of Coast Surveys, has especially prepared for me for this article. He says—

“The land area of the Philippine islands is about 115,026 square miles, and consists of over 3100 islands and islets. The water area is about five times greater in extent than the land area, and the shoals and reefs in this area of water must be carefully located and surveyed, as are the adjacent shores. About the same method of surveys as used in the United States was adopted here, only slightly modified to suit the existing conditions, and are as follows: Astronomical determinations, to furnish the latitudes and longitudes of points which are used as bases, and also azimuths to enable the charts to be correctly oriented. All these elements are determined by star observations. The triangulation furnishes a framework for the detailed survey operations, establishing the correct relative positions of the controlling points: the bases for this work are carefully measured with a steel tape. The hydrography furnishes the information regarding the water area of the charts. For the inshore work and detailed examinations of shoal and dangers a boat or launch is used, and the soundings made with a hand lead-line; for the offshore work the steamers are used, and various forms of sounding machines employed. The topography furnishes the information as to the land area of the charts, and is generally confined to the shore-line and its immediate vicinity, with the location of all prominent peaks and other landmarks that may be of service to the navigator. Tidal observations are always made in the immediate vicinity of the hydrographic work, both for use in the reduction of soundings to a common plane, and in order to make the tidal predictions which are published in our Annual Tide Tables. Magnetic observations are made in connection with every survey to determine the variation of the magnetic needle from true north, information which is placed on every chart. The Manila observatory has maintained continuous magnetic records for a number of years, but we have to obtain the data for the locality of each survey. The magnetic variation is small in the Philippines, and the line of no variation, where the needle points true north, touches the north of Luzon island.

“Active work was commenced in the Philippines in December, 1900. A sub-office was established in Manila, and two vessels were equipped for the work—the steamer *Pathfinder* by the Federal Government, and the steamer *Research* by the Insular Government. At the present time we have five steamers and one chartered launch, with a complement of 284 officers and men engaged in field work, and an office force in

BUILDING THE BENGUET ROAD, LUZON.

Manila of about 45, consisting of computers, draftsmen, and clerks. The cost of operation is borne in conjunction by the Federal and Insular Governments. The United States pays about 65 per cent. of the expenses, supplies one large steamer, all the technical force in the field, the supervising technical force in the Manila office, all the instruments and outfit, and meets the entire cost of the final revision and

publication of the charts, tide-tables, sailing directions, and other results. The Insular Government defrays about 35 per cent. of the cost of operation, furnishes four steamers and keeps them in repair, and supplies the office accommodations in Manila."

The total area within boundaries of Philippine islands, taking treaty limits (approximately), square statute miles	...	...	...	...	700,686
Land area of Philippine islands, square statute miles	...	...	...	...	115,026
Total water area within boundaries, square statute miles	...	...	...	...	585,960
Total length of general coast of the Philippine islands in statute miles (approximate)	...	...	...	...	11,511
Total length of general coast-line surveyed up to June 30, 1908, in statute miles (approximate)	...	...	...	...	3,418

TOTAL STATISTICS OF FIELD-WORK EXECUTED DURING THE YEAR ENDING
JUNE 30, 1908.

Triangulation—

Square miles of area covered	...	...	...	...	13,805
Stations occupied	...	...	...	...	285
Mountain peaks determined	...	...	...	...	143
Geographical positions determined	...	...	...	...	479
Azimuth stations occupied	...	...	...	...	3
Base lines measured	...	...	...	...	3
Magnetic stations occupied	...	...	...	...	9

Topography—

Square miles of area covered	...	...	...	...	1,547
Miles of detail coast-line surveyed	...	...	...	...	1,573
Number of topographic sheets completed	...	...	...	...	54

Hydrography—

Square miles of area sounded	...	...	...	...	9,614
Miles of lines run while sounding	...	...	...	...	24,454
Number of soundings made	...	...	...	...	561,415
Tidal stations established	...	...	...	...	45
Number of hydrographic sheets completed	...	...	...	...	72
Number of steamers employed	...	...	...	...	5
Number of chartered launches employed	...	...	...	...	2
Number of officers and men on vessels and launches	...	...	...	...	284
Number of miles of general coast-line charted	...	...	...	...	944
Area sounded over, square miles	...	...	...	...	9,614

The Bureau of Lands is obviously created for the purpose of making cadastral surveys. Besides making innumerable patent surveys for mineral and forest concessions, it has had the large task of surveying the great estates known as the Friar Lands. It may be said here that after the insurrection there arose disputes over certain great tracts of the best land in the islands. The three parties involved were the Government, the religious orders, and the natives. One of Mr. Taft's greatest achievements in the administration of the Philippines is the amicable settlement of this big question of the Friar Lands. But besides this mass of routine work, this bureau has found time to extend its functions and initiate some very important work of a much greater

scope. In this work, which I shall outline more fully below, two men have been the most active—Mr. S. O. Scudder, chief surveyor, and Mr. Chas. Benson. The latter, on the completion of a large amount of patient work in the more civilized portions of the Mountain province, pushed northward up the Agno river, mapping all the way. His party

THE BENGUET ROAD COMPLETED, LUZON.

surveyed, during portions of three years, 470 miles of rivers and trails, sketching 620 square miles of topography, and established the elevations and locations of 1739 points by the vertical angle and intersection method. This work was done at the rate of about £2 10s. per lineal mile of traverse, or about 38s. per square mile of topography. As the traverse surveys alone cost about one-half the total amount, the actual

cost of the topography was at a rate of \$3.62 per square kilometre. Mr. Benson, upon his own initiative, made some experiments in photo-surveying. Owing to rain and accidents, most of the plates exposed in the one expedition on which the method was tried (Cervantes to Tegudin) were spoiled. However, enough were preserved to demonstrate that excellent results can be obtained in an open country and at a very low cost. Much of the north central Luzon country is quite open and exceedingly rugged, just the type of country most suited to this method. The Director of the Bureau of Lands, with his assistants, has elaborated a general plan which we earnestly desire to see fulfilled. It is, as follows, quoting from his memorandum: "This plan involves the putting into the field by the Coast and Geodetic Survey of a party to execute a triangulation extending south from Manila through the provinces of Rizal, Laguna, Batangas, Albay, and Sorsogon, covering the most important part of the island of Luzon from the view point of population and commercial and agricultural activity; this survey party to locate church towers or other prominent objects in each municipality within the field of operations. This plan also involves the placing of a survey party to operate in the area covered by the triangulation system of the Coast and Geodetic Survey between Manila and Dagupan, and, upon the completion of the work south of Manila, this triangulated area to be covered further in the following manner: The survey parties of the Bureau of Lands are to set two permanent monuments in the vicinity of each municipality in which a point has been located by the Coast and Geodetic system of triangulation, to determine the true azimuth and distance from the triangulation point. An accurate survey is then to be made of the streets of said municipality, and an accurate traverse line run from these monuments over the main roads connecting adjacent municipalities. This will then give an accurate skeleton map of all municipalities and main roads within the area defined."

Soon after the conclusion of hostilities (it is very difficult to say just when that occurred) the United States Army began systematic topographic mapping all over the islands. This work is of not so accurate a nature as that done by the Coast and Geodetic Survey, for two very good reasons: first, a map for military purposes does not have to be as accurate as one upon which navigation and public works depend; and, second, the men who do this class of work in the army, while they are all more or less trained men, are primarily soldiers and not professional topographers. The topographers of the army, of whom there are at present twenty-three in the Philippines, have covered an immense area throughout the islands, a large part of which is in the little-known interior of Mindanao, where it has not been altogether safe for other than a military party to operate. In this region the work of Captains Moore and Murphy deserves especial mention. Military topographic

parties are now working northward in Luzon from the vicinity of Manila. In the Visayan islands, Leyte, Cebú, and Panay, they have also been very active.

The Bureau of Constabulary, which is a sort of insular police organization, is also doing considerable map work of a very serviceable nature, though much less accurate than that done by the other organizations. This organization is made up of native soldiers officered for the most part by white men. Very frequently it is necessary for these men to go into portions of the country seldom, if ever, visited by any of the other organizations I have mentioned, and their reconnaissances are of great value, as upon them alone we must rely for any information whatever concerning certain districts.

AN IGORAT DANCE, LUZON.

The Division of Mines of the Bureau of Science is the lineal descendant of the Old Mining Bureau of Spanish days. It is the function of this organization "to make, facilitate, and encourage special studies of the mineral resources, mineral industries, and geology of the Philippine islands; to collect statistics concerning the occurrence of the economically important minerals, and the methods pursued in making their valuable constituents available for commercial use; to make collections of typical geological and mineralogical specimens, especially those of economic and commercial importance, such collections to constitute the museum of the Mining Bureau, subject, however, to transfer by executive order of the Civil Governor to any general

museum established; to provide a library of books, reports, drawings, etc., bearing upon the mineral industries, the sciences of mineralogy and geology, and the arts of mining and metallurgy, such library constituting the library of the Mining Bureau; to make a collection of models, drawings, and descriptions of mechanical appliances used in mining and metallurgical processes; to preserve and so maintain such collections and library as to make them available for reference and examination, and open to public inspection at reasonable hours; to maintain, in effect, a bureau of information concerning the mineral industries of the Philippine islands; to make an annual report to the Secretary of the Interior, setting forth the important results of the work of the Bureau, such special reports as may be called for by proper authority, and such bulletins concerning the statistics and technology of the mining industries and of the geological and mineralogical and other office and field work of the Bureau as may be approved by the Chief of the Bureau and ordered published by the Secretary of the Interior."

Because of the absence of accurate detail topographic maps of the mineral districts, Mr. McCaskey, the second chief of the Mining Bureau since 1898, initiated a series of surveys of three districts. He began the work himself in 1893 in the Angat iron-field, in Luzon. This was followed by maps of the Mancayan copper district by Messrs. Goodman and Ickis; the Baguio Mineral district by Mr. A. J. Eveland; the Danao-Compostela coal-field, in Cebu, by Messrs. Goodman and Ickis; the Masbate gold-fields, triangulation by Messrs. Goodman and Ickis; topography by Mr. H. G. Ferguson. The next field selected is the Paracale gold-field of Ambos Camarines, in south-eastern Luzon. These areas vary from 40 to 150 square miles, and represent the most accurate topographic work yet done anywhere in the Philippine islands. All this work is tied to points established by the Coast and Geodetic Survey, and both transit and stadia and telescopic plane-table have been used. Besides this work the various members of this staff have made longer or shorter route surveys in many portions of the islands. In the latter part of 1907, and in the early part of 1908, an expedition was made by three members from this division, consisting of the chief as geologist, Mr. Goodman as mining engineer, and Mr. Ickis as topographer, over the following route in Mindanao: Cagayan to Seville, Camp Overton to Malabang, Malabang to Cottabato, Cottabato to Davao, Davao to Butuan over the entire length of the Agusan river, and many shorter routes.

Route-maps showing topography were made wherever possible. The narrative of this expedition has already appeared in the *Philippine Journal of Science*. It is a matter of the profoundest regret that we must record here the murder of Mr. Ickis on April 1, 1908, just about at the completion of this long and arduous trip. That a man of his

sterling character, high efficiency, and loyal nature should be cut off by the ruthless hand of the savage is hard to become reconciled to. When the final history of American endeavour in these islands shall come to be written, his name should be placed high on the roll of honour. In 1906 Mr. Ickis made a route-map with geological notes across Luzon, the first time a complete section had been made.

A similar expedition to the Mindanao one is now being planned by this division for the early part of 1909 to explore the almost absolutely unknown Sierra Madre range between the Cagayan river and the eastern coast of Luzon. For this work we have been promised the co-operation of the U.S. Army. This party, it is hoped, will consist

BAGOBO HOUSE AND PEOPLE ON THE SLOPES OF MOUNT APO, MINDANAO.

of two geologists, an ethnologist, a botanist, an entomologist, and two topographers from the U.S. Army. This expedition will last five or six months, and will traverse the country occupied chiefly by the little-known tribe known as Ilongots.

So far I have referred only meagrely to botanical, ethnological, geological, etc., investigations being carried out in the Philippines. The number of travellers who have visited these shores for the purpose of study, political, ethnological, and botanical features is legion. Many like Semper, Von Drasche, Whitehead, Jagor, Blumestritt, Foreman, Worcester, etc., have made real contributions; while many others, though they have written voluminously, are to be classed rather with tourists than with serious-minded students.

The Government of the Philippine islands maintains a corps of trained scientific men known as the Bureau of Science, of which Dr. Paul C. Freer is director. This consists of divisions of ethnology, geology and mines, chemistry, and biology, in which are included sections of botany, entomology, ornithology, and fisheries. All scientific articles are published in the *Philippine Journal of Science*, which is now in its third year.

Besides the Bureau of Science, especial mention should be made of the Bureaus of Forestry and Agriculture, which are making forestry and soil maps respectively of the Public domain.

All of the scientific work is directed by the Secretary of the Interior, the Honourable Dean C. Worcester, a Fellow of the Society. It is particularly fortunate that this work is guided by a man with his reputation as a scientist, and one who has had a longer and more thorough acquaintance with the country and its peoples than any other American.

The regions still unexplored are the central portions of Mindanao lying north of the Kabakan river and between Lake Lanao and the Agusan river. Mr. Ickis was in the heart of this tract when he was killed. With him were lost all his maps, notes, and instruments. The second big unknown tract is Central Mindoro. Until recently Mount Halcon in the northern part had remained unscaled, but a party consisting of Major E. A. Mearns, U.S.A., Mr. E. D. Merrill, botanist, Bureau of Science, made the ascent. The third largest tract is in the Sierra Madre mountains in Isabella and Kagayan provinces, in the north-eastern part of Luzon; and a fourth is the territory lying between the Kagayan river and the Cordillera del Norte, also in Luzon.

I wish to make grateful acknowledgments of much assistance rendered me in the preparation of this article by my friend Mr. John T. Macleod of Manila.

NOTE ON THE ATOLL OF ONGTONG JAVA OR LORD HOWE'S GROUP IN THE WESTERN PACIFIC.

By C. M. WOODFORD.

As this group of islands is referred to in a paper entitled "The Western Pacific: its History and Present Condition," by Sir Everard im Thurn, read before the Society on May 10, 1909, and printed in the September number of the *Geographical Journal*, it seems to me that the present is a not inopportune moment for the publication of a note which I prepared some time ago on the origin of the name "Ongtong Java," bestowed by Tasman upon the islands sighted by him during his voyage of discovery.

The group of islands marked upon the present Admiralty chart in