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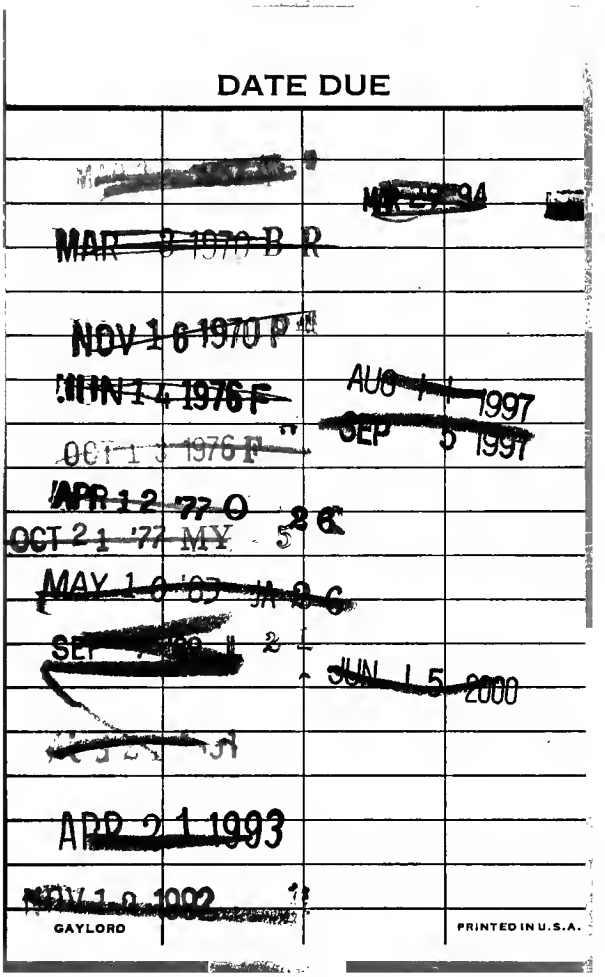

THE PHILIPPINE
JOURNAL OF SCIENCE

THE PHILIPPINE JOURNAL OF SCIENCE.

During the coming year a series of articles on ethnological and ethnographical subjects will appear in the Philippine Journal of Science. The first article of this series appears in this number of the Journal. The following additional papers will certainly be available:

1. The Non-Christian Tribes of Southern Luzon, with Map Showing Distribution of Non-Christian Tribes throughout the Entire Island of Luzon; by Dean C. Worcester.
2. The Tagbanua and Mangyan Alphabets; by Dr. T. H. Pardo de Tavera.
3. The Subanos of the Zamboangan Peninsula; by Edwin B. Christie.
4. Primitive Philippine Fire-Making Apparatus; by Dean C. Worcester.

This entire series of ethnological and ethnographical papers will be of fundamental importance to all who are interested in the peoples of the Philippine Islands.

3. BUSAOS.

Habitat: The northern part of Tilas Cordillera, Tiagan, the northern half of Lepanto and Bontoc on the northern waters of the Rio Cagayan.

4. ALTASANES and ILIMUTES.

Habitat: Nueva Vizcaya.

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THE NON-CHRISTIAN TRIBES OF NORTHERN LUZON.

By DEAN C. WORCESTER.
(*From the office of the Secretary of the Interior, Manila, P. I.*)

INTRODUCTION.

In this article the words "Northern Luzon" are used to designate that portion of the island lying north of a line drawn due east from the city of Manila to the Pacific coast.

Great confusion exists as to the classification and geographical distribution of the non-Christian tribes inhabiting this area. It would be impracticable, within the limits of a brief article, to discuss all of the different classifications which have heretofore been proposed and I shall confine myself to three of the latest and most authoritative. In 1882 Prof. Ferdinand Blumentritt published his "Versuch einer Ethnographie der Philippinen," in which he recognizes one race and tribe, the *Negritos,* and a second race, the *Malays,* which he subdivides into twenty-three tribes. His classification by tribes stands as follows:

1. THE NEGRITOS.
   Habitat: Principe, Isabela, Cagayan, North and South Ilokos, Abra, Pangasinan, Zambales, and Bataan.
2. IGORROTES.
   Habitat: Benguet, Lepanto, including the district of Tiagan and Bontoc.
3. BUSAOS.
   Habitat: The northern part of Tilas Cordillera, Tiagan, the northern half of Lepanto and Bontoc on the northern waters of the Rio Cagayan.
4. ALTASANES and ILIMUTES.
   Habitat: Nueva Vizcaya.

5. BUJUANOS.
   Habitat: Isabela.

6. PANUIPUYES.
   Habitat: Nueva Vizeaya and Isabela. "Perehance only a branch of the Mayoyaos."[1]

7. ISINAYS.
   Habitat: The middle eourse of the Agno River.

8. IBILAOS.
   Habitat: The region extending from the border line between Nueva Vizeaya and Nueva Eeija to the vieinity of Baliran.

9. ILONGOTES.
   Habitat: Nueva Vizcaya, Isabela, Principe and northern Nueva Eeija.

10. MAYOYAOS; also called QUIANGANES, PUNGIANES, and SILIPANES.
    Habitat: Southern and eastern Bontoe and northern Nueva Vizcaya.

11. IFUGAOS.
    Habitat: Left bank of the Magat River to the south and southwest from Fural between Mayoyao and Camarga in Nueva Vizcaya.

12. GADDANES. (A considerable number of this tribe christianized.)
    Habitat: The region between the Magat River and the Rio Chico.

13. ITETAPANES.
    Habitat: The territory to the east of the *Busaos* and the west of the *Gaddanes.*

14. GUYMANES (QUYMANES, QUIAMANES).
    Habitat: Territory north of the *Busao Igorots,* especially the eastern slopes of the Cordillera which separates the Province of Abra from Cagayan; the right bank of the Abra River to the left of the Pusulgan River marks the western limits reaehed by them.

15. CALAUS or ITAVES.
    Habitat: Western Cagayan from Piat and Tuao on the south to Malaueg on the north.

16. GAMUNANGES and BAYABONANES.
    Habitat: Mountains east and north of Tuao, Province of Cagayan; may be a branch of the *Dadayags.*

17. DADAYAGS.
    Habitat: Left bank of the middle portion of the Rio Grande, Provinee of Cagayan, extending into the heights near Cabagan.

18. NABAYUGANES.
    Habitat: Region to the west of Malaueg on one of the northern affluents of the Rio Chieo, Province of Cagayan.

19. ARIPAS.
    Habitat: Region between the Nagsiping and Tubang to the south of the union of the Rio Grande and Rio Chico, Province of Cagayan; also the southern part of the mountain range which forms the watershed between the Rio Grande de Cagayan and the Rio Apayao.

20. CALINGAS.
    Habitat: The mountains where the *Aripas* dwell and farther north.

[1] Blumentritt: *Versuch einer Ethnographie der Philippinen* (1882), 32.

21. TINGUIANES (ITANEGAS, TINGGIANES, TINOUES).

Habitat: From Candon in Ilokos Sur to Mount Pacsan on the border line between Cagayan and Ilokos Sur; also extending south to the neighborhood of Santa Cruz and Namacpacan, so that they inhabit the Provinces of Ilokos Sur, Abra, and Ilokos Norte.

22. APAYAOS.

Habitat: Valley of the Apayao River and northern portion of eastern slope of the mountain chain which separates the Province of Cagayan from Ilokos Norte, extending south to Malaueg.

23. CATALANGANES.

Habitat: Catalangan River, one of the right branches of the Rio Grande, in the Province of Isabela.

24. IRAYAS.

Habitat: The region to the south of the *Catalanganes*, chiefly on the west side of the Cordillera of Palanan.

In 1890 Professor Blumentritt published his "Alphabetisches Verzeichniss der eingeborenen Stämme der Philippinen und der vor ihnen gesprochenen Sprachen." This list differs from that published in 1882 in the following particulars:

The *Altasanes* and *Alimut* are given as separate tribes, as are the *Bayabonanes* and the *Silipanes*, while the following tribes not mentioned in his first list are added:

ABUNLON.
Habitat: Mountains of Zambales.

BUNGANANES.
Habitat: Isabela and Nueva Vizcaya.

IFUMANGIES.
Habitat: Nueva Vizcaya.

ILAMUT.
Habitat: Vicinity of Quiangan, Nueva Vizcaya.

ILEABANES.
Habitat: Nueva Vizcaya.

ITALONES.
Habitat: Mountains of Nueva Vizcaya.

JUMANGIS.
Habitat: Central (?) Luzon.

PUNGIANES.
Habitat: Not given.

The total number of tribes recognized by Professor Blumentritt is thus raised to thirty-six.

In 1899 a number of priests of the Jesuit mission of Manila collaborated to produce, for the use of the first Philippine Commission, a very full account of the Philippine Islands, their resources, and their people.[2]

[2] Published in *Report of the Philippine Commission* (1900), **3**, 333–412.

They recognized three races, the *Negrito,* the *Indonesian,* and the *Malay,* of which only the *Negrito* and the *Malay* were believed by them to be represented in northern Luzon. The Malay race they divided into three subraces—the *Malay-Negritos,* the *Malay-Chinese,* and the *Malay-Mohammedans.*

In order to facilitate comparison, I give these two lists in tabulated form:

Name of tribe.		Habitat.
Blumentritt's list.	Jesuit list.	
1. Abunlon	1. Abunlon	Mountains of Zambales.
	2. Aetas	Pangasinan and Zambales.
2. Adang	3. Adaugtas	Mount Adang in North Ilokos.
3. Alimut		Quiangan (?), Nueva Vizcaya.
4. Altasanes		Northwestern Nueva Vizcaya.
5. Apayaos	4. Apayaos	Northwestern Cagayan and neighboring parts of North Ilokos and Abra.
6. Aripas	5. Aripas	Near Nacsiping and Tubang, Cagayan.
7. Bayabonan		Mountains east of Tuáo, Cagayan.
	6. Attas	Eastern mountain chain of Cagayan, down to the Pacific coast.
8. Bujuanos		Isabela.
9. Bungananes		Nueva Vizcaya and Isabela.
	7. Balugas	Eastern cordillera of Nueva Ecija; mountains bordering on Tarlac and Pampanga; Cordillera of Zambales; eastern mountains of North and South Ilokos.
	8. Buquiles	Zambales.
	9. Burics	Abra.
10. Busaos	10. Busaos	Siguey mountains, Abra, near Benang (Jesuits).
11. Calauas	11. Calauas	Valley of the Rio Chico near Malaueg, Cagayan.
12. Calingas	12. Calingas	Between the Rio Grande de Cagayan and the Ablug River.
13. Catalanganes	13. Catalanganes	Watershed of Catalañgan River, east of Ilagan, Isabela.
14. Dadayag		Mountains west of Cabagan, Cagayan.
	14. Dumagas	Mountains from Baler and Casiguran to Cape Engaño.
15. Gamungan		Mountains east and north of Tuao, Cagayan.
16. Guinaanes	15. Guinaanes	Watershed between Abra River and Rio Grande de Cagayan. Border territory between Isabela and Abra.
17. Ibilaos	16. Ibilaos	Border territory of Nueva Vizcaya and Nueva Ecija.
18. Ifugaos	17. Ifugaos	Nueva Vizcaya and Isabela (Blumentritt). Missions of Ituy and Paningui, eastern Carraballos (Jesuits).
19. Ifumangies		Nueva Vizcaya.
20. Igorrotes	18 Igorrotes	Benguet and Lepanto (Blumentritt). Abra, Pangasinan, Nueva Vizcaya, Zambales, and Pampanga (Jesuits).
21. Ilamut		Nueva Vizcaya in cordillera forming boundary with Benguet.
22. Ilcabanes		Nueva Vizcaya.

Name of tribe.		Habitat.
Blumentritt's list.	Jesuit list.	
23. Ilongotes	19. Ilongotes	Boundary region of Nueva Vizcaya and Principe; also Nueva Ecija.
24. Irayas	20. Irayas	Western slopes of the cordillera of Palanan (Blumentritt). Banks of River Ilaron and eastern slopes of Sierra Madre on the side of Nueva Vizcaya, Isabela, and Cagayan (Jesuits).
25. Isinays	21. Isinays	Nueva Vizcaya (Blumentritt). Panay (Jesuits).
26. Italones	22. Italones	Nueva Vizcaya.
27. Itetapanes	23. Itetapanes	Western Isabela and possibly Bontoc (Blumentritt). Territory east of the Busaos, bounded on the south by the Igorrotes of Benguet and on the north by the Guinaanes (Jesuits).
28. Jumangi		Central (?) Luzon.
29. Mayoyaos		Southwest corner of Isabela and northwest corner of Nueva Vizcaya.
30. Nabayuganes		Territory west of Malaueg, Cagayan.
31. Negritos	24. Negritos	Different parts of Luzon (Blumentritt). Bataan, North and South Ilokos, and Nueva Ecija (Jesuits).
32. Panuipuyes		Western Nueva Vizcaya or Isabela.
33. Pungianes		Not given.
34. Quianganes	25. Quianganes	*Comandancia* of Quiangan, Nueva Vizcaya.
35. Silipanes		Do.
36. Tinguianes	26. Tinguianes	Abra and North and South Ilokos (Blumentritt). Cordillera of Tila and Province of Abra (Jesuits).

It will be noted that the Jesuits enumerate but twenty-six tribes while Blumentritt lists thirty-six. The *Alimut, Altasanes, Bayabonanes, Bujuanos, Bungananes, Dadayag, Gamungan, Ifumangies, Ilamut, Ileabanes, Jumangi, Mayoyaos, Nabayuganes, Panuipuyes, Pungianes,* and *Silipanes* do not appear in the Jesuit list, and on the other hand the *Aetas, Attas, Buquiles, Burics, Balugas,* and *Dumagas* of the Jesuit list are omitted by Blumentritt, and rightly so, as all of these peoples except the *Burics* are Negritos, while the word *buric* means *tattooed* or *painted* and is used in describing certain tattooed persons. It is not a tribal name.

In 1902 Dr. David P. Barrows, at that time Chief of the Bureau of Non-Christian Tribes, wrote for the Census of the Philippine Islands a history of the non-Christian tribes of the Philippines[3] in which he makes the following statement:

One impression that has gained foothold in regard to the tribes of the Philippines I believe to be erroneous, and that is as to the number of distinct types or races and multiplicity of tribes. Owing to the fact that nowhere in the Philippines do we encounter large political bodies or units, we have a superlative number of designations for what are practically identical people. The tribe itself

[3] *Census of the Philippine Islands of 1903* (1905), 1, 453–477.

as a body politic is unknown in this Archipelago. The Malayan has never by his own effort achieved so important a political organization. Such great and effective confederacies as we find among the North American Indians are far beyond the capacity of the Filipino of any grade. For example, among the powerful and numerous Igorot of northern Luzon the sole political body is in the independent community. * * *

Errors in nomenclature prevail everywhere in the Islands. Sometimes three or four different terms have been applied by different localities or towns to identical peoples, and all these designations have gone to swell the reputed number of Philippine tribes. Thus Blumentritt credits fully eighty-two such distinct tribes; the Jesuits, who have been diligent collectors of information here, as everywhere, report sixty-seven tribes, and the enumerators for the census turned in on their schedules a total of about one hundred and sixteen different or differing titles, which had to be explained and reduced to system.

Dr. Barrows, in his history, adopts the following classifications for the tribes of northern Luzon:

NEGRITO RACE.

Tribe, NEGRITOS. (Synonyms: ITA, ETA, AGTA, BALUGA, DUMAGAT, ABUNLON.)

Habitat: Cagayan, Isabela, Ilokos Norte, Abra, Nueva Vizcaya, Tayabas (Principe and Infanta), Nueva Ecija, Bulacan, Rizal, Pangasinan, Tarlac, Zambales, Pampanga, and Bataan.

MALAY RACE.

Tribe, IGOROT.

Habitat: The Cordillera Central from the extreme north of Luzon to the plains of Pangasinan and Nueva Ecija.

Under *Igorot*, he employs various dialect group designations such as the *Gaddang, Dadayag,* and *Mayoyao,* said to be divided solely by slight differences of dialect. He states that the exact number of these groups has not thoroughly been worked out, but that he has personally studied and collected vocabularies of twelve and believes that this number includes all except minor variations and one branch in the extreme north of the cordillera, called *Apayaos.* This last people, he says, is on both slopes of the cordillera, but far more numerous on the Cagayan side.

Referring further to these dialect groups of people, he mentions the following:

DADAYAG.

Habitat: The head waters of the Rio Chico de Cagayan in Itaves district, Cagayan Province, where they occupy the low foothills of the Cordillera Central.

GADDANG.

Habitat: The region farther south, along the same foothills as the *Dadayag,* extending through Isabela.

KALINGA.

Habitat: The region east of the *Dadayag* and *Gaddang.*

BANAOS.

Habitat: The region midway between Balbalasan and Labuangan, as well as the Saltan River valley, all in the Province of Bontoc. They are regarded by Dr. Barrows as the prototype of the present more civilized *Tingian.*

BUNNAYAN.

Habitat: Western part of old Spanish *comandancia* of Quiangan.

SILIPAN.

Habitat: Eastern part of old Spanish *comandancia* of Quiangan.

MAYOYAO.

Habitat: Region on dividing line between Quiangan, in the Province of Nueva Vizcaya, and the Province of Isabela.

ISANAY.

Habitat: Mountains west of the civilized portion of Nueva Vizcaya.

TINGUIANS.

Habitat: Abra and eastern mountains of Ilokos Sur and Ilokos Norte.

KANKANAY.

Habitat: Northern Benguet and Amburayan.

NABILOI.

Habitat: Southern Benguet and the district of Kayapa of the same province.

Dr. Barrows states that for the purpose of ethnological classification all these peoples represent one group. He then discusses what he terms a very curious tribe of head-hunters known among the people of Nueva Vizcaya as *Ibilao* but sometimes designated as *Ilongot.*

Habitat: Head waters of the Rio Grande de Cagayan in Isabela Province, Caraballo Sur Mountains, thence southeast through the mountainous portions of Nueva Ecija and Principe.

This tribe he apparently does not regard as one of the "Igorot peoples."

He next refers to the nomadic Malayan families living southward in the montainous country north of Rizal Province and occurring also in Ambos Camarines, Negros, and Panay. These people are designated by him a wild " type," and with other peoples are included under the designation *Bukidnon.* If he gives the *Bukidnon* tribal rank, as he apparently does, Dr. Barrow's classification stands as follows:

Race.	Tribe.	Dialect groups.
1. Negrito	1. Negrito.	
2. Malay	2. Igorot	Gaddang. Dadayag. Mayoyao. Kalinga. Banaos. Bunnayan. Silipan. Ganay. Tinguians. Kankanay. Nabiloi. Apayaos.
	3. Ilongot.	
	4. Bukidnon.	

I am in entire accord with all that Dr. Barrows has said relative to the superabundance of tribal designations. In a number of instances, two or more have been given to the same tribe. The names *Ibilaos* and *Ilongotes,* for instance, are clearly two distinct designations for a single people. However, I am of the opinion that there is another and much more important source of error. It is undoubtedly true that the ideas which existed among the Spaniards as to the meaning of the word "tribe" were rather vague. Throughout the Cordillera Central the *rancheria* or settlement is the social and political unit. In the head-hunting countries *ranchérias* of people of the same tribe were constantly at war with each other, and the blood feuds between them were handed down from generation to generation. As a result, intercourse between these *ranchérias* was more or less completely cut off for scores of years. It was unavoidable that differences of dialect should develop under such circumstances.

Further study of the peoples of northern Luzon has shown that such variations have appeared to a greater extent than Dr. Barrows had been led to believe.

It was the usage of the Spaniards to designate as a tribe each group of people which had a dialect, more or less peculiar, of its own. Furthermore, the custom which is widespread among the hill people of northern Luzon of shouting out the name of a settlement when they desire to call for one or more persons belonging to it, seems in many instances to have led the Spaniards to adopt settlement names as tribal ones, even when there were no differences of dialect between the peoples thus designated.

In criticising Professor Blumentritt's classification, it must be remembered that he has never visited the Philippine Islands. He is a compiler, pure and simple, and when preparing his list of Philippine tribes has been compelled to follow, more or less blindly, the persons from whom he has derived his information. After nearly four centuries of Spanish occupation and rule, extensive areas in northern Luzon remained entirely unexplored at the time of the American occupation, and it has proved a simple matter to find, in the northern part of the Cordillera Central, extensive river valleys within which the face of a white man had never been seen prior to that date. The alleged facts as to the inhabitants of this region were necessarily hearsay when they reached the Spaniards, and second-hand hearsay when they reached Professor Blumentritt.

At the time their list of Philippine tribes was prepared, the Jesuits had never occupied missions in northern Luzon, and no explorations had been made by the Americans in that part of the island, so that they were forced to digest, as best they could, the miscellaneous mass of information prepared for them by Blumentritt and other writers.

Dr. Barrows had the benefit of personal acquaintance with many of the peoples concerning whom he wrote.

In July, 1902, he left Baguio, in the Province of Benguet, and traveled north by way of Tublay, Kapangan, Balakbak, Kibungan, and Palina. Crossing into

Amburayan he visited Bokong, Tubaoo, Bagu, Balhalit, Lameo, Buanis, Amilugan, Bais and Alilem, the capital of the subprovince. From Alilem he went to the coast and north to Candon, thence to Salcedo, and by way of Barakbak and Paltog to Tiagan; thence to Angaki and Cervantes, returning to Baguio by way of Buguias and Daklan.

On September 24 of the same year, Dr. Barrows, accompanied by Dr. Albert E. Jenks, again left Baguio for the north. They proceeded to Ambuklao and the old *comandancia* of Kayapa, visiting Losod, Wagan, and Limus in the latter region. Thence they went to Dupax in Nueva Vizcaya, passing through the country of the few remaining uncivilized *Isinays*. From Dupax they traveled to the Ilongot *rancheria* of Baiyait, and thence to Quiangan by way of Bagabag. From Quiangan they proceeded to Lagani, Banao, and Libung, returning to Bagabag and crossing the mountains to Echague and Ilagan in Isabela. From the latter place they went by the Catalañgan River to San Mariano, visiting various *Negrito* and *Kalinga* rancherias. Returning to Ilagan, they traveled to Cabagan Nuevo and thence to Bulana, the old mission station of Itaves, passing through the country of the *Dadayags;* thence to Amiao, Nanung, and Minanga, all on the Rio Chico; thence to Kagaiwan, and over the divide to Ablug in the subprovince of Bontoc. From Ablug they went by way of Laguagan, Tokukan, and Butbut to Sakasakan; thence to the *rancheria* of Bontoc, returning to Baguio by way of Sagada, Cayan, Cervantes, Loo, Buguias, Adaoay, Kabayan, Daklan, and Ambuklao.

On other occasions Dr. Barrows has also traveled extensively in southern Benguet and in Abra.

He was necessarily impressed with the absurdity of applying the host of tribal names which had been assigned them to the peoples with whom he came in contact, and in preparing his "history" he very properly attempted to reduce the number in use. It does not appear, however, that he had clearly in mind a definition of the word "tribe," and we find him dividing the people into "tribes," "types," and "dialect groups," without informing us what he means by any of these terms.

Apart from this confusion of terminology, any classification which unites such strikingly different peoples as the peaceable, industrious, and highly civilized *Tingians* of Abra, the long-haired, warlike, head-hunting *Igorots* of Bontoc, the short-haired, head-hunting peoples of Banaue, Silipan, and Mayoyao, and the fierce and wild *Kalingas* in one "ethnological group" seems to me fundamentally wrong. These peoples differ in many of their physical characteristics; in the manner in which they group their habitations; in their dress and manner of wearing their hair; in their tattoo patterns; in their architecture and industries; in their music and dancing; in their religious ceremonies; in their methods of head-hunting and in the ceremonies which follow successful head-hunts, and in their customs relative to marriage and the burial of the dead. While I am far from denying that they may have had a common origin, or for that matter that their origin and that of the civilized tribes of northern Luzon may, in the remote past, have been a common one, I do maintain that any ethnological classification which groups together such radically distinct peoples fails in the main object of such classification.

In addition to the explorations made by Dr. Barrows and Dr. Jenks,

other extensive and important investigations have been carried on relative to the non-Christian tribes of northern Luzon.

Dr. M. L. Miller, now Chief of the ethnological division of the Bureau of Education, on November 3, 1904, left San Fernando, in the Province of Union, and proceeded up the coast to Candon in South Ilokos. In the vicinity of Candon he visited twenty-two *Tingian rancherias*.

From this place he again proceeded along the coast northward to Badoc and Paoay, and near Badoc visited the *Tingian* settlement of Uguis. Returning to Vigan, he went up the Abra River to Bangued, and thence to Pilar by way of Catebongan, visiting the *Negrito* settlement near the latter place. From Pilar he passed through the settlements of San José, San Guillermo, Tui, and Balbalasan to Guinaan. From Guinaan he proceeded to Baguio by way of Labuagan, Tinglayan, Bontoc, Cervantes, Mancayan, Loo, Bugias, Daklan, and Ambuklao.

On January 31, 1906, he went to Capas, in the Province of Tarlac, and thence to O'Donnell and Iba in Zambales. Between Iba and Santa Fe he visited five *Negrito* settlements, and afterwards Aglao, an *Ilokano* settlement. He then crossed over the mountains through *Negrito* territory to Florida Blanca. In February of the same year he traveled to Tarlac and visited a *Negrito* settlement near Mangatarem.

In April, 1906, he went to San Isidro and Cabanatuan, in Nueva Ecija, and thence to Baler on the Pacific coast, passing through the country of the *Ilongots* and *Igorots*.

Capt. Charles E. Nathorst, of the Philippines Constabulary, lived for some time among the *Igorots* in southern Lepanto and, since his appointment as a Constabulary officer, has traveled very extensively in the mountain country of northern Luzon.

He has visited the Bontoc *Igorot rancherias* of Amboan, Barlig, Lias, and Balangao in southern and eastern Bontoc, bordering on Nueva Vizcaya; the *Kalinga rancherias* of Lubo, Mangali, Taloctoc, Tanglac, Liclic, Balantey, Bolo, Salecsec, Calogney, Damijon, Dalugen, Boök, Patiquian, Linas, and Baneng, which are in eastern, northeastern, and northern Bontoc, bordering on Cagayan, and also the *rancherias* of Seseean, Talalan, Balbalasan, Pasqual, and Innanungan, in northern and northwestern Bontoc. These *rancherias* have a mixed population, composed largely of *Tingians* who have intermarried to some extent with Bontoc *Igorots*, and *Kalingas*.

Captain Nathorst has been informed that south of Lubo is a *Kalinga rancheria* called Gaän, and south of Gaän an *Ifugao* one called Dakalan, on the border of Isabela.

Capt. Samuel D. Crawford, who accompanied me from Laoag in North Ilokos to Ablug in Cagayan in 1906, has also made numerous expeditions of his own through the mountains of northern Luzon.

Lieut. L. E. Case, of the Philippines Constabulary, was stationed at Banaue in Nueva Vizcaya from January, 1903, to July, 1906, and visited nearly every *rancheria* in the northwestern part of that province.

My own more important trips through northern Luzon have been as follows:

In 1900: Manila to Baguio, Benguet, and return by way of San Fernando.

In 1901: Manila to Pozorubio, in Pangasinan; thence to various settlements of "new Christians," who proved to be *Tingians*, in the foothills of the Benguet

mountains in the vicinity of Pozorubio and Rosario; thence to Baguio, Benguet, by way of the coast route in Union, and the Naguilian trail; thence north by way of the *Igorot* settlements of Ambuklao, Daklan, Kabayan, Buguias, Adaoay, Loo, Suyok, and Mancayan to Cervantes; thence to the coast and Manila, passing through the *Igorot* settlements of Angaki and Concepcion en route.

In 1903: Manila to Bangued, the capital of Abra, from which point numerous *Tingian* settlements were visited; thence to Cervantes in Lepanto, by way of the *Tingian* settlements of Tiagan and Angaki; thence to Bontoc by way of the Lepanto *Igorot* settlements of Kayan and Bagnan, and the Bontoc *Igorot* settlement of Sagada; thence to the Bontoc *Igorot* settlement of Mayinit and return; thence to the Bontoc *Igorot* settlements of Talubin and Amboan; thence through the mountain range to the *Ifugao* settlement of Banaue, in Nueva Vizcaya, returning to Bontoc; and thence by another route through the Bontoc and Lepanto *Igorot* settlements to Kayan; thence by the route previously traveled to Cervantes, and through Benguet to Baguio and Manila.

In 1905: From Manila to Bangued in Abra; thence to the *Tingian* settlements of Manobo, San Andres, and Tui; thence over the Cordillera Central to Balbalasan, and down the valley of the Saltan River through Sesecan and Patiquian to Salecsec; thence north, through the *Kalinga* settlements of Gannaän and Ubel; thence over a spur of the Cordillera Central to Mabaca, Umbali, Bunuan, and Balanga, and down the hitherto unknown Mabaca River by way of Lapoc, Kalaling, Madadnao, Kalaoang, Bagnang, Bontoc (a small Kalinga *rancheria*, not the capital of the subprovince of the same name), Took-Took, Manongnong, Asiga, Uaged, Malagnat, Ammasian, and Pinakpook (Pinecpec); thence to Tuao and Tuguegarao, in Cagayan, and up the Rio Grande to the *Ilongot* settlement of Dumabato in southern Isabela; thence by way of Echague and Carig to Bayombong, the capital of Nueva Vizcaya, north through the Quiangan and Banaue settlements and over the Polis range, to Bontoc, returning by the usual route to Baguio and Manila.

In 1906: From Manila overland to Laoag, in Ilokos Norte; thence to Piddig, and thence by river bed and trail over the Cordillera Central to Dallaoas, in Apayao; thence down the Ablng River, through the *rancherias* of Dallaoas, Cabugaoan, Lapoc, Abbil, Naguilian, Nagtuyangan, Dibagat, Palocago, Dipadi, Nacagman, Madatag, Tamogac, Cabotot, Pili, Masimnt, Locab, Nagbabalayan, Nagsimbangan, Cabugaoan (there are two *rancherias* of this name on the Ablug River), Atanani, Magapta, Bolo, Uaga, Puncian, Guenned, Bubulayan, Burayangan, Tauit, and Maculaling, to Ablug; thence to Aparri, and by way of the Rio Grande to Ilagan and Gamu, in Isabela Province; thence to the *Kalinga rancheria* of Sili and the *Ifugao rancherias* of Mayoyao, Ayangan, and Banaue; thence to Bontoc, Baguio, and Manila by the usual trail.

Governor Blas Villamor, who accompanied me on my 1905 and 1906 trips, has visited practically every settlement of non-Christians in his province and has made the direct journey overland from Ilagan and Santa Maria in Isabela Province, to Bangued, in Abra, stopping en route at many *Kalinga* and *Ifugao rancherias*.

Capt. Henry Knauber, of the Philippines Constabulary, has made numerous trips northward and westward from Malaueg, in the Province of Cagayan, has thoroughly explored the *Kalinga* country between Malaueg and Nagsimbangan on the Ablug River, and has ascended the river for some distance above the latter point.

It should further be remembered that there are organized and effective

governments in Benguet, Nueva Vizcaya, and in the subprovinces of Amburayan, Lepanto and Bontoc, which collectively form the Province of Lepanto-Bontoc. Governor Pack, of Benguet, and Lieutenant-Governor Hale, of Amburayan, have repeatedly visited every settlement under their jurisdiction. Governors Dinwiddie and Reed have done the same in Lepanto, as have Lieutenant-Governors Folkmar and Eckman in Bontoc. In Nueva Vizcaya there remains practically no unexplored territory, thanks to the efforts of Governors Johnson, Bennett, and Knight, and of Lieutenant Case.

While the census enumeration of 1903 was in progress, a special effort was made to ascertain the truth about the non-Christian tribes of the Philippines, and much valuable information was obtained relative to those of northern Luzon.

It is not too much to say that hardly a *rancheria* now remains in the Cordillera Central and its foothills, except in the district of Apayaos, which has not been visited by Americans, while even in the latter district twenty-nine of the more important *ranchcrias* have been visited. As a result of these recent explorations, a large amount of reliable information has been gathered, and it is upon this information and upon personal observations that the conclusions hereinafter set forth are based.

Doubtless much of the present confusion as to the tribes of northern Luzon is due to the fact that those who have written concerning them have used the word "tribe" with very different meanings. I will, at the outset, endeavor to make plain the sense in which I employ it.

The Century Dictionary and Cyclopedia describes "tribe" as follows:

Tribe: (1) In Roman history, one of the three patrician orders, or original political divisions of the people of ancient Rome, the Ramnes, Tities, and Luceres, representing respectively, according to tradition, the separate Latin, Sabine, and Etrusean settlements, having at their union equal representation in the senate and retaining their distinctive names for several centuries. Hence, (2) any one of the similar divisions of a race or nation common in antiquity, whether of natural or of political origin: as the tribes of Athens. (Ethnical tribes among the ancients regarded themselves as enlarged families, and generally bore the name of some real or supposed common progenitor. Such were the twelve tribes of the Israelites, the tribes of the Dorians and other Greek races, etc.) (3) Specifically, a division of a barbarous race of people, usually distinguishable in some way from their congeners, united into a community under a recognized head or chief, ruling either independently or subordinately. In general, the tribe, as it still exists among the American Indians and many African and Asiatic races, is the earliest form of political organization, nations being ultimately constituted by their gradual amalgamation and loss of identity in the progress of civilization. The characteristic of all these races (Uralian), when in the tribal state, is that the tribes themselves, and all subdivisions of them, are conceived by the men who compose them as descended from a single male ancestor. In some cases the tribe can hardly be otherwise described than as a group of persons taken collectively; any aggregate of individuals of a kind, either as a united body or as distinguished by some common characteristic or occupation.

Webster's International Dictionary gives the following definition of the word "tribe:"

Tribe: (1) A family, race, or series of generations descending from the same progenitor, and kept distinct, as in the case of the twelve tribes of Israel, descended from the twelve sons of Jacob. (2) A number of species or genera having certain structural characteristics in common. (3) A nation of savages or uncivilized people; a body of rude people united under one leader or government, as the tribes of the Six Nations; the Seneca tribe. (4) A division, class, or distinct portion of a people from whatever cause that distinction may have originated; as, the city of Athens was divided into ten tribes. (5) A family of animals descended from some particular female progenitor; as, the Duchess tribe of shorthorns.

Under the fourth alternative definition given in the Century Dictionary any one of the several classifications which have been adopted for the wild tribes of northern Luzon could be justified. On the other hand, were we to adopt any definition which includes as an essential feature the existence of a head or chief warrior of the tribe as a whole, we should be forced to the conclusion that there is no such thing as a tribe in the Philippines outside the territory occupied by the Moros.

I use the word in the following sense:

A division of a race composed of an aggregate of individuals of a kind and of a common origin, agreeing among themselves in, and distinguished from their congeners by physical characteristics, dress, and ornaments; the nature of the communities which they form; peculiarities of house architecture; methods of hunting, fishing and carrying on agriculture; character and importance of manufactures; practices relative to war and the taking of heads of enemies; arms used in warfare; music and dancing, and marriage and burial customs; but not constituting a political unit subject to the control of any single individual nor necessarily speaking the same dialect.

Where different dialects prevail among the members of a single tribe it should be subdivided into dialect groups. The differences in language between the people of different dialect groups of a tribe are of course far less radical than are those between the people of different tribes.

Returning now to a consideration of the list of tribes published by Blumentritt and by the Jesuits, I will endeavor by a concrete example to show the absurdity of the conclusions to which one is led who follows their classification.

Blumentritt assigns the following fifteen tribes to Nueva Vizcaya:

Alimut, Altasanes, Bungananes, Ibilaos, Ifugaos, Ifumangies, Ilamut, Ileabanes, Ilongotes, Isinays, Italones, Mayoyaos, Panuipuyes, Quianganes, and *Silipanes.*

The Jesuits add the *Igorots* and the *Irayas.*

Nueva Vizcaya has been so thoroughly explored that no unknown tribe can possibly exist there, and these explorations have shown conclusively

that there are but three non-Christian peoples in the province, viz: the *Ilongots,* the *Ifugaos,* and the *Isinays.* Of the remaining tribal designations employed by Blumentritt, *Ibilaos* and *Italones* are synonyms of *Ilongots; Alimut* and *Ilamut* are synonyms; and the *Bungananes* or *Bunnayanes, Mayoyaos, Quianganes,* and *Silipanes* are all *Ifugaos* to whom the names of their *rancherias* (or in the case of the *Alimut,* the name of their river valley) have been applied as tribal designations.

The *Altasanes, Ifumangies, Ileabanes,* and *Panuipuyes* do not exist. In all probability these latter names were taken from those of *rancherias* which have long since disappeared. While some of the larger *rancherias* in northern Luzon are very old, others are of recent origin and the names and locations of these settlements are constantly changing.

When descending the Saltan River valley in 1905 I was greatly puzzled by my failure to find numerous *rancherias* shown on the Spanish map which I was using. As the Spaniards had a garrison at Balbalasan, it seemed that they should certainly have mapped correctly the *rancherias* on the upper Saltan River. I inquired concerning the ones which seemed to be missing and learned that the people of one had been decimated by smallpox and the survivors had burned the houses and fled; those of another had practically been exterminated by their enemies; those of a third had moved in search of more extensive agricultural lands, and so on. Meanwhile several new *rancherias* had sprung up. Therefore, it will readily be understood how it is that in many instances no peoples can at present be found answering to names which a few years ago were considered to be tribal designations.

To the lists of tribal names employed by Blumentritt and the Jesuits which may be excluded from further consideration because no people can at present be found who apply these names to themselves must be added the *Addang, Adangtas, Aripas, Bayobanan, Bujuanos, Gamungan, Itetapanes, Jumangi, Nabayuganes,* and *Pungianes.*

As already stated, the term "Burics" of the Jesuit list is not a tribal designation at all, while the separation of the Negritos into *Abunlon, Aetas, Adaugtas, Attas, Balugas, Buquiles,* and *Dumagas* is hardly justified. It is true that the groups of *Negritos* to which these names have been applied differ more or less, these differences depending on the extent to which they have intermarried with neighboring peoples; and since they have always adopted the languages of their civilized neighbors they often speak different dialects as well; but they have all attained to substantially the same degree of civilization, or perhaps better, they all continue to lack civilization to substantially the same degree and can not be considered as belonging to different tribes when the word "tribe" is employed in the sense in which I use it in this article.

I will not here further criticize the lists of Blumentritt and the Jesuits,

but will state that in my opinion the following tribes should be recognized in northern Luzon:

I THE NEGRITOS. II THE ILONGOTS (IBILAOS). III THE KALINGAS. IV THE IFUGAOS. V THE BONTOC IGOROTS. VI THE LEPANTO-BENGUET IGOROTS. VII THE TINGIANS.

A word as to terminology. Dr. Barrows and Dr. Jenks in writing the names of Philippine tribes have ordinarily used the same form for both singular and plural, although Dr. Barrows at least has been very inconsistent in this matter. This usage has been allowed under protest in printing his contributions to the Census Reports.[4] There is some excuse for it when the name of a tribe is of Malay origin, but it becomes absurd when applied to names derived from the Spanish, as, for instance, *Negrito*. When one is writing English rather than Malay it seems to me well to form plurals in the usual way by adding "s" or "es" to the singular, and I have followed that usage in this article.

I will now endeavor to describe briefly the several tribes above listed, giving under each—

1. The synonyms of its name as well as the names of peoples which now exist or are supposed to have existed and have been given separate tribal rank, and in my opinion are not entitled to such rank, but should be classed as belonging to the tribe under discussion.

2. Its habitat so far as it is at present known.

3. A brief description of the physical characteristics of its members; of their dress and ornaments, including ornamentation of the skin by scarring or tattooing; of their buildings and settlements; of their hunting, fishing, agriculture and manufactures; of their methods of warfare and head-hunting; of their arms; of their music and dancing; of their marriage customs, and of their customs relative to the burial of the dead.

I shall not discuss folklore, or religious beliefs, or other ceremonials except in so far as they are directly related to the subjects above mentioned.

Tribe I. THE NEGRITOS.

SYNONYMY.

ABUNLON. Name applied to the *Negritos* of Zambales, especially when of mixed blood.

ABURLIN. Name applied to the *Negritos* of Moriones, Tarlac.

ADANG. Name of a *Negrito* people which formerly inhabited Mt. Adang in North Ilokos at the extreme northern end of the Cordillera Central. No such people now exists.

ADANES. Synonym of *Adang*.

ADANGINOS. Synonym of *Adang*.

ADANGTAS. Synonym of *Adang*.

ADAUGTAS. Synonym of *Adang*.

[4] *Census of the Philippine Islands of 1903* (1905), 1, 453.

AETAS. The common name for *Negritos*. It has been applied more especially to those of Cagayan, Isabela, Pampanga, Bulacan, and Bataan.

AGTAS. Name applied to the *Negritos* of Isabela.

AHETAS. Synonym of *Aetas*.

AITAS. Synonym of *Aetas*.

ATTAS. Name applied to the *Negritos* of Cagayan.

BALUGAS. Name applied to the *Negritos* of Nueva Ecija, Pampanga, Zambales, Ilocos Sur, and Tarlac; especially to those of mixed blood.

BUQUILES. Name applied to the *Negritos* of Zambales.

DUMAGAT. Name applied to those of the Pacific coast of northern Luzon.

DUMAGAS. Synonym of *Dumagat*.

DUMANGAS. Synonym of *Dumagat*.

ETA. Synonym of *Aetas*.

ITAS. Synonym of *Aetas*.

PARAMES. Name applied to the *Negrito* inhabitants of a *rancheria* in the municipality of Baggao, Cagayan.

HABITAT.

The *Negritos* are still numerous in the mountains of Bataan and Zambales and in the eastern mountain chain of northern Luzon extending from Cape Engaño to Baler. They are found in limited numbers in the mountains of Rizal, Bulacan, Pampanga, Tarlac, Pangasinan, and Ilokos Norte. A few still remain in Nueva Ecija and Abra.

There is a considerable area between the Rio Grande de Cagayan and the Ablug River in the Province of Cagayan which is populated almost exclusively by *Negritos*. They are also to be found in the former *comandancias* of Infanta and Principe, which now constitute part of the Province of Tayabas.

DESCRIPTION.

The Negritos, generally believed to have been the aborigines of the Philippines Islands, are racially distinct from the other tribes.

It is possible that when they have been more carefully studied we shall find it is necessary to subdivide them into several tribes. At present, next to nothing is known of those inhabiting the great eastern Cordillera of northern Luzon, from the latitude of Baler to Cape Engaño. However, the inhabitants of the remaining *Negrito* settlements in northern Luzon are quite well known and are in every way so similar to each other that there seems to be no sufficient reason for making any attempt to subdivide them.

The *Negritos*, as is well known, are as a rule of dwarfish stature, but contrary to the usual belief, many of them are well formed.

Among 77 Zambales *Negritos* selected at random and measured by Mr. Reed, the tallest man measured 5 feet 2 inches, and the tallest woman 4 feet 11 inches. The average height of 48 men was 4 feet 9 inches; that of 29 women was 4 feet 6 inches. The shortest man measured was 4 feet 2 inches high, and the shortest woman 4 feet.

The photographs of an adult man and woman standing beside me, which are reproduced in Plate I, figs. 1 and 2, give a good idea of relative

size. The types shown are full-blooded *Negritos* of Bataan. Unfortunately, many of the persons measured by Mr. Reed were of mixed descent and some were even half-breeds.

The *Negritos* are of a dark, sooty-brown color and have woolly hair, which is usually black but may be reddish-brown. The men often have abundant beards and a thick growth of hair on the arms, chest, and legs. (Pl. IV, figs. 1 and 2.) They have broad and flattened noses, thick lips, long arms, and in many instances prominent abdomens. They make no attempt to dress their woolly hair, which stands out from their heads and is allowed to grow until it gets long enough to be troublesome, when it is chopped off with a bolo, or cut with scissors if they are fortunate enough to possess any. (Pl. II, fig. 1.) Some of the Bataan *Negritos* shave a round spot on the crown of the head during the hot months of the year. (Pl. IX, fig. 1.) This, they say, is to let the heat out! Those of Zambales occasionally shave the entire back of the head up to a line extending from one ear to the other, over the top of the cranium. (Pl. XIV, fig. 3.)

The custom of pointing the front teeth is widespread among the representatives of this tribe. The operation is performed not with a file, as is commonly supposed, but in the following manner: A chip of wood is placed back of the tooth to be operated on, the point of a bolo is pressed firmly against the front surface of the tooth and the bolo is struck a sharp blow with a stick or stone, so that a corner of the tooth is chipped off. This operation is repeated on the other side and an artistic point is thus produced. (Pl. XXI, fig. 4.)

The Negritos do not tattoo themselves, but do ornament themselves with scar-patterns, produced by making cuts through the skin with slivers of bamboo. (Pl. XXIII, fig. 1.) Into these cuts, which are arranged with more or less geometric symmetry, dirt is rubbed to cause them to become infected and to produce large scars. The men may have scar-patterns on their chests, backs, and arms; the women on their chests, backs, arms, the calves of their legs, fronts of their thighs (Pl. XXV, fig. 1), and sometimes also on their breasts and abdomens.

The normal dress of the *Negrito* men and boys is a clout of bark or cloth (Pl. I, fig. 1; Pl. II, fig. 1); that of the women is a short skirt of bark or cloth, reaching from the waist to the knees (Pl. I, fig. 1; Pl. XII, fig. 1). However, as many of the groups of *Negritos* frequently come in contact with civilized natives, they often acquire from the latter articles of civilized dress of which they are very proud. Many of the women habitually wear *camisas* or upper garments, which the ones who are unmarried are very reluctant to remove.

Their ornaments are varied and characteristic. The most peculiar ones are bamboo combs, which the women wear thrust into their back hair; these are decorated with scratch-work patterns, which are blackened by rubbing grease and soot into them. In many instances they are

provided with depending plumes of horsehair, to which bright-scarlet, yellow and white feathers are fastened with bits of beeswax; these plumes are attached to the concave, or inner, surfaces of the combs by means of the same material. (Pl. XXV, fig. 4.) A highly characteristic *Negrito* ornament consists of circlets of boars' bristles, worn by the men about the calves of the legs. (Pl. X, fig. 1.)

Their other ornaments are earrings, bits of copper wire, buttons, beads, pieces of looking glass, and similar things. Many have no ornaments of any sort. Like most of the other non-Christian peoples in northern Luzon, they are especially fond of bright-scarlet cloth.

They often employ "medicines," consisting of leaves or herbs which are pasted on their temples or thrust through the holes in their ears, and of tubers or seeds which are strung on bits of creeper or rattan and hung about their necks. (Pl. XXIII, fig. 1.) These remedies are supposed to be of value in curing colds, headaches and fevers.

They have practically no manufactures of their own. On occasion they roll leaf tobacco into rude cigars for their personal use. They fashion their bows and wooden-headed arrows and lances with bolos obtained from the Christian natives. The arrow and lance-heads of iron and steel which they sometimes possess are all obtained by purchase or trade. They make no cloth or pottery and, so far as my observation goes, do not even know how to make any fermented drink, although they are at no loss to know the use to which such drink is commonly put and when supplied with it by others promptly get intoxicated.

Most of the Negritos, while somewhat inclined to be mischievous and thievish, are timid and peaceful. They have feuds among themselves, but seldom make war on neighboring tribes. However, the people of some of the settlements in the eastern cordillera of northern Luzon have the reputation of being quite fierce and warlike. The bow and poisoned arrow are the principal weapons used in war. (Pl. X, fig. 1.) The *Negritos* are afraid of strangers and sometimes take "pot shots" from ambush at persons who invade their territory without giving due warning of their approach. Head-hunting is unknown among them.

Normally the *Negritos* are nomadic in their habits, and as a natural result they do not build houses worthy of the name. Their dwellings are mere huts with roofs of leaves or grass, under which there may or may not be sleeping platforms of poles. (Pl. XXIX, fig. 2.) Such huts can be constructed in a few moments and are of course abandoned without regret. They are usually scattered here and there through the forest, although occasionally a group of one or two dozen will be found together. Governor Blas Villamor informs me that the largest settlements of northeastern Luzon number forty to fifty families.

The *Negritos* subsist chiefly on game, fish, wild honey, and forest products. In fishing they sometimes use small traps and sometimes bows and arrows. I have found those of southern Isabela very skillful in

the use of circular casting-nets, which they occasionally obtain from their civilized neighbors. In hunting they employ dogs, and often, also, nets into which deer and wild hogs are driven in order that they may be lanced while entangled. They are very skillful in the use of the bow and arrow and in their hunting employ poisoned arrows which bring large game down very quickly, without rendering the flesh unfit for eating. Snakes, lizards, frogs, and certain insects and insect larvæ are prized by them as articles of food.

Most of the *Negritos* do not practice agriculture at all. A few of the individuals who have come in contact with the civilized natives, plant *camotes* (yams) and squashes, and a still smaller number a limited amount of mountain rice. Little or no cultivation is given to the crops when planted, and it often happens that by harvest time their owners have wandered off through the mountains to some point many miles distant, thus losing the fruits of their labor.

In very rare instances small groups of *Negritos* settle in some particular locality and actually cultivate fields. In such cases they usually build houses which, while but feeble imitations of those of their civilized neighbors, are a distinct improvement over their ordinary huts.

Dogs and chickens are their only domestic animals, and they have few of the latter.

They are very found of music, although their instruments are of a primitive sort. They make "jew's-harps" and flutes from bamboo, but their principal musical instrument is the copper timbrel imported from China and known throughout northern Luzon as the *gansa*. (Pl. LII, fig. 4.) Bamboo violins and rude guitars are sometimes seen among them, but dance music is almost always furnished by *gansas* alone. I have seen men dancing on their knees and playing *gansas* at the same time. (Pl. LII, fig. 4.) The most characteristic *Negrito* dance is the so-called circle dance, in which men, women, and boys group themselves about one or two of the older inhabitants of the settlement; each person hooks two or three fingers into the clout or waistband of the skirt of the individual in front of him and the whole company then begins slowly to move in a circle with much stamping of feet and some shouting and singing, the latter being usually performed with the mouth covered by the hand. This circle dance, which is indulged in at funeral and wedding feasts and on other important occasions, is often kept up until a dusty path has been worn through the sod. (Pl. LII, figs. 1 and 2.)

Various obscene dances of the *Negritos* have been described by travelers. Many of these tales are obviously untrue, as are all stories to the effect that these people go wandering through the forest in a state of absolute nudity; but Dr. Thos. R. Marshall, formerly Chief Health Inspector of the Philippine Islands, has described to me in detail an obscene dance participated in by one woman and two men which he witnessed at night in the mountains of Zambales. His word is above suspicion. I have

neither seen nor heard of similar dances among any of the other northern Luzon tribes.

Mr. Reed describes the following special dances which he observed among the *Negritos* of Zambales:

The *camote* dance, in which the performer, after some preliminary fancy steps, goes through the motions of finding a *camote* patch, digging the tubers, putting them in a sack, and shouldering it, all the time keeping watch for the owner in order that he may not be caught stealing. He then cuts his way through the fence which surrounds the patch, attempts to ford a river, gets into deep water, and loses his burden. The feet are kept in rapid motion throughout this pantomime and the body is bent forward in a crouching position, so that great physical exertion is involved.

In the bee dance, the performer finds a nest of bees, which is conventionally represented by a piece of cloth tied to a pole. He then goes through the motions of making a smudge, climbing the tree, and holding the smudge under the nest. He is stung, retreats, makes other attempts and finally succeeds in smoking out the bees and securing the honey, whereupon he holds a feast.

In the torture dance, a person who represents the captive is bound to a stake and the participants first execute a circle dance, with its usual vocal accompaniments, around him. The movement soon becomes very rapid, until the performers are leaping around in an apparent state of great excitement. Finally, when worked up to a proper point they draw their bolos, rush at the victim, and go through the motions of chopping him to pieces.

In the lovers' dance, a man and a woman take part. The woman keeps her feet moving in time to the music but remains in one place. The man dances about her with various extravagant gestures, and the performance is continued until both are tired out.

In the duel dance two men, armed with bows and arrows, have an imaginary encounter. One of them ultimately succeeds in placing a fatal shot, his opponent falls to the ground, the victor dances up to the body and goes through the motions of cutting off the head with a bolo. He then calls for the relatives of the dead man to come and avenge the deed, but as no one appears he buries the head and body. Mr. Reed states that this dance lasts some fifteen minutes and that during this time the man, who by previous arrangement was to be the victor, never for a single instant pauses or loses step.

In practice the *Negritos* are ordinarily monogamous, but polygamy is allowed and is not infrequently indulged in, inability to support more than one wife being apparently the usual reason for not having a larger number.

Among the *Negritos* of Zambales and Bataan, when a young man has found a girl whom he wishes to marry, he informs his parents, whereupon the family discuss her value, and after an agreement has been

reached on this point the suitor or some one of his relatives goes to her parents to ask if the suit will be favorably considered. If an affirmative answer is received they return and a little later take presents to the father of the prospective bride. If he is satisfied, he gives his consent. If not, more presents must be forthcoming. Betrothals are made by parents for children of very tender years, but actual marriage does not take place until about the age of puberty.

The marriage ceremony varies in Zambales from practically none at all in the Pinatubo region to a rather complicated affair in the vicinity of Olongapo. In some cases, as soon as payment has been made for the bride, a dance follows, after which the young couple go to their own hut. In other *rancherias* there is a ceremony during which food is exchanged. A mat is placed on the ground and on it is set a dish of cooked rice. The bride and bridegroom seat themselves, facing each other, with the dish between them. The man places food in the mouth of the woman and she reciprocates, whereupon the crowd set up a shout and the ceremony is held to be terminated. Sometimes the girl runs away and her husband pursues her, calling to her to stop, and she ultimately does so.

I once witnessed a marriage ceremony among the *Negritos* inhabiting Mount Mariveles, in Bataan Province. The bride and her friends hid in the forest. The bridegroom and his friends searched until they found them. The bridegroom then attempted to persuade the bride to go to the place where the ceremony was to be concluded, beating a *gansa,* dancing in front of her, and constantly retiring in the desired direction. The bride had a piece of cloth which she kept drawn over her head and face and she moved along the ground a few yards at a time in a squatting position. When the sweet music discoursed by the bridegroom failed to accelerate her progress sufficiently, he or his friends placed gifts a short distance in front of her. Ultimately she came out into a clearing in which a platform had been erected some 12 feet above the ground. An inclined plane of poles led up to this platform. The relatives of the bride gathered about her, armed with long rattans. The bridegroom made a rush for her, getting soundly whacked in the process. He seized her in his arms, and carried her up to the top of the platform, where both of them sat down with their arms interlocked. Some of their friends and relatives also mounted the platform. Others placed gifts at the bottom of the inclined plane to persuade the couple to come down. Ultimately they descended and squatted in front of an old man and an old woman who had been detailed to give them "good advice."

Mr. Reed states that divorce is not common among the *Negritos* of Zambales and that there seems to be a prejudice against it. My observation is that it is quite common among the *Negritos* of Bataan. It is effected by mutual consent between the two persons interested, if their respective families agree to the arrangement. Where there has been no

fault on the part of either person the property is divided equally, but the mother takes the children.

If a woman deserts her husband for some other man whom she prefers, the new husband must pay a fine, and if he can not be compelled to do so the family of the woman must pay back to the husband what he gave for her. If the new husband is caught, and is unwilling or unable to pay the fine imposed, he may be put to death.

The dead of the Bataan *Negritos* are buried in the ground at some distance from the houses, after more or less elaborate ceremonies. The graves are often fenced in to keep wild hogs away. The relatives of the deceased watch the graves for some time and hold occasional feasts near them.

The Zambales *Negritos* also bury their dead in the ground, wrapping them in mats and placing them in graves 3 or 4 feet deep.

Unfortunately, there is little reason to believe that the *Negritos* can ever be civilized. Attempts in this direction heretofore made in the cases of individuals have usually ended in lamentable failure. Even children who have been taken very young and brought up in christian families have shown a strong tendency to return to a wild life.

Negritos have in many places been greatly imposed upon by the christian natives, and in not a few cases their children have been stolen from them by the latter, nominally so that they might be christianized but really in order that they might be brought up as slaves. Their parents have revenged themselves on their civilized neighbors by raiding crops and killing or running off cattle.

Under strong provocation they are entirely capable of doing murder, but murderous attacks are usually the result of gross mistreatment.

For the present, at any rate, all that can be done for these little blacks is to protect them from their civilized neighbors and persuade them to refrain from making trouble when they are not themselves molested.

They are a fast disappearing people, but their numbers do not seem to be diminishing as rapidly in northern Luzon as in other parts of the Archipelago. The total number of *Negritos* in the Islands is commonly estimated at 25,000, but while the whole northeastern coast line and the Pacific cordillera of northern Luzon remain unexplored, and while we do not even know whether true *Negritos* exist in the interior of Mindoro, such an estimate is at the best but a mere guess.

Tribe II. THE ILONGOTS.

SYNONOMY.

IBILAOS. Name applied to the *Ilongots* by the *Isinay* people of southern Nueva Vizcaya.

ILUNGUT. Synonym of *Ilongots*. Name applied by the *Ilongots* of Tayabas to themselves.

ITALONES. The *Gaddan* name for the *Ilongots*.

LINGOTES. Synonym of *Ilongots*.

HABITAT.

Southeastern and southern Isabela, especially along the head waters of the Rio Grande de Cagayan; eastern Nueva Vizcaya; mountains along border between Nueva Ecija and the old *comandancia* of Principe, now a part of the Province of Tayabas; also the old *comandancia* of Infanta, now a part of the same province. There are a few, small, isolated *rancherias* near Dupax, in Nueva Vizcaya.

DESCRIPTION.

The *Ilongots* are of Malay origin, showing, however, abundant indications of a considerable infusion of *Negrito* blood. In southern Isabela, where they are in close contact with the *Negritos,* they still intermarry freely with the people of the latter tribe. As a result, many of them are dark-skinned, curly haired, abundantly bearded and of low stature. (Pl. IV, fig. 3.) Some of them, however, seem to be nearly pure Malays, and an occasional individual may be met with who has quite sharp and regular features. (Pl. IV, fig. 4.). The hair, which the men as well as the women allow to grow long, is confined in a knot at the back of the head, around which strips of bark or cloth are sometimes wrapped. Many of the men wear over the hair and just above the forehead in front, a net which, while keeping the hair out of their eyes, also serves as an ornament. (Pl. IX, fig. 2.) No other Philippine tribe uses a hair-net of this sort.

The dress of the men consists of the usual clout and that of the women of a skirt reaching from the waist to the knees. (Pl. II, fig. 2; Pl. XII, fig. 2.) These garments are sometimes, though rarely, supplemented by shirts in the case of the men and by *camisas* with the women, but the latter articles, even if possessed, are worn only on state occasions.

The ornaments of the *Ilongots* are peculiar to, and highly characteristic of, this tribe. I have referred to the curious hair-nets worn by the men. Another common and peculiar ornament is a girdle made of small cowries strung on bits of cloth or twine. The women and sometimes also the men wear girdles of this type about the waist, or extending over one shoulder and under the opposite arm. (Pl. XX, fig. 1; Pl. II, fig. 2.) As the *Ilongots* are essentially an inland tribe, extending to the coast only in Principe and Infanta, it is remarkable that these shell girdles should be so generally distributed. They are highly prized, and must be secured with difficulty. Another very characteristic ornament consists of a round and concave piece of mother-of-pearl on which black scratch-patterns have been made. (Pl. XXV, fig. 5, *a* and *b*.) This is attached by means of a bit of wire to the ear, usually to the cartilage of its upper border. (Pl. VII, fig. 3.)

Still another highly characteristic ornament is an hour-glass shaped affair made of copper wire, coiled spirally. It is worn by the women, usually on the left arm but occasionally on the right, and extends from the hand to the elbow. It is so heavy as seriously to interfere with the use of the arm on which it is worn. (Pl. XX, fig. 1.)

The *Ilongots* like to wear about the neck, the waist, or over one shoulder and under the opposite arm, great coils of fine copper wire or of a fine cord, the latter woven in ornamental patterns from strips of bark or fiber stained in different colors. They are also very fond of wearing coils of split rattan of a scarlet color, which they say is the natural one. (Pl. VII, fig. 3.) They have other ornaments, consisting of tufts of bristles or tassels of fine thread, to which, with infinite pains, they attach bright bits of metal, feathers, etc. (Pl. XXV, fig. 5, *b*.) Many of the bristles are ringed about with fine threads of bright colors. Tobacco pouches of bark cloth are decorated with ornamental stitch-patterns of colored thread and with bright-colored seeds. Lime-boxes of bamboo are sometimes ornamented with scratch-patterns, darkened after the Negrito fashion with grease and soot. Elaborate armlets of polished bands of metal of different colors are commonly worn by the men.

In short, the *Ilongots* display a high appreciation of ornaments, and with the very limited means at their disposal show much patience and ingenuity in fashioning them.

I have never observed *Ilongots* who were tattooed to any extent, but Governor Villamor informs me that he has seen men whose chests were covered with tattoo marks. They do not ornament themselves with scar-patterns, as do the *Negritos*.

Some of their houses are fairly well constructed and of considerable size. (Pl. XXX, fig. 2.) They are built on piles set firmly in the ground, or on the trunks of trees which have been cut off at a considerable distance above its level. To enter a house one must usually scramble up an inclined pole, which may or may not have notches cut in it. The house often has an outside platform. The floor is made of bamboo or of the smooth stems of saplings tied in place with rattan or creepers. The sides may be low and open, or high and covered with palm or rattan leaves or with grass. The roof is well thatched and has a good slope; it ends in a short ridge from each end of which there projects a pointed piece of wood, curving upward with a broad sweep. This form of roof and type of roof ornament are peculiar to the *Ilongots*. Not all of the houses have the pair of sticks projecting from the ridge of the roof like a pair of horns, but most of the better ones are so decorated. While some of the houses are wretched affairs (Pl. XXX, fig. 1), all, so far as my observation goes, are better than *Negrito* huts.

In addition to their houses, the *Ilongots* make small, but well-constructed, rice granaries, on the roofs of which often may be seen the same curved and pointed pieces of wood which appear on those of their dwellings.

These people often live together in considerable numbers. Their houses are usually scattered irregularly about clearings made by girdling forest trees and cutting and burning underbrush.

They keep dogs for use in the chase. Occasionally, also, they have pigs

and chickens, but I have never seen any other domestic animals about their settlements.

The manufactures of the *Ilongots* show a distinct advance over those of the *Negritos*. They do not weave cloth, but make the so-called bark cloth and also circular casting fish-nets, buying the necessary cord and sinkers from the Christian natives. The women sew with a reasonable degree of skill and embroider as well, in a rude fashion. The men make head-knives, metal lance-heads and arrow-points, employing in their blacksmith operations the usual double-barreled bellows and a charcoal fire. They also manufacture many of their own ornaments, as well as their wooden shields, and construct small wooden boats which they handle quite skillfully in swift water. They grow, cure, and roll their own tobacco.

They prepare *basi*, extracting the juice of the sugar-cane with a simple mill similar to that used by the *Kalingas*. (Pl. XL, fig. 2.) The juice is then boiled for a short time and is put into *ollas* and kept. No spices or fruits are mixed with it at any stage, and after fermentation it becomes clear and ultimately quite sour.

The *Ilongots* are more warlike than are the *Negritos*, but are cowardly, their attacks being almost invariably made from ambush. Feuds exist to some extent between their different settlements, as well as between *Ilongots* and *Negritos*. Christian natives who are forced to travel the lonely mountain trails of their country are sometimes attacked and killed by them, robbery being, it is said, the usual motive of the aggressors. Occasionally, also, the *Ilongots* attack barrios of the civilized towns and take a few heads to assure a good rice-crop for the coming year, or to avenge wrongs received at the hands of the Christians.[4]

Like the *Negritos*, the *Ilongots* depend largely on fishing and the chase for their food supply. In taking game, they employ nets of their own manufacture and use bows and metal-headed arrows and lances. Their hunting arrows and lances are usually made with detachable heads fastened to the shafts with strong cords. (Pl. XV, figs. 3 and 4.) When the barbed head of such an arrow or lance is fixed in an animal, the shaft, dropping loose and catching in the brush or grass, impedes the escape of the game.

The *Ilongots* are expert fishermen. They are very successful in the use of circular casting-nets and are also skilled in spearing fish by torchlight.

Their agriculture, while a distinct advance over that of the *Negritos*, is primitive. They select a suitable piece of forest land, girdle the trees, and chop down the brush. (Pl. XXXVII, fig. 1.) When the trees have

[4] Dr. M. L. Miller informs me that when *Ilongots* murder travelers on the trail from Nueva Ecija to Baler, in Tayabas, they never rob their victims, even though the latter may be loaded with goods, but content themselves with cutting off and carrying away a hand or some similar trophy.

died, the brush is burned and in the soil thus left bare are planted mountain rice, squashes, gourds, cucumbers, and sometimes a few tomatoes and a little sugar cane or egg-plant; bananas also are grown abundantly. In planting rice, the women make holes in the ground with specially shaped and carved implements of hardwood, while the men drop in the seed and cover it. (Pl. XXXIX, fig. 1.) The clearings are often quite extensive, although but little care is given to the growing crops, which become buried in a tangle of vines and weeds. However, rice, which is an especially valuable crop, is sometimes quite carefully weeded. It is harvested by cutting off the individual heads, which are tied in bundles, placed on low platfroms, and protected from rain by thatches of leaves. (Pl. XXXVI, fig. 1.) It is said that the *Ilongots* of any given settlement are unwilling to transfer their rice to their granaries until some one of their number has taken a human head in order to assure a good crop for the coming year.

Their arms consist of bows and arrows, broad-bladed head-knives, and lances with weak shafts and still weaker points which are hardly larger than good sized arrow-heads. (Pl. X, fig. 2; Pl. XV, figs. 3 and 4; Pl. LX, fig. 2, *a*.). The shafts of their lances are ornamented with spiral bands of metal or of vegetable fiber for about half of their length. The shields are long and narrow, of very light wood, and are obviously designed for stopping arrows. (Pl. LXI, figs. 1, *a* and 2, *a*.)

The head-hunting of the *Ilongots* is of a rudimentary sort and may perhaps fairly be considered as representing the first step in the evolution of this particular form of sport. They usually cut off the heads of their victims, but either leave them beside the bodies or throw them away after having carried them for a time through the forest. They apparently do not take them home to exhibit at a subsequent ceremony, as do most of the head-hunting tribes. In taking heads the *Ilongots* use a sharp, broad-bladed knife. (Pl. LX, fig. 1, *a*.)

Their most common musical instrument is made of a joint of bamboo, from the outer layer of which strings have been cut, and raised by means of wooden bridges. (Pl. LIX, fig. 1, *a*.) A man holds the instrument, while a woman plays it by striking these strings with two slender, curved strips of bamboo. (Pl. LIII, fig. 1.) In addition to this peculiar instrument the *Ilongots* make and use the nose-flute and the bamboo mouth-organ.

The only dance I have seen was to the accompaniment of the bamboo instrument just described. There was but one dancer, a man, who gave a grotesque and exaggerated imitation of the movements of ambushing and slaying an enemy and taking his head. (Pl. LIII, fig. 2.)

In another one described by Governor Villamor, two or three men and an equal number of women take part. The men form a line and with outstretched arms dance around in a circle. The women never enter the

line, but dance at one side of it. The mouth-organ as well as the bamboo instrument above described are used to provide the music.

The *Ilongots* are polygamous. One man may have several wives who not infrequently all live together in one house. However, if he is wealthy, he may construct as many houses as he has wives, the dwellings being built close together. Many men also secretly keep *queridas* or mistresses, but if this fact becomes known they are obliged to pay fines to the relatives of their lawful wives, and this act also makes lawful wives of their *queridas*.

The *Ilongots* not infrequently abandon their sick. They are said not to use medicines for ordinary illnesses, but only in the treatment of wounds and in connection with childbirth. They try to cure their sick by stuffing them with food.

When a death occurs, the members of the family mourn throughout the ensuing night, keeping up a series of doleful cries which may be heard at a great distance. Early the following morning they desert the house in which the death occurred, leaving it not to return, but they take with them all articles of value. The dead person has the dwelling as his sepulchre. Sometimes, when the house of a sick person is large and valuable and it is evident that he is likely to die, in order to avoid abandoning the more pretentious structure a smaller one is hastily constructed and the patient is removed to it before death occurs.

The *Ilongots* punish robbery among themselves—that is, among the people of a single *rancheria*—by obliging the thief to grasp a piece of red-hot iron. However, if a man from one *rancheria* steals from an individual belonging to another, he is held to have committed a praiseworthy act. A murder among the people of a *rancheria* leads to a feud between the two families concerned. When a person from one settlement kills a person belonging to another, war between the two *rancherias* results. Adultery is punishable by fine paid by the offending person to the family of the one offended.

The *anito* images of the *Ilongots* [5] are made of grass or leaves and are usually set up on river banks. After the necessary measures to propitiate them have been taken they are abandoned or even burned.

In general it must be said of the *Ilongots* that, while superior to the *Negritos*, they are of inferior intelligence and of a somewhat unreliable and treacherous disposition, which makes them far more dangerous than

[5] The word *anito* is used by the *Ibilaos*, the *Kalingas*, the *Ifugaos*, the Bontoc *Igorots*, the Benguet-Lepanto *Igorots*, and the *Tingians*. Primarily it seems to mean a spirit, and in very many cases the term is employed to designate the spirits of the dead. It is also applied to images of men and women carved from wood or made by tying leaves or grass together which have to do in one way or another with efforts to secure the assistance of good spirits and to propitiate evil ones. Gifts are made either to the visible images of *anitos* or to the invisible spirits bearing the same name and various propitiatory ceremonies are performed, the performance of such ceremonies being termed by some tribes "making *anito*."

their little black neighbors. They keep very much to themselves, maintaining only such intercourse with the people of the neighboring civilized communities as may be necessary in order to secure salt, metal, cloth, and a few other necessaries. However, the experience of Americans with them has tended to show that they appreciate fair dealing and that when their confidence has been won they refrain from hostile acts toward those who have become the objects of it.

Probably, as in the case of the *Negritos*, there is little hope of doing more for them than to protect them from the aggression of the civilized natives and to cause them to refrain from hostile attacks upon others.

They constitute a sharply marked tribe, the members of which may usually be distinguished without difficulty from any of their non-Christian neighbors.

The names *Ilongots*, *Ibilaos*, and *Italones* are designations for the same people, and I have adopted the former because it seems to be the one in more general use.

Tribe III. THE KALINGAS.

SYNONYMY.

ARIPANES. Synonym of *Aripas*.

ARIPAS. Name applied to the *Kalingas* who formerly lived near Tubang, Cagayan. No such people now exists.

BAYABONAN (?). Said to have been a tribe occupying the "mountains east of Tuao, Cagayan." As the country east of Tuao, Cagayan, is a level plain, it may well be doubted whether such a people ever existed. At all events they do not now exist.

CALAGUAS. Synonym of *Calauas*.

CALAUAS. Name applied to the *Kalingas* occupying the heights in the neighborhood of Malaueg and the valley of the Rio Chico, in Cagayan.

CALINGAS. Synonym of *Kalingas*.

CATALANGANES. Name applied to the *Kalingas* living east of Ilagan, on the Catalañgan River, in Isabela.

CATALAÑGES. Synonym of *Catalanganes*.

CATATANGANES. Synonym of *Catalanganes*.

DADAYAGS. Name applied to the *Kalingas* living west of Cabagan Nuevo and in the lower Saltan River valley.

DADAYAS. Synonym of *Dadayags*.

GADDANES. Name applied to the *Kalingas* of western Isabela Province, many of whom were long since converted to Christianity and have become civilized.

GAMUNGAN. A name which has been applied to the uncivilized inhabitants of the mountains "east and northeast of Tuao, in Cagayan." As no such mountains exist, it is doubtful if there ever was such a people.

GAMUNANG. Synonym of *Gamungan*.

GAMUNANGANES. Synonym of *Gamungan*.

IRAYAS. Name applied by Blumentritt to the people living to the westward of the *Catalanganes*.

KALIBUGAN. Name applied to certain *Kalingas* of Isabela Province.

NABAYUGANES. Name applied to the *Kalingas* living to the westward of Malaueg, in Cagayan.

YOGADES. Synonym of *Gaddanes*.

HABITAT.

The territory inhabited by the *Kalingas* is, broadly speaking, the eastern slopes, river valleys and foothills of the Cordillera Central from the Saltan River north to Dagara and to the vicinity of the valley of the Ablug River. In some places they extend into the level plains of Isabela and Cagayan. There are several important *rancherias* on the Santa Maria friar estate in the former province and there is one north of Ilagan near the Rio Grande de Cagayan. There are a number of others to the east of Ilagan in the level country and in the foothills of the western slopes of the chain of mountains which borders the Pacific coast.

The line of demarcation between their territory and that of the *Tingians* of Bontoc is a fairly sharp one, although there has been some intermarriage in the settlements along the upper waters of the Saltan River. The Cordillera Central separates the *Kalingas* from the *Tingians* of South and North Ilokos. They are constantly at war with those of Dagara and the Apayaos district. They apparently have not intermarried at all with the *Negritos*, and their territory, except for the isolated *rancherias* near Ilagan and those lying to the eastward of Ilagan, is bounded on the east by that of the Christian municipalities.

DESCRIPTION.

The *Kalingas* are of Malay origin. They are less well-known than is any other northern Luzon tribe except the *Ilongots*. They are a cleanly people, of medium stature and are physically well-developed. The average member of the tribe may be recognized at a glance by his high cheek bones, and especially by his peculiarly shaped eyes, which are set very far apart. (Pl. V, figs. 1 and 2; Pl. IX, fig. 3.) No other Luzon people have such eyes. The skin is brown, the hair black and usually straight, but in some rare instances wavy. The men wear the hair long behind, and banged across the forehead, with a cut extending from the level of the bang along each side of the head over and considerably back of the ear. The long, back hair is allowed to hang down. (Pl. IX, fig. 3.) This method of cutting the hair is peculiar to the people of this tribe, although a very similar style is followed by the Bontoc *Igorots*.

In spite of the remoteness of the regions which they inhabit, the *Kalingas* are better dressed than the people of any other northern Luzon tribe except the *Tingians*. The men wear the usual clouts, but in addition have short jackets, which, like their clouts, are often ornamented with beadwork. Many of them have collars of beads. They also usually wear blankets of silk or very gaily colored cotton cloth, which are knotted over the right shoulder in such a way that the arm on the opposite side is supported in a fold. A bag or sack which is opened and closed by sliding silver or brass rings is often worn around the neck. (Pl. X, fig. 3; Pl. VII, fig. 4.)

Huge holes are pierced in the lobes of the ears and stretched to receive great rolls of gaily colored worsted or cotton yarn, or plugs of wood which extend back along the sides of the neck in such a way as to turn the lobes of the ears forward. When wooden ear-ornaments are used, coins, pieces of brightly colored stone, or bits of looking-glass are inserted

in the ends which are directed forward, or these ends are covered with pieces of cloth embroidered in bright colors. (Pl. VII, fig. 4.)

The women wear skirts reaching from the waist to the knees, or, in rare instances, even to the ankles; also *camisas* of brightly colored and large-figured cloth of European manufacture, or of the handsome striped cloth which they themselves weave. (Pl. XII, fig. 3; Pl. XVII, fig. 2.) They wear clouts under their skirts.

That the habitual wearing of so many clothes by the women is a matter of display rather than of modesty is shown by the fact that they discard their *camisas* when at work, and if they have occasion to cross deep streams, strip naked, regardless of the presence of men.

Nearly every woman or girl owns a pair of huge brass earrings of a peculiar form (Pl. XX, fig. 2) which weigh two to four ounces. The part which passes through the ear is wrapped in leather or cloth to prevent its chafing the flesh. Still more highly prized are large ear ornaments of mother-of-pearl, each shaped like a solid figure 8. (Pl. XX, figs. 3 and 4.) Many heavy necklaces are also worn. (Pl. XX, fig. 3.) The beads most highly prized, called *manding,* are of agate and very roughly made. (Pl. XX, fig. 4.) They are apparently valued on account of their age, and one of them is sometimes worth a carabao. Next to these in value come imitation agate beads of recent manufacture.

Many of the women have beautiful, long hair, which is banged across the forehead and worn in great coils about the head, being held in place by numerous strings of beads. (Pl. XX, fig. 3.) On state occasions it is the fashion to wear great switches of dead hair. (Pl. XX, fig. 4.) Very wealthy women and influential men sometimes wear elaborate ornaments of scarlet and yellow feathers. (Pl. XX, fig. 4; Pl. VIII, fig. 1.)

The *Kalingas* do not tattoo themselves to any very great extent. The women sometimes have marks on the throat or the forearms supposed to bring good luck. (Pl. XXIII, fig. 2.) The men are tattooed even less than the women. Their marks are usually on the shoulders and are said to be of no special significance.

Their settlements consist of groups of from three or four to a score of houses, placed close together and often perched in some inaccessible spot on a steep mountain side. (Pl. XXVII, fig. 1.) Not infrequently they are surrounded by wind-breaks of bamboo. The houses are of two types. Those built on the ground are quite clean and are very substantially constructed. The floors, which are raised five or six feet above the ground, are usually made of well-cleaned stalks of *runo* grass tied close together. The piles on which the houses stand, and their frameworks, are of hard wood. The roofs, which on the inside have a concave curve, consist ordinarily of an inner layer of closely tied and well-cleaned *runo* stems over which is placed a very thick, outer layer of carefully laid grass

thatch. These roofs must last for many years. The sides of the houses of this type are usually made of boards, hewn with great labor from thick tree trunks. (Pl. XXXI, fig. 2.) I have never seen any wood-carving on these houses, but am informed by Governor Blas Villamor that the inner surfaces of the side boards are sometimes carved. Where timber, *runo* and grass for thatching are scarce, the floors, sides, and roofs of houses may be made of bamboo. Some of the bamboo roofs made of joints laid like tiles are very remarkable affairs. (Pl. XXXII, fig. 1.)

The *Kalingas* of Isabela often build their houses amid the branches of trees which previously have been killed. These tree houses, which, as a rule, are not very substantial, can be entered only by long ladders. The latter are drawn up at night or when an attack is feared. (Pl. XXXI, fig. 1.) Granaries for rice are usually to be found near dwelling-houses.

The agriculture of the *Kalinga* shows a distinct advance over that of the *Ilongot*. He often raises enough tobacco for his own use and sometimes has a little to sell. Occasionally, also, he raises small quantities of cacao and coffee and barters them with his Christian neighbors. He grows *gabi* (taro) and rice in irrigated fields, and on the mountain sides cultivates *camotes* and mountain rice which grow without irrigation. Indian corn he sometimes raises upon a considerable scale. He usually has a good supply of bananas.

He keeps dogs and chickens and in some instances cattle, carabaos, and even horses, although ownership of the latter three kinds of animals by *Kalingas* is rare, those of Taling and Nanong being the only ones who raise any considerable number of cattle, carabaos, and horses. Cattle and carabaos are kept for eating and are never worked, but horses are sometimes used for riding.

The *Kalingas* do not use the bow and arrow, but occasionally kill with their lances a deer or a hog which their dogs have brought to bay. They set fish-traps in the mountain streams.

Basi is indispensable to the successful celebration of a *cañao* and is made by the *Kalingas* in considerable quantity. Their houses usually contain large, earthenware pots filled with this drink. The sugar-cane juice is pressed out by means of a simple apparatus similar to that used by the *Ibilaos*. An aromatic bark is mixed with it, it is boiled until it is of the proper consistency, and is then allowed to ferment.

Although many head-axes made by the *Tinguians* are imported into the *Kalinga* country from the south, there are quite a number of good *Kalinga* smiths who are fairly skillful in shaping weapons of iron and steel.

Some of the women weave cloth and many of them embroider quite well.

The houses of the *Kalingas* usually contain quantities of glazed earthenware pots, many of which are ornamented with raised figures of dragons, but although porcelain and china plates and bowls are also in

common use, I have never seen an individual of this tribe make pottery of any sort. Apparently many of the highly valued earthen pots have come from China.

Wood carving is not common. I have seen only scratch-work, blackened with soot and wax or grease, on bamboo lime-boxes, and ornamental clothes-hangers of carved wood on which figures had been burned with hot irons. *Kalinga* fireplaces are usually provided with carefully cut, stone fire-dogs.

The *Kalinga* is a bold warrior and an inveterate head-hunter. His arms consist of shield, head-axe (Pl. X, fig. 3), and lance. The shield is painted black, with red and yellow rattan lashings. It has three points above and two below and is of a graceful form, peculiar to the people of this tribe. (Pl. LXI, fig. 2, *b*.) The head-axe has a slender blade with a curved, cutting edge on one side and a long, projecting spine on the other. The wooden handle is frequently ornamented with bands of metal of different colors and has on it a projecting point under which the first finger may be hooked to prevent the axe from slipping from the grasp when it is carried blade down. Ordinarily it is thrust into the waistband of the owner. It is a tool as well as a weapon. (Pl. LX, fig. 1, *b*.)

The lances show a great variety of forms. Some of them have heads of hardened bamboo ornamented with scratch-work designs and with plumes of horsehair. Others have steel heads which may be plain or may have two to six or even eight pairs of barbs. Many of the lance-shafts are ornamented with horsehair plumes and with lashings or woven envelopes of scarlet, yellow, and black rattan. (Pl. LX, figs. 2, *b, c, d,* and *e*.)

The head-hunting expeditions of the *Kalingas* are carefully planned in advance, and a plan of campaign once formed is carried out as closely as circumstances will permit. A band of forty or fifty warriors may be on the trail for days before they reach their objective point. The combat is usually begun from ambush, and is of short duration. The man who first reaches the enemy is the leader. As soon as either side has a combatant down, it concentrates its efforts on saving his head and to this end tries to get away with him as speedily as possible.

Warriors always make a determined effort to secure the heads of enemies killed in battle and to carry them to their *rancherias,* where they are immediately exhibited in bamboo baskets at the houses of the persons who took them. These baskets, which are in general use among the *Kalingas* and *Tingians,* are made in the following manner: A thick piece of green bamboo of the proper length is sharpened at one end and driven into the ground. The other end is split down for a foot and a half or two feet in such a manner as to make a dozen flexible slats. These slats are then separated and others are interwoven with them in a horizontal direction so as to form a conical basket with its point directed downward and ending in a solid stem of bamboo. A pair of partially

completed baskets of this sort may be seen immediately to the left of the small structure shown in Plate LXVII, fig. 1.

Returning head-hunters, if successful, are met by their friends and neighbors, who make the air ring with the high-pitched ululating *Kalinga* war cry.

The members of a war party who have not been lucky enough to secure heads, hasten to their homes and return to the house of some more fortunate companion, bringing pieces of bark cloth which they dip in the blood of a head and then hang over the doorways of their dwellings in order to avert evil fortune in general and more especially the vengeance of the friends of the victim. (Pl. LXII, fig. 1.)

A feast, held at the expense of those who have taken heads, begins at once. It may last for seven or eight days. Shortly after arrival at the home *rancheria* the top of each head taken, including the upper part of the skull, is removed and cut into as many pieces as there were warriors in the party, one piece being given to each. The brains are then stirred up with *basi* and the head, which serves as a drinking cup, is passed around in order that all who desire to do so may partake of the gruesome mixture. The first to drink is the man who took the head. It is believed that those who partake thereby ward off danger of being punished if they were members of the war party and in any event are protected against illness.

The lower jaw is separated from the skull and kept for use as a *gansa* handle, as with the Bontoc *Igorots.* That part of the skull which remains is then put in a hiding-place, used in common by all members of the *rancheria.* This may be a hole in a tree, a cave, or an excavation in the ground.

The feast is accompanied by dances which are sometimes decidedly imposing affairs. The men and women form a circle about a level plot of ground, in the middle of which a fire burns if the *cañao* is at night. An old man hands a handkerchief to some warrior who has distinguished himself. This is a signal that he is expected to tell his story to the assembly. Wearing his best clothes, and carrying a lance, head-axe, and shield, he walks into the center of the circle accompanied by another individual who serves as a sort of dummy. He recounts his adventures in a high falsetto voice, similar to that which Japanese actors use on the stage. His remarks are staccato to an extraordinary degree, each word being clipped off short. Each sentence is begun with a sharp outcry, which sounds like the sudden yap of a dog. Not only does the performer describe his adventures, but he acts them out, going through the motions of slaying the unfortunate dummy as he slew his enemy, taking his head, etc. The crowd yells with delight and every now and then some one gives the war cry. Meanwhile the *basi* is circulating freely, and by the time the *cañao* has been in progress for two or three hours, nearly

everyone is drunk. When the original performer has exhausted his resources, he hands the handkerchief on to some one else who takes his place. As the night advances, the excitement becomes more and more intense and the *cañao* not infrequently breaks up in a drunken row, in the course of which men inflict serious injuries upon one another. However, it is generally understood that one is not responsible for what he does when he is drunk at a *cañao*, and little, or no, ill will seems to be borne afterwards.

Annually, just before harvest, all of the skulls in the *rancheria* collection are brought out and exposed in bamboo baskets throughout an entire night. Old women conduct the ensuing ceremony in which the men are not allowed to participate, although they watch it with interest. Before inaugurating it, one of the old women sticks a lance in the ground in front of the baskets containing the skulls and she and her assistants stand behind it throughout the performance. Ultimately, one of them informs the men whether or not it is necessary that they should go to war and take more heads in order to protect their crops from a mythical big bird which is supposed to come each year and devour them. As a matter of fact the rice is eaten by many very small birds, but the *Kalingas* refuse to believe that such small creatures can do so much damage and insist that their crops are destroyed by a big bird which they have never seen.

The *cañao* circle is the scene of more than the recounting and acting out of warlike exploits. All important events and affairs which especially concern the settlement as a whole are discussed there, the man who has the floor invariably speaking in the high, staccato tones above described.

Within this circle the dances are also held. Although nose-flutes are occasionally met with, dance-music is ordinarily furnished by a battery of four or more *gansas* played with great energy and skill by men who beat them with their hands. The dancing is participated in by women as well as men. Ordinarily, one man and one woman perform at the same time, but if the man is an especially good dancer, two or more women may compliment him by coming into the circle with him. The dancing is of a decidedly vigorous sort and involves much jumping and noisy stamping of the feet. Especially when slightly intoxicated, the *Kalingas* are prone to insist that strangers enter the circle and do their share toward the entertainment of the assembly by dancing or singing. If one is neither a dancer nor a musician he may readily satisfy his audience by performing a few sleight of hand tricks or burning a little magnesium wire or red fire. Even a candle is in many *rancherias* a great curiosity.

The *Kalingas* do not, as a rule, have boats, but are excellent swimmers and expert raftsmen, taking their bamboo rafts in safety down rapids where one would expect them to be dashed to pieces. (Pl. LVIII, fig. 2.)

I have never seen any evidence of worship, or of attempts to propitiate good or bad spirits, among the *Negritos*, but in nearly every *Kalinga* settlement one will find some secluded spot where *anitos* are made.

The method of "making *anito*" practiced by the *Kalingas* is interesting. A lance or head axe is stuck up in the ground and is surrounded with bamboo baskets made by splitting the ends of green pieces of bamboo into slats and then interweaving other pieces horizontally around the bundle thus formed. In these baskets are placed flowers and dishes of food, and the bushes in the vicinity, or the lance, may be hung with fresh pieces of bark-cloth or with articles of clothing belonging to the persons who take part in the ceremony. *Anitos* of this sort are made in giving thanks for victory over enemies or for good crops.

Justice is administered in a *Kalinga rancheria* by a council of old men, all crimes, even including murder when committed among the people of the *rancheria,* being punishable by fine.

The *Kalingas* are polygamous and have more wives than do the members of any other tribe of northern Luzon. A wealthy man may have as many as seven helpmeets who may and often do live in one house. They are said to get on well together, it being their wish that the number of their people should increase as rapidly as possible and polygamy being deemed a desirable means to this end.

The men also keep *queridas* on occasion, but always secretly. If the wife or wives can prove that the husband is keeping a *querida* they bring the fact to the attention of the old men of the *rancheria,* who impose a fine on the guilty individual and collect it from him. He is not otherwise punished, but his wife or wives may secure divorce from him if the council of old men gives its consent. However, divorce is ordinarily brought about by mutual agreement between the persons concerned.

The *Kalingas* are kind to their sick, and care for them until they die or recover, treating them with roots and herbs and with baths. They also hold such *cañaos* and sacrifice such animals as their old medicine-women may direct. If the medicines, the *cañaos,* and the incantations of the medicine-women prove of no avail and the patient dies, a funeral feast is held to which all of the people of the *rancheria* are invited. After a day or two of feasting, the dead person is buried under his house, which is then fenced in, the head of the family remaining fully armed inside the fence for a period of twelve or fourteen days. It is his duty to kill any person who may enter the inclosure during this period. Food and drink are handed in to him by relatives. After the prescribed time has elapsed, the fence is removed and the house is occupied again as if nothing had happened. This ceremony is performed only in connection with the death of adult persons. If the individual who dies is unmarried, the house is fenced in and left empty for the prescribed period, but no armed person remains on guard to repel intruders.

The *Kalingas* form a well-marked tribe. As previously stated, they are readily recognized by their high cheek-bones and their peculiar eyes, as well as by the style of hair-cut universal among the men. They also differ from their neighbors in their house architecture, their weapons

and head-hunting customs, their music, their dancing, and especially in the character of their peculiar *cañaos*, at which public events are discussed and victories over enemies are celebrated.

They are strong, cleanly, brave, and intelligent. They are probably less industrious than the *Ifugaos* or Bontoc *Igorots*, but are vastly more so than are the *Negritos* or *Ilongots*. I do not believe that the checking of head-hunting among them will prove to be a matter of any great difficulty, and when they are once on good terms with their Christian neighbors and thus gain a market for their products, they will pay more attention to agriculture.

One former branch of the tribe, the *Gaddanes*, now forms an important element of the civilized population in the Cagayan Valley, and there would seem to be no good reason why the remaining wild *Kalingas* should not follow in their footsteps.

Tribe IV. THE IFUGAOS.

SYNONYMY.

ALAMIT. Name applied to the *Ifugaos* of the Alamit River Valley, Quiangan, Nueva Vizcaya.

ALIMUT. Synonym of *Alamit*.

ALTABANES. Synonym of *Altasanes*.

ALTASANES. Name formerly applied to the *Ifugaos* of northwestern Nueva Vizcaya. No such people now exists.

AYANGAN. Name applied to the *Ifugaos* of the *rancheria* of the same name in Nueva Vizcaya.

BUNGANANES. Said by Blumentritt to be a warlike and possibly head-hunting tribe of Isabela and Nueva Vizcaya. No such tribe now exists.

BUNNAYAN. Name applied to the *Ifugaos* of Quiangan and neighboring *rancherias*.

EPOCAOS. Synonym of *Ifugaos*.

GILIPANES. Synonym of *Silipanes*.

ILABANES. Blumentritt quotes Diaz Arenas as authority for the existence of such a tribe in Nueva Vizcaya in 1848. It no longer exists.

IFUGADOS. Synonym of *Ifugaos*.

IFUMANGIES. According to Diaz Arenas, who is quoted by Blumentritt, a tribe of "*Igorrotes*" of Nueva Vizcaya in 1848. No such people now exists.

ILAMUT. Synonym of *Alamit*.

IPUCAOS. Synonym of *Ifugaos*.

IRAYAS. Name applied by the Jesuits to the *Ifugaos* and *Kalingas* inhabiting the banks of the River Ilaron and the eastern slopes of the Sierra Madre in Nueva Vizcaya, Isabela, and Cagayan.

MAYOYAOS. Name applied to the *Ifugaos* of the *rancheria* of Mayoyao and other neighboring *rancherias* of Nueva Vizcaya.

PANIPUYES. Synonym of *Panuipuyes*.

PANUIPUYES. According to Blumentritt "a tribe of so-called *Igorrotes* to to be sought in western Nueva Vizcaya and Isabela." No such tribe now exists.

PUNGIANES. Classed by Blumentritt interrogatively as "a tribe of the *Mayoyaos*." No such people now exists.

GUIANGANES. Name applied to the *Ifugaos* of the *rancheria* of Quiangan. The Jesuits have erred in stating[5] that these people are *Malay-Negritos*. They show no indications of *Negrito* blood.

SILIPANES. Name applied to the *Ifugaos* of Silipan and neighboring *rancherias* in Nueva Vizcaya.

HABITAT.

The *Ifugaos* occupy the whole of northwestern Nueva Vizcaya and extend for a short distance into southwestern Isabela, where they have several important *rancherias*. So far as is at present known, their northernmost *rancheria* is Pulay, in Isabela.

DESCRIPTION.

The *Ifugaos* are a Malay tribe and physically are well-developed. For their strong, muscular bodies they doubtless have to thank the pure air and water of the rugged country which they inhabit, no less than the tremendous exercise involved in going up and down its steep mountain sides. (Pl. XIV, fig. 1.) They are well-proportioned people of medium height, with dark-brown skins, straight hair, and typical Malayan features.

The ordinary costume of the men is a clout, usually of cloth (Pl. II, fig. 4; Pl. XIV, figs. 1 and 2); that of the women is a short skirt, consisting of a piece of cloth wrapped around the body below the waist in such a way as always to leave the navel exposed. It may extend to the knees, but often it does not. (Pl. XII, fig. 4; Pl. XIV, fig. 2.)

Usually, both men and women are tattooed. (Pl. VIII, fig. 3; Pl. XXIII, fig. 3.) The tattoo marks of the men are on the chest and neck, but those of the women are on the arms only. The patterns differ radically from those of the Bontoc *Igorot*. The tattooed *Ifugao* may be recognized immediately as such by the pattern of the markings alone.

The men wear their hair cut, the appearance being exactly that which would result were a rather wide and shallow bowl pressed down on the top of the head and the hair clipped up to its edge. This style of cutting the hair is highly characteristic of the *Ifugaos* and is not in vogue among the people of any other northern Luzon tribe. (Pl. IX, fig. 4.) The women wear their hair long. It is usually drawn straight back from the face on all sides and confined in a knot at the back of the head. (Pl. XVII, figs. 3 and 4.)

The ornaments of the *Ifugaos* are quite elaborate, and in some instances are of considerable value. The men are especially fond of wearing huge earrings of copper wire or beaten brass. (Pl. VIII, fig. 2.) They also delight in coils of thick copper wire worn around the legs just above the calves. (Pl. II, fig. 4.) Their most highly cherished ornaments are girdles made of handsomely carved opercula of sea-shells

[5] *Report of the Philippine Commission* (1900), **3**, 358.

(Pl. II, fig. 4; Pl. XIV, fig. 1); from each a pendant, also of opercula, hangs in front. These girdles are very valuable and, if their wearers are to be believed, are often the property of the settlement rather than of the individual; their use seems to be confined to men of high rank or of great wealth. The women wear armlets or leglets of copper wire, earrings, bead necklaces, and strings of beads in the hair. (Pl. XVII, figs. 3 and 4.) The beads are in some instances very large and of a white stone resembling fine grained marble. (Pl. XXII, fig. 3.) Both men and women occasionally wear in their hair white tail-feathers from cocks. (Pl. V, fig. 4; Pl. XIV, fig. 2.)

The *Ifugaos* live in *rancherias* which sometimes number five or six thousand souls. However, the houses of a given *rancheria* are not placed closely together, but are scattered about in little groups of from four or five to a dozen or two, so that a settlement may extend along a valley for ten miles. Doubtless one of the reasons for this arrangement is that the people desire to be near their wonderful, terraced rice-fields, in order to watch the supply of irrigation water and to prevent depredations upon their crops. (Pl. XXVI; Pl. XXXVII, fig. 2.)

Their dwellings are built from 5 to 8 feet above the ground, on strong piles which are often ornamented with rough carving. (Pl. XXXII, fig. 2.) They have board floors and sides and thatched roofs. In the peak of the roof there often is a small room in which rice and other commodities are stored. At one side of the main living-room is a fireplace made of earth and stones; the smoke escapes through the chinks of the house as best it may. Over the fireplace and at its sides, are grouped the skulls of animals killed in the chase or sacrificed at feasts, and also, on occasion, the skulls of enemies whose heads have been taken in war. Carved, wooden images, called *anitos*, are not infrequently seen at the sides of the door. (Pl. LXIII, fig. 1.) The houses are usually windowless. I have seen lizards carved in relief on the under surfaces of floor boards.

At the side of the door may sometimes be seen a shelf on which are placed the skulls of enemies. (Pl. LXII, fig. 2; Pl. LXIII, fig. 1.) At the corners of the house one also sees skulls of carabaos or pigs, carved wooden imitations of carabao horns, bunches of dried grass, and sometimes human skulls. I have seen an ornamental frieze of alternating carabao and human skulls on a level with the floor and extending halfway around a house. Hanging from the floor timbers are neatly woven baskets with small doors. In these the chickens are placed at night to prevent their being stolen or carried away by civet cats. (Pl. XXXII, fig. 2.)

The *Ifugaos* build rice granaries and also often construct, at a short distance from their own dwellings, little grass-thatched houses with tight board floors and sides, the crevices between the boards being chinked

with a mixture of clay and carabao dung. (Pl. LXV, fig. 1.) In these houses are placed the bodies of persons who die natural deaths. The bodies of men killed in war must be buried in the ground.

The *Ifugaos* never use the bow and arrow, but when hunting hogs and deer employ dogs to bring the game to bay, killing it with their lances. However, they are by no means so dependent upon game as are the *Negritos* and *Ilongots*.

Their agriculture is little short of wonderful, and no one who has seen their dry stone dams, their irrigating ditches running for miles along precipitous hillsides and even crossing the faces of cliffs, and their irrigated terraces extending for thousands of feet up the mountain sides, can fail to be impressed. (Pl. XXVI; Pl. XXXVII, fig. 2.) When water must be carried across cliffs so hard and so broken that the *Ifugaos* can not successfully work the stone with their simple tools, they construct and fasten in place great troughs made from the hollowed trunks of trees, and the same procedure is resorted to when cañons must be crossed, great ingenuity being displayed in building the necessary supporting trestlework of timber. The nearly perpendicular walls of their rice paddies are usually built of stone, although near Quiangan, where the country is comparatively open and level, walls of clay answer the purpose and are used. The stone retaining walls are sometimes forty feet high, and so steep are the mountain sides that the level plots gained by building such walls and filling in behind them are often not more than twenty or thirty feet wide. I know of no more impressive example of primitive engineering than the terraced mountain sides of Nueva Vizcaya, beside which the terraced hills of Japan sink into insignificance.

Water is led with the greatest skill from plot to plot, sometimes being allowed to flow down the faces of the stone retaining walls and sometimes being led through subterranean passages which have their upper openings in the middle of plots.

The *Ifugaos* keep hogs. Manure is carried from the hog-pens to the rice-paddies and worked into the ground, which is carefully prepared before planting and which continues to produce fine crops year after year. The rice is always well weeded and thinned.

When the rice crop has been harvested, the irrigation water is often shut off and the earth in the paddies raised into little mounds. The water is then once more turned on, whereupon these little mounds become miniature islands on which are planted garlic, beans, *gabi*, and other vegetables, the water serving to keep away cutworms and crawling insect pests.

The *Ifugao* raises tobacco in limited quantity and rolls his own cigars. He makes a fermented drink from rice called *bubud* which is much used at feasts and in ceremonials connected with the cementing of friendship. (Pl. XLI, fig. 1.) He also keeps dogs and chickens which are

well cared for and carabaos which are allowed to run half wild and are apparently not used as draft animals but are kept to be eaten at feasts. I have never seen cattle or horses in an *Ifugao* settlement.

The *Ifugao* women weave very good cloth, usually of a dark indigo-blue color with small, scarlet figures. The simple type of loom used by them will be better understood from the accompanying illustration (Pl. XLIII, fig. 2) than from a detailed description. It will be noted that the warp is held taut by a broad belt which passes around the back of the operator and against which she leans; also that the shuttle is passed by hand, the threads being held apart during the operation by a piece of wood set on edge. When the shuttle has been passed, this piece of wood is dropped on its side and drawn sharply toward the operator so as to drive the thread into place. Although this method of cloth making is slow, the narrow strips produced are often of very good quality.

There are among the *Ifugaos* many skillful workers in iron and steel, although a smithy is not to be found in every *rancheria*. Some of the settlements, notably Sapao, have a widespread reputation for the excellence of their steel and iron manufactures. The implements used by the smith are of the simplest. He has an old iron hammer or two for shaping, several heavy, stone hammers for flattening, and a rude, wooden trough of water for tempering. His bellows consists of two vertical wooden cylinders in which pistons, packed with feathers and rags, are alternately raised and lowered by the operator. From each of these cylinders a tube leads to a central pipe of bamboo or fire clay, which extends to a little depression in the ground, filled with charcoal, in which the ingot of iron or steel is heated. In spite of the primitive nature of this plant the *Ifugao* smith turns out beautifully shaped and well-tempered lance-heads and head-knives. (Pl. LX, figs. 1, *c* and 2, *g*, *h*, and *i*.) He is also skillful in making metal pipe-bowls, which are cast in clay molds.

The *Ifugaos* of Banaue, and doubtless of other *rancherias* as well, manufacture excellent pottery which has a smooth, glazed surface.

They are especially skillful in wood-carving. I have called attention to the fact that the door posts, under surfaces of floor boards, and the *harigues* or supporting piles of their houses are often ornamented. A house may be surrounded by a stockade, some of the posts of which are carved in imitation of human heads. As one approaches a *rancheria* he may find beside the trail *anitos* carved from the basal portions of the stems of tree ferns and set there to keep watch for enemies. Skillfully carved wooden images or *anitos*, which are supposed to be able to bring good crops or good weather, may be found within the houses. They are often bedecked with gifts consisting of earrings, rice-knives, etc., which have been presented in the hope of propitiating the *anitos*. (Pl. XLVII, fig. 1.)

The *Ifugao* eats his rice from a carved wooden bowl which may be single or double, or may take the form of a large vessel with four small ones attached to its perimeter. (Pl. XLVI, fig. 1.) The large bowl is used for serving boiled rice and the smaller ones hold salt, pepper, tomatoes, etc., with which the rice may be flavored. Forks and spoons, with handles carved in imitation of men and women, are in common use, as are bowls on the covers of which are carved pigs, carabaos, or figures of men and women. (Pl. XLVI, figs. 2 and 4; Pl. XLVII, fig. 2.) I have seen a lime-box made from a human bone, on which was scratched a picture illustrating the manner in which the original owner of the bone lost his life. (Pl. XLVI, fig. 3, *b*.) Lime-boxes ornamented with elaborate scratch-work patterns are frequently seen. (Pl. XLVI, fig. 3, *a*.)

Near, or under, the houses one sometimes finds large, artistically shaped wooden resting-benches, each large enough to accommodate two persons stretched out at full length. (Pl. XLVII, fig. 4.)

The *Ifugao* has been, and when not held in check, still is an inveterate head-hunter. The head-hunting feuds are strictly *rancheria* affairs. When some of the people of a given *rancheria* lose their heads, their friends make little or no attempt to take vengeance upon the particular individuals who took them but are content to get the heads of any of the residents of the settlement to which the aggressors belong. In the past, each *rancheria* has, as a rule, been at war with every other for miles around. Its people were ordinarily sufficient unto themselves and in many instances had little intercourse with outsiders for scores of years. It is doubtless due to this fact that a number of local dialects have sprung up, and that the *Ifugao* people, who really form a distinct and sharply marked tribe, have been subdivided into so many so-called tribes.

Heads taken in war are brought home by those who take them and are exposed at feasts which last for varying periods, their length depending upon the wealth of the victors and the importance of their victims. The skulls are then carefully cleaned and are used as household ornaments by those who took the heads, being either placed about the fireplaces, or at the doors or outer corners of the houses, or in a row at the level of the heavy floor timbers, or even, in some instances, hung in baskets under the eaves.

The arms of the *Ifugao* consist of a long shield in the form of a board, with a hand grip at the back, the lower end cut squarely off and the upper bluntly pointed (Pl. XI, fig. 1; Pl. LI, fig. 5); a steel lance with finely shaped head and wooden handle, reinforced with rattan lashings which are often colored red, and a broad bladed knife attached to a board sheath by means of one or two loose rattan lashings. The knife and sheath hang from the waistband of the owner's clout. (Pl. XI, fig. 1; Pl. LX, figs. 1, *c* and 2, *g*, *h*, and *i*.)

Small groups of houses are often surrounded by rice-paddies with high

and almost vertical walls, which make the approach of enemies difficult. (Pl. XXVI.) It is said that in repelling an attack in the terraced fields, bamboo lances, the points of which have been thrust into dead animals, are ordinarily used for throwing. Steel lances are usually reserved for thrusting, as they are too valuable to throw except in case of great emergency.

The only musical instrument in common use among the *Ifugaos* is the *gansa*, which is played with a drumstick. In the typical *Ifugao* dance both men and women take part. They form a line, the dancers in front and the musicians behind, and march back and forth with many rhythmical sidewise motions of the hands and arms and much flexing of the upper part of the body. This dance, which is common throughout the *Ifugao* country, is radically different from that of any other northern Luzon tribe. (Pl. LIV, fig. 1.)

I once attended the funeral of a man who had lost his head. (Pl. LXIII, fig. 2.) No *gansas* were used, but as the body was carried through the fields, the chief musician beat a tattoo on a piece of hard wood suspended by a cord in such a way that its vibrations were not interfered with. This piece of wood was painted black with white stripes. Behind the chief musician came five or six men carrying shields painted black, with zigzag, white stripes, and after the leader had beaten out a few notes he would stop while the men with the shields drummed a precisely similar series of beats upon them with wooden sticks.

Whatever may be the theoretically proper matrimonial state of the *Ifugao*, in practice he is not infrequently a polygamist. I have known a number of old and influential men who had wives of their own age and also a liberal assortment of young *queridas*.

The *Ifugao* wedding-dress is quite elaborate and striking. (Pl. XXIV, fig. 2.)

As already stated, the dead are sometimes buried in small houses especially constructed for the purpose. Not infrequently they are buried under the houses where they have lived, in the *Tingian* fashion, but the body of a man who has lost his head in war is placed in the ground, often on some lonely mountain top. (Pl. LXIV, fig. 1.)

I employ the name *Ifugaos* for the people of this tribe, because it has long been in general use with reference to a considerable number of them and seems to me more appropriate than any of the designations derived from the names of single *rancherias*. Some of the Bontoc *Igorots* call themselves *Ipukaos* or *Ifugaos*, but no *special* significance attaches to this fact, as the name *Ipukaos* or *Ifugaos* means simply "people." The Bontoc *Igorots* have always been known by the name of their principal *rancheria* and of the subprovince which they inhabit, and, as previously stated, I have deemed it desirable to retain this name for them.

Tribe V. THE BONTOC IGOROTS.

SYNONYMY.

The Bontoc *Igorots* are so sharply differentiated from their neighbors that they have never been confused with any other tribe. Many of them apply to themselves and their neighbors the name *Ipukao* or *Ifugao*. This name means "people" and is also applied by them to the short-haired inhabitants of Quiangan and Banaue, who are most certainly tribally distinct from them. Inasmuch as it has never been used in literature as a designation for the people of Bontoc, but has been so used for the short haired inhabitants of northwestern Nueva Vizcaya, it seems to me best to retain the commonly employed name Bontoc *Igorots* for the Bontoc people and to reserve the designation *Ifugaos* for their short haired neighbors.

I know no other synonymous designation for this people.

HABITAT.

The Bontoc *Igorots* are separated by the lofty Polis range of mountains from the *Ifugaos* on the south and southwest, and there has been no intermarriage with this tribe, with whom they have been at war for a very long time.

The line between their territory and that of the *Kalingas* and *Tingianes* on the east and north is not so sharply drawn, and there has been some intermarriage with the people of both these tribes, notably with the *Tingians* of Guinaan, Balatoc, and Balbalasan.

Captain Nathorst gives a list of the border *rancherias* of Bontoc visited by him and characterizes their inhabitants as follows:

AMBOAN. Southeast, bordering on Nueva Vizcaya. Bontoc *Igorots.*

BARLIG. East by south, bordering on Nueva Vizcaya. Bontoc *Igorots.*

LIAS. East by south, bordering on Nueva Vizcaya, Bontoc *Igorots.*

BALANGAO. East by south, bordering on Nueva Vizcaya, Bontoc *Igorots.*

LUBO. East, bordering on Cagayan or Isabela. *Kalingas* (?), *Igorots.*

MANGALI. East, bordering on Cagayan. Comprising six large barrios. *Kalingas.*

TALOCTOC. East, bordering on Cagayan. *Kalingas, Igorots.*

TANGLAC. Northeast, bordering on Cagayan. *Kalingas* and Bontoc *Igorots.*

LICLIC. Northeast, bordering on Cagayan. *Kalingas* and Bontoc *Igorots.*

BALANTEY. Northeast, bordering on Cagayan. *Kalingas.*

BOLO. North, bordering on Cagayan. *Kalingas.*

SALECSEC. North, bordering on Cagayan. *Kalingas.*

CALOGNEY. North, bordering on Cagayan. *Kalingas.*

DAMIJON. North, bordering on Cagayan. *Kalingas.*

DALUGEN. North, bordering on Cagayan. *Kalingas.*

BO-OK. North, bordering on Cagayan. *Kalingas.*

PATIQUIAN. North, bordering on Cagayan. *Kalingas* and Bontoc *Igorots.*

LINAS. North, bordering on Cagayan. *Kalingas* and Bontoc *Igorots.*

BANENG. North, bordering on Cagayan. *Kalingas* and Bontoc *Igorots.*

SESECAN. North, bordering on Cagayan. *Kalingas* and Bontoc *Igorots.*

TALALAN. North, bordering on Cagayan. *Kalingas, Tingians,* Bontoc *Igorots.*

BALBALASAN. North, bordering on Abra. *Tingians, Kalingas,* Bontoc *Igorots.*

PASCUAL. Northwest, bordering on Abra. *Tingians, Kalingas,* Bontoc *Igorots.*

INNANUNGAN. Northwest, bordering on Abra. *Tingians, Kalingas,* Bontoc *Igorots.*

Governor Villamor is of the opinion that the people of Lubo and Taloctoc are *Igorots.*

Dr. Jenks says that the Bontoc culture area stops short at Tinglayan, but does not tell us whether he has visited the latter place or any of the *rancherias* north of it. Of the *rancherias* listed by Captain Nathorst the only ones which I have visited are Balbalasan, Talalan, Sesecan, Patiquian, and Salecsec.

In my opinion, *Tingian* blood is predominant in Balbalasan, Talalan, and Sesecan, although that of the *Kalingas,* at least, is decidedly in evidence and becomes predominant in Patiquian, while the inhabitants of Salecsec are almost pure *Kalingas.*

More work must be done in several of these border *rancherias* before any final determination as to the exact limits of the territory of the Bontoc *Igorots* on the north and east can be reached.

The line between the territory of the Bontoc *Igorots* and that of the Benguet-Lepanto *Igorots* is well defined, the first *rancherias* of the latter tribe on the north and west being Quinali, Besao, Payeo, Bagnen, Bangnitan, Data, Sabangan, Bonayan, Pingad, Gayan and Namatec.

DESCRIPTION.

The Bontoc *Igorots* are a tribe of Malay origin. While one occasionally sees individuals with curly or wavy hair, they do not show any of the other characteristics of *Negritos,* and if their curly hair is a consequence of the admixture of *Negrito* blood, such admixture probably occurred a very long time ago.

The Bontoc *Igorots* have been so carefully and fully described by Dr. A. E. Jenks, in his book entitled The Bontoc Igorot,[6] that any further extended description would be superfluous, and the facts essential to this discussion may be stated in summary form.

The men are of medium size, but their muscular development is magnificent, and they create the impression of being much larger than they really are.

Thirty-two individuals measured by Dr. Jenks averaged 5 feet 4⅛ inches in height. Of these, the shortest measured 4 feet 9⅛ inches and the tallest slightly more than 5 feet 9 inches. The average height of 29 women was 4 feet 9⅜ inches, the tallest woman measuring 5 feet 4¾ inches and the shortest 4 feet and three-fourths of an inch.

The men are never corpulent and they are seldom very thin, except in extreme old age. The body is distinctly narrower at the waist than at the shoulders or hips. The buttocks are heavy, the legs straight, with thighs and calves splendidly developed; the hands and feet are broad and short; the skin is dark-brown, sometimes with a distinct, saffron tinge. (Pl. III, fig. 1; Pl. XI, fig. 2.) Individuals who have joined the Con-

[6] *Ethn. Surv. Pub.*, Manila, P. I. (1905), 1.

stabulary and as a result have worn clothes and bathed with frequency, have bodies so much lighter in color than their fellow-tribesmen that their appearance when they divest themselves of their uniforms never fails to create surprise.

The breasts of young women are large, full, and well supported; the hips broad and the waist scarcely narrower than the hips. The legs are very strong and are usually straight, with large calves and coarse ankles. The hands and feet are short and broad. (Pl. XIII, fig. 1; Pl. XXIV, fig. 1.) The women reach their prime at about twenty-three years, and at the age of thirty are beginning rapidly to grow old.

The hair-cut of the men strongly resembles that of the *Kalingas*, from which it differs only in that the cut extending over the ear is not usually continued so far back as with the members of the latter tribe. The hair over the forehead is banged squarely across, just as with the *Kalingas*, but the back hair, while allowed to grow long, is usually worn in a coil at the back of the head and is held in place by a cap, ordinarily of basket-work, but sometimes of wood. (Pl. IX, fig. 5.) Many of the men are very elaborately tattooed (Pl. VIII, fig. 4) and most of the women have tattoo marks on the arms. (Pl. XXIII, fig. 4.) Theoretically, the people of an *áto* (one of the political divisions of a Bontoc town) may be tattooed only when some person belonging to that *áto* has taken a head. However, the suppression of head-hunting in Bontoc has contributed to the breaking up of this custom, and undoubtedly a large amount of tattooing is done at present when no heads have been taken.

In every *rancheria* there are one or more men who are skillful in tattooing. The desired design is first drawn with a mixture of soot and water upon the skin of the person to be operated upon, and the tattooer then pricks the skin, following the lines of the design. After the design has been pricked in, soot is rubbed into the wounds thus produced. This causes the flesh to rise in great welts, which sometimes become infected and cause serious trouble.

The Bontoc *Igorots* recognize three kinds of tattoo. First, that on the breast, usually running upward from each nipple, curving out on the shoulders and ending on the upper arms. This indicates that the person so marked has taken a head. Second, the tattoo on the arms of men and women. Third, all other tattoos of both sexes. The women are tattooed only on the arms.

Dr. Jenks states that tattoo marks on the face, arms, stomach, and other parts of the body are believed to be purely esthetic, but other observers have remarked that it is often possible to determine from a man's tattoo marks the *rancheria* to which he belongs. With the Bontoc *Igorots*, as with a number of the other northern Luzon tribes, tattoo marks, because of their supposed therapeutic value, are put on goiters, tumors, and varicose veins.

The people of this tribe do not blacken their teeth, as do the wild *Tingians* of Apayao, nor do they chew betel nut.

Adult men usually wear a clout (Pl. III, fig. 1), although its place may be taken by a girdle about the waist and a bag attached to the girdle, which hangs down in front and serves the double purpose of apron and pocket. Very old men not infrequently have blankets, but young men scorn to use them. In addition, every man has a small cap, usually made of basket work, but sometimes of wood, which is worn on the back of the head and helps to confine the back hair. (Pl. VI, figs. 1 and 2; Pl. IX, fig 5.) In a few of the southern and western towns, where the men have cut their hair in imitation of the Benguet-Lepanto *Igorots*, a head-band is worn instead of this cap. In addition to the articles above mentioned, many of the men possess conical rain-hats covered with wax and thus made waterproof, and all have basket-work sleeping caps.

The ordinary dress of the women consists of a single, short piece of cloth woven from bark fiber which is wrapped about the body and extends from the waist to the knees. The opening between the two ends usually comes along the outside of the right leg. This skirt is held in place at the waist by a girdle of similar material. From the ends of this girdle there project long threads on which are strung seeds resembling the beads commonly known as "Job's tears." (Pl. XIII, fig. 1.) Most of the women also own cotton blankets, which are worn for warmth in inclement weather and also when the owners are dancing. (Pl. LIV, fig. 2.)

Women as well as men often strip before wading streams, and it is not unusual to see adults of both sexes going about entirely naked during rainy weather, or when engaged in dirty field-work.

Both men and women wear quite elaborate ornaments. Small holes are pierced through the lobes of the ears and are then stretched by forcing into them a constantly increasing number of small pieces of wood, about the size of matches, until they reach huge dimensions. (Pl. XXI, fig. 1.) Into these holes are thrust great rings of bamboo or blocks of wood in which coins, pieces of metal or of looking-glass, or bits of brightly colored stone may be set. At times, brass, silver, or gold ear ornaments of a pattern resembling those seen among the Benguet-Lepanto *Igorots* are used. (Pl. VI, figs. 1 and 2; Pl. XVIII, figs. 1 and 2.)

The men often wear in their hair brass tobacco-pipes of more or less elaborate design, from the bowls of which hang metal chains supporting metal pipe cleaners. (Pl. VI, fig. 1.) Huge earrings of metal are sometimes seen and the spoons of the unwary traveler are apt to disappear temporarily, reappearing later in the ears of the thief, after undergoing a very complete metamorphosis. The men often wear about the waist, chains of highly polished copper or brass wire (Pl. III, fig. 1), and about the neck, necklaces of seeds, boar's tusks, or dog's teeth. Armlets of boar's tusks, worn above the elbow, are quite common.

Perhaps the most highly treasured ornament of the men is made from one of the valves of a pearl-oyster shell. (Pl. III, fig. 1.) The fortunate owner of such an ornament wears it suspended from the waistband of his clout or from a chain or girdle about the waist. Armlets and leglets of copper wire are common. Finger-rings are relatively rare. I have seen men with pieces of coral thrust into their hair or through the holes in their ears.

The women are fond of copper-wire armlets and leglets, but seldom wear chains about their waists. Strings of beads or of dog's teeth and bright-colored seeds are highly prized. (Pl. XVIII, fig. 1; Pl. XXIII, fig. 4.) Unmarried women often wear flowers or bunches of green foliage in the hair, which is carefully dressed and held in place by strings of beads. The women do not ordinarily possess hair combs, but are very glad to get them. Many save their loose hair and wear it in the form of switches. (Pl. XXI, fig. 2.)

The houses of the Bontoc *Igorots* are usually closely grouped, forming genuine towns which often number several thousand inhabitants. Each town is made up of a number of political divisions known as *átos* which, for want of a better name, we may call wards. The affairs of the *áto* are presided over by a council of old men, and delegates from each of these councils sometimes meet to discuss affairs which concern the town as a whole.

In each *áto* there ordinarily are three public buildings which may be placed in close proximity to each other. (Pl. LXIV, fig. 2.) One of these, called the *pabafúnan,* is the house of the *áto* ceremonials. It is reserved for the men and boys of the *áto,* and women may not enter it. Boys of more than three or four years of age and all unmarried men of the *áto* sleep in the *pabafúnan.* It consists of an open, stone court, partially covered by a roof. About this court there may be trees, and one ordinarily also sees posts on which rude images of human heads are carved, or dead limbs of trees with the ends sharpened of the branches which project upward. On these posts and sharpened branches the heads of vanquished enemies are placed during the head feast. The *pabafúnan* is incidentally the men's club of the Bontoc settlement. In it the men loaf when not busy at home or in the fields, and they naturally improve the opportunity to exchange gossip and discuss current events.

The *fáwi* or *áto* council house is used as a place of meeting by the old men, and other persons are not ordinarily allowed to enter it. It is roofed over, and although often adjoining the *pabafúnan,* is not in connection with it, entrance being had by a separate and very narrow door. In the *fáwi* are kept the skulls of enemies whose heads have been taken by the warriors of the *áto.*

The *ólag* is the dormitory for girls, and unmarried femals of the *áto,* of two or more years of age are expected to sleep there. It has but one opening, a door some thirty inches high and often not more than ten or

twelve inches wide. Its floor is covered with boards about four feet long by eight to fourteen inches wide, each board serving as a bed for one of the girls. In some *átos* the *ólag* is lacking, in which case the girls go to the *ólag* of some other *áto* to sleep; or there may be two *ólags*, if the number of girls and unmarried women is large.

The typical Bontoc family dwelling house is the place where a man, his wife, and his children less than two years of age sleep and where the entire family eats. In the *rancheria* of Bontoc it is practically always constructed on a fixed plan. (Pl. XXXIII, fig. 1.) The walls are about three and a half feet high; the front wall is open in the middle; the front and side walls are built of boards, but the rear one is of stone, chinked with clay. There is a post six or seven feet high at each of the four corners of the building; the boards of the side walls are tied to these posts, which also support the greater part of the weight of the roof. There is no floor on the first story. On the left, as one enters, is a small room partially marked off by stones sunk in the earth. In this room rice is hulled, millet is threshed, and food is prepared for cooking. Next to this room on the left comes one in which the food is cooked. Down the center of the house extends a passageway and to the right as one enters there is a shelf or bench on which are placed various household articles.

At the rear is a sleeping box, extending from one side of the house to the other, so that the side walls make its ends and the back wall forms its back side. It has a front side and a top of wood, and is entered by means of a small door. This box is sometimes lined on the inside with stone, except at the point where the door gives entrance to it. It contains sleeping boards for the husband and wife, and in one end of it a fire is built for warmth. Many of the Bontoc *Igorots* suffer from serious eye trouble, which doubtless has its origin in the constant irritation caused by the smoke in their sleeping boxes.

The roof of the house extends nearly, but not quite, down to the level of the sides and projects beyond them for some distance. In its peak there are ordinarily two rooms, one above the other. Entrance is had to the lower by means of a door and short ladder. It is used as a storeroom. The second room must be entered from the first. It is sometimes used as a storeroom and sometimes stands empty. The roof of the house is well thatched with grass. Under the eaves, firewood is stored.

Dwelling houses of very different types may be found in many of the other *rancherias* of the Bontoc *Igorots*, and even in the settlement of Bontoc itself, those inhabited by widows are sometimes mere huts.

The fish of the Bontoc streams are few in number and are usually small in size, but the people manage to secure a considerable supply of them either by catching them with their hands under stones in the streams or by chasing them into wickerwork baskets or traps. (Pl. L, fig. 1.)

Traps are also set for jungle-fowl and for small birds and mammals. Wild carabaos are hunted by large bands of warriors, who lie in wait by their runways and attempt to spear them when they pass. This form of sport is attended with a good deal of danger, as a wounded carabao is a fierce and determined fighter. Dogs are sometimes kept for running deer and hogs. Deer are relatively scarce in Bontoc, but hogs are quite abundant. When brought to bay by the dogs, they are killed with lances, the use of the bow and arrow being unknown among the Bontoc *Igorots*. Deer and hogs are also taken in pitfalls and dead-falls.

The agriculture of the Bontoc *Igorots*, like that of the *Ifugaos*, is very highly developed for a people otherwise so primitive. As the country which they inhabit furnishes little game and fish, they are very largely dependent upon the fruits of agriculture for a livelihood. They build wonderful irrigation dams and ditches and terraced rice-fields which often extend far up the mountain sides. (Pl. XXXVIII, fig. 1.) The ground, after being flooded, is prepared for planting with no other implements than sharpened sticks and the hands and feet of the laborers. Men and women join in this work, and may not infrequently be seen working side by side in a state of absolute nudity, their clothes having been discarded in order to prevent injury to them by mud and water. However, more frequently the women leave their girdles on, and attach bunches of leaves or grass to them in lieu of skirts. (Pl. XXIV, fig. 1.)

The two principal crops are rice and *camotes;* the former grown under irrigation, and the latter as a rule high up on the steep mountain sides. However, in some cases a crop of *camotes* is grown on the rice-terraces during the dry season, and in rare instances one sees terraces which are given up exclusively to the cultivation of these tubers.

The Bontoc *Igorots* also raise a considerable quantity of millet, beans, and maize. Their cultivated fields are fertilized with care. They have well-established property rights over them and also have rules relative to the use of irrigation water, which are designed to insure its equitable distribution.

Rice is first sown thickly in seeding beds, and when it has sprouted is transplanted by hand. During the entire period of growth it is kept carefully weeded and is thinned out as occasion may require. After it has headed, constant care is necessary to protect it from the depredations of hogs, monkeys, rats, and birds. In this, as in all other work, the Bontoc *Igorots* display great patience and industry.

Before the rice harvest is begun, a brief ceremony is performed in a pathway adjoining each plot where harvesting is to go on. Tall stalks of *runo* grass are then set as a warning to other *Igorots* that harvesting is in progress and they must not pass that way. Persons violating this rule are subject to heavy fines.

More attention is paid by the Bontoc *Igorots* to domestic animals than is given by the *Negritos, Ilongots,* or *Kalingas.* Pigs are kept in large

numbers and lead a pampered existence, being provided with well-thatched houses in which they may seek shelter from the sun or rain. These houses open from yards sunken in the stone courts of the houses of the owners. Cooked food is often prepared for the pigs and is served to them from wooden buckets, in troughs of wood or stone. The pigs thus carefully raised do not furnish a part of the ordinary food supply, but are reserved for consumption at ceremonial feasts. Chickens are kept in some abundance, and some of the more wealthy *Igorots* own carabaos which are usually allowed to run in a half-wild state, so that it is necessary to organize a regular hunt in order to kill them. They are never employed as draft animals but, like pigs and chickens, are eaten at ceremonials. In a few of the settlements a small number of horses are kept. They are not ridden, but serve as a source of food supply. Dogs are raised in considerable numbers. Some of them are used by their owners in hunting, but the majority are kept to be killed and eaten at ceremonials. However, occasionally the ordinary bill of fare is helped out with a little dog meat.

The Bontoc *Igorots* have manufactures of some importance. They occasionally roll cigars, but as a rule prefer to smoke their tobacco in pipes. They make *basi* in considerable quantity and sometimes have enough not only to satisfy their own necessities, but to sell to others. The apparatus used for extracting the cane-juice may properly be dignified by the term "mill." It consists of two vertical, wooden cylinders, one of which is geared to the other. To the upper end of one of the cylinders a long wooden beam is fastened, and men and boys furnish the necessary motive power by pushing on this beam. (Pl. XLI, fig. 2.) The cane is fed between the cylinders and there is a receptacle in which is caught the juice, which is subsequently boiled for six or seven hours. A handful of vegetable ferment is then thrown into it and it is allowed to stand for four or five days, when fermentation is complete. The fermented liquid is then poured into large, earthen jars and tightly covered. It will keep for four or five months, but ultimately turns into vinegar.

The Bontoc *Igorots* also make another fermented drink, called *tapuy*, from rice. They also prepare a very limited amount of cane-sugar.

The women roll strips of bark into coarse thread (Pl. XLIII, fig. 1) which they weave into cloth on primitive looms. In a few towns they weave cotton clouts and blankets of quite elaborate design and varied pattern. The making of basket-work is one of their most important industries. They weave not only basket caps for the hair, which are made of brightly stained rattan and are often highly ornamental, but rattan sleeping caps; baskets for serving food; for confining chickens; for carrying rice and *camotes*; for rain shields, and for a variety of other purposes. Pottery of very good quality is manufactured in several towns, notably in Samoki and in Bitwagan. Other towns make clay and metal

pipe bowls. Wooden pipes are manufactured by the people of all the towns.

Head-axes and lance-points are fashioned from iron and steel at Baliwang, and axes which, by a change in the position of the head on the handle, can readily be converted into adzes are produced in considerable numbers.

Ceremonial drinking cups and lime-boxes, ornamented with scratch-work patterns, or with quite elaborately woven lashings of vegetable fiber, are made from bamboo. Bowls, troughs, and ladles are fashioned from wood, and pig-troughs are sometimes hollowed from stone. The elaborately carved wooden spoons, forks, bowls, and other wooden dishes so common among the *Ifugaos* are conspicuous by their absence. So called *anito* posts, carved from tree-fern trunks, are sometimes seen in the fields or beside the trail. (Pl. XLVIII, fig. *a*.)

One town of Bontoc, Mayinit, has an important and unique industry in the manufacture of salt from a brine which flows from boiling springs. This brine is led to clay courts roughly paved with small stones and roofed over to keep off the rain. It flows among the stones, evaporating by its own heat and depositing its salt. When a sufficient amount has been deposited on the lower surface of the stones, their position is reversed. When they are entirely covered they are taken out, the salt is washed off, and the strong brine thus formed is evaporated in kettles over fire. The salt thus produced is made into cakes and dried and then becomes an important article of *Igorot* commerce.

Until within a short time the Bontoc *Igorots* have been persistent head-hunters, but this practice is now rapidly disappearing. Dr. Jenks states that the possession of a head is in no way requisite to marriage, and that the heads of enemies have no part in the ceremonies celebrated in order to secure good crops, good health, or for other similar purposes; that they do not affect a man's wealth, nor his supposed fortune in the world to come. He accounts for the persistency with which head-hunting is indulged in on the basis that a man desires to be considered brave by his neighbors and his descendants, and that he also needs activity and excitement.

It does not appear that Dr. Jenks had any opportunity personally to investigate the head-hunting customs of the Bontoc *Igorots*. Information received from other sources leads me to believe that the taking of a head is of very real assistance to a Bontoc man in making a good match. If the heads taken are of so little use, how are we to account for the undoubted fact that the cash value of a head in Bontoc was, until recently, a hundred pesos, a very large sum among such poor people?

The Bontoc warriors are brave men, and instead of murdering their victims from ambush, as do the *Ilongots*, they not infrequently send formal challenges to the enemies with whom they wish to fight. When a challenge is accepted, an open attack is made by the inhabitants of one

town on the other. Challenges may be refused, and there are regular, established procedures for breaking the peace between towns, and for reëstablishing it.

When a warrior takes a head, he usually returns at once to his town and placing the trophy in a funnel-shaped receptacle fastens it to a post in the stone court of the *fáwi*. A short ceremony lasting a day and a night, at which a dog or a hog is killed, is immediately inaugurated, and on the following night there begins a ceremony which lasts for a month. At the outset the head is taken to the river and washed, the lower jawbone is cut off, cleaned, and reserved for use as a *gansa* handle. (Pl. LV, fig. 1.) On the evening of this day the head is buried under the stones of the *fáwi*, while the ceremony continues. Endless dances are held, and carabaos, dogs, hogs, and chickens are killed and eaten. After the head has been buried for approximately three years, it is dug up, and the skull, after being thoroughly washed, is placed in a basket with other skulls and hung in the *fáwi*. (Pl. LXIV, fig. 3.) Another feast is celebrated at this time. The skulls are ultimately again buried under the stones of the *fáwi* and, in fact, some of the *rancherías* do not dig them up at all. The body of a warrior unfortunate enough to lose his head is buried without formal ceremony under the trail leading to the town of the man who took it. On the day following such a burial, the people of the *áto* to which the victim belonged have a fishing ceremony, and eat fish for the evening meal. On the succeeding day they go to a spot near the place where their companion lost his head and ask his spirit to return to their town.

The Bontoc warrior is usually armed with a broad-bladed head-axe, a steel-headed lance, and a good-sized wooden shield. (Pl. XI, fig. 2.) Lance-heads are variously shaped, some of them being mere plain blades, while others have from one to four pairs of barbs. (Pl. LX, figs. 2 *j*, *k*, *l*, and *m*.) In the *rancherías* of Amboan, Agawa, Sagada, and Tetepan most of the warriors use head-knives or bolos instead of head-axes.

The Bontoc *Igorots* have a number of musical instruments, including "jew's-harps" made of bamboo or brass, bamboo flutes and *gansas*. Of these, the *gansa*, which is in such general use among the non-Christian tribes of northern Luzon, is by far the most important. It is made of copper or brass, and is suspended from a handle which theoretically should be and practically often is, the lower jawbone of an enemy killed in a battle. (Pl. LV, fig. 1.)

The Bontoc *Igorot* does not beat his *gansa* with his hands as does the *Kalinga*, *Tingian*, and *Ifugao*, nor with a bit of wood as does the Benguet-Lepanto *Igorot*, but uses a well-fashioned, skin-covered drumstick.

He dances while he plays, and in the dance both men and women participate. In one of the common dances the men form a long line which winds in and out through the crowd of spectators, while the dancers pound their *gansas* and execute some very fancy steps. This dance is

participated in by women who do not join the line, but keep near it, dancing with outstretched arms and with much rising on tiptoes and descending on the flats of the feet.

In the head-dance, the chief actor goes through the motions of hunting down and killing his enemy, taking his head, etc., dancing meantime to the accompaniment of *gansas* played by men who at the same time themselves dance, as do the women who happen to be near. (Pl. LIV, fig. 2.)

In another dance the men form a line with their arms about each other's necks, and the women form a similar one immediately behind them. The man at the right holds in his hand a stick which he stretches toward the ground from time to time. This dance is executed to the tune of rather mournful singing by the participants, and is accompanied with much flexing of the body and legs. (Pl. LV, fig. 2.) It is said to be performed in connection with funerals. All of the dances of the Bontoc *Igorots* are spirited and striking affairs.

The Bontoc *Igorot* is monogamous. He has but one wife and is usually faithful to her. However, he has the peculiar custom of trial marriage, a young couple establishing a temporary union while the girl is still living in the *ólag* and leaving future events to determine whether this union shall become permanent. The advent of a child usually settles the matter in the affirmative.

Unfruitful unions generally lead to divorce, separation being accomplished by mutual consent between husband and wife. In case either party to a marriage deserts the other, he or she must pay a fine of one or more rice plots or other valuable property. If either party dies, the other must not remarry for at least a year.

Theft, lying to shield oneself from the consequences of evil deeds, assault and battery, adultery and murder are recognized as crimes by the Bontoc *Igorots*. There are a number of interesting tests to determine which of several suspected persons is guilty of a crime, but I will not describe them, as we have not sufficient knowledge of similar practices among the other northern Luzon tribes to establish a comparison of importance. However, it should be said in passing that one of these is the rice-chewing test, in which each of the suspected persons is made to chew a mouthful of raw rice, and to spit it out at word of command. Each mouthful is then examined, and the person whose rice is driest is considered guilty, it being supposed that the guilty one will be frightened during the trial and that the flow of saliva will consequently be checked. This same test occurs among the *Tagbanuas* of Palawan and the *Mangyans* of Mindoro.

The Bontoc *Igorots* believe that sickness and death are caused by *anitos*. They have medicine for wounds, burns, and headaches. They poultice boils and other sores, and make a salve of millet and charcoal to use in curing the itch. Toothache is treated with salt mixed with

pounded herbs. A decoction of certain leaves is used to cure smallpox, but in ordinary cases of severe illness the measures taken are purely of a nature calculated to appease the *anitos* who are believed to be making the trouble.

Death is taken very quietly by the living. A woman weeps a day for a child or a husband, but men do not weep over the death of friends or relatives. There is no long or loud lamentation as with the *Ilongots.* The body, wrapped in a blanket on which are woven white *anito* figures, is placed in a rudely fashioned chair and set inside the house, immediately in front of the door. Feasting and drinking then begin and last for a time which varies with the wealth and importance of the deceased.

There is no field work in an *áto* on the day when an adult person is buried. The body is placed in a coffin and buried in the ground. When the coffin has been lowered, the grave is filled as quickly as possible in order to avoid evil portents, such as the crowing of cocks, the barking of dogs, and the crossing of the trail by snakes or rats. The bodies of persons of importance are buried at the outskirts of the town; those of ordinary persons in the fields near their houses; those of children are not placed in coffins. The bodies of very young children are buried close to the houses in order that the children may be afforded protection. After a burial, the relatives return to the house of the deceased and pass the night there, a ceremony being performed with the apparent objet of propitiating his *anito.* On the following day all the male relatives go to some neighboring stream and fish. That evening they have a fish festival to which all the ancestral *anitos* are invited. The second night is also spent at the house of the deceased, after which the relatives retire to their homes at night. The funeral rites last from two to eight days.

In general it may be said of the Bontoc *Igorot* that, although a pagan, he is brave, industrious and intelligent, and is possessed of a strong sense of humor which leads him at times to play practical jokes even upon white men. He has shown himself rather docile in the matter of giving up head-hunting. He responds readily to the discipline of military service, and makes a good soldier. All in all, there is much hope that he ultimately will make great progress in civilization and in material prosperity, but his intense conservatism will, at the outset, render such progress slow.

The boys are bright and learn rapidly. They also indulge in vigorous, not to say rough, play, and laugh and shout like small American boys, presenting in this particular a pleasing contrast to the silent and timid children of the civilized towns.

I incline to believe that Rizal's statement that the hope of the Philippines lies in the people of the mountains is worthy of more serious consideration than has hitherto been accorded to it. At present, very few of his countrymen are really interested in the work of civilizing the wild

tribes. It is to be hoped that the number of such persons will increase in the not very distant future. Meanwhile, the average wild man accedes with much better grace to suggestions from a white man than to those made by a civilized Filipino.

Tribe VI. THE BENGUET-LEPANTO IGOROTS.

The non-Christian people of the Province of Benguet and the subprovince of Lepanto call themselves *Igorot*, and the name *Igorots* might, with entire propriety, be assigned to them as a tribal designation were it not that no satisfactory name for the Bontoc people except that of Bontoc *Igorots* has thus far been suggested, and it therefore becomes necessary to distinguish between the *Igorots* of this subprovince and those of Benguet and Lepanto.

SYNONYMY.

BENGUETANOS. Name applied to *Igorots* of Benguet.
IGUDUT. Synonym of *Igorot*.
YGOLOTES. Synonym of *Igorots*.
YGOROT. Synonym of *Igorot*.

HABITAT.

The entire Province of Benguet, including the former *comandancia* of Kayapa; the mountains of that portion of Union Province which borders on Benguet and Amburayan; the entire subprovince of Amburayan with the exception of the township of Sigay, where there are a number of *Tingians;* the hills bordering upon Amburayan and South Ilokos, and the entire subprovince of Lepanto with the exception of the townships of Angaki, Concepcion, and San Emilio, in each of which there are considerable numbers of *Tingians.*

The *rancherias* inhabited by Benguet-Lepanto *Igorots* which border upon the territory inhabited by the Bontoc *Igorots* have already been listed.

It should be noted that in the mountains of northeastern Benguet there live, in inaccessible places, a people called by the Benguet-Lepanto *Igorots* "Busaos." This word means "enemies" and is not a tribal designation. The people to whom it is applied are Benguet-Lepanto *Igorots* and speak the Kankanai dialect.

DESCRIPTION.

The Benguet-Lepanto *Igorots* are of lower stature than are the Bontoc *Igorots* and *Ifugaos,* but as a result of inhabiting a very healthful mountain country they are remarkably strong and well developed. Many of them have large and very beautiful eyes. Their skins are of the usual dark shade of brown, although often darkened by earth and soot and by long continued exposure to the sun. The men usually wear their hair cut moderately short. The women bang the hair which hangs over the forehead, but allow the rest of it to grow moderately long and wear it hanging down their backs.

The usual costume of the men is a clout, supplemented, whenever the means of the individual will permit, by a cotton blanket, which is wrapped around the upper part of the body to protect it from the cold breezes of the mountains. (Pl. III, fig. 2.)

At the present time many of the men have adopted civilized dress. Old hats and blue flannel shirts are especially desired. Trousers they don with some reluctance. It is considered etiquette for the presidents and councilors of the *rancherias* to wear civilized dress during office hours and on state occasions. Many of them discard their trousers as soon as these hours are over, and some of them request vacations from time to time in order that they may go back to their clouts and "rest."

The Benguet women, unlike those of any other non-Christian tribe in northern Luzon, habitually clothe the entire body. Their working costume consists of a skirt reaching to, or a little below, the knee, a long-sleeved upper garment and a towel or a piece of cloth coiled about the head in the manner of a turban. The poorer women, on state occasions, and the wealthier ones when not at work, wear garments of brightly colored cloth. Three or four skirts may be superimposed one over another, like Japanese kimonos (Pl. XIII, fig. 2), and the same holds true of the upper garments. From childhood, the *Igorot* women are accustomed to carry heavy burdens in baskets on their backs. In order to save their clothes, when carrying they usually put their upper garments on with the back side forward, leaving their backs bare, so that the wear from the baskets may come on their skins rather than on their much-cherished clothes. Occasionally also, when at work in the fields or in the privacy of their homes, they remove their upper garments, which are, however, always promptly donned if a stranger appears.

The men of southern Benguet usually have the hair cut quite short all over their heads and often wear pieces of cloth coiled around their heads turban fashion. (Pl. VI, figs. 3 and 4; Pl. IX, fig. 6.) The women usually bang their hair across their foreheads, but allow the rest of it to grow moderately long and to hang down their backs. They almost always wear towels or pieces of cloth bound around their heads so as to form rude turbans, and if their hair is long enough to cause them annoyance when at work, it may be bound up at such time. (Pl. XVIII, figs. 3 and 4; Pl. XXI, fig. 3.)

Both men and women are sometimes tattooed, the women more frequently than the men. The tattoo marks are chiefly confined to the hands and arms (Pl. XXV, fig. 2), although sometimes they are made upon goiters and tumors because of their supposed curative effect. The men often have conventional tattoo marks, representing the sun, on the backs of their hands.

They have few ornaments, but sometimes wear earrings of copper, silver, or gold, and leglets of copper wire. A few of the men have metal pipes, and many of them carry a set of metal toilet articles consisting of ear spoons of different forms and pinchers for pulling hair from the face or body. The women have ear-ornaments similar to those of the men (Pl. XXV, fig. 3*a*), and occasionaly bedeck themselves with beads. Some of the women of Kabayan have thin bands of solid beaten gold

which are worn between their lips and front teeth, completely closing their mouths. (Pl. XXI, fig. 3.) These gold bands are no longer made, the ones which exist having been handed down by the ancestors of the present generation.

In the vicinity of Suyok, large, and strangely fashioned, gold ornaments, which, for want of a better name may be called brooches, are occasionally met with. (Pl. XXV, fig. 3*b*.)

The Benguet-Lepanto *Igorots* usually live in well-defined settlements (Pl. XXVIII, fig. 1), although occasionally one finds single families inhabiting remote and inaccessible mountain fastnesses. The dwelling house may have a grass roof and sides and be placed on the ground, or it may have board sides with a thatched roof, and be either placed on the ground or raised several feet above it on piles. (Pl. XXXIII, fig. 2; Pl. XXXIV, fig. 1.) Frequently it has a platform under the eaves, on which the occupants sit during rainy weather. It is sometimes lighted and ventilated by but a single door, but may have two or more doors and several windows. It is almost invariably black with soot on the inside, the cool weather of the mountains making a fire constantly necessary.

In the *rancherias* along the Bontoc border and in some of those in Amburayan the houses are built on the ground, with low sides and very high peaked roofs, each roof containing a small room, to which there is access by a ladder and in which rice and other commodities are stored. (Pl. XXXIV, fig. 2.)

Rice-granaries and pig-pens are the only other structures ordinarily made by the Benguet-Lepanto *Igorots*, unless, indeed, that name be applied to the ceremonial platforms usually found near their houses, on which are placed offerings to propitiate the spirits.

The boards and timbers used for house construction are hewed from pine trees and are rarely carved or ornamented, although there are exceptions to this general rule.

The streams of Benguet and Lepanto contain even fewer fish than those of Bontoc and Nueva Vizcaya. Nevertheless, with traps and with their bare hands the people manage to catch a few small fish (Pl. L, fig. 2), and they sometimes spear eels of large size.

Deer and wild hogs, which are fairly abundant, are hunted with dogs and killed with lances. The use of the bow and arrow is unknown among the people of this tribe.

The agriculture of the Benguet-Lepanto *Igorots* is not so well developed as is that of the Bontoc *Igorots* and the *Ifugaos*, although they sometimes construct quite extensive, terraced rice-paddies. The walls of these terraces are almost invariably made of mud, but in the vicinity of Kabayan, in Benguet, one sees stone walls. *Camotes* are the staff of life, rice being more or less of a luxury. *Camotes* are usually grown on the steep mountain sides, and after two or three crops have been raised the land is allowed to rest for some time before being planted again. Tomatoes,

squashes, and *taro* are grown to a limited extent. Fine bananas are raised in abundance and good mangas are to be had in the warmer valleys. Considerable coffee is raised at Daklan and Kabayan, in Benguet. (Pl. XXXVIII, fig. 2.)

The Benguet-Lepanto *Igorots* keep dogs for hunting purposes and for household pets and also bring in from the lowlands a large number of these animals which they eat. They raise chickens and pigs in considerable numbers, the latter being mostly reserved to be eaten on state occasions. Their pigs, which are well cared for and sometimes attain a large size, are of a type distinctly better than that of those kept by the civilized natives of the lowlands. Carabaos, cattle, and horses are raised in considerable numbers. The men are good horsemen and ride skillfully either with or without saddles. (Pl. LI, fig. 3.) They have very little consideration for their horses, and often run them up and down hill. Many of the women also ride. (Pl. LI, fig. 1.) Chickens, pigs, carabaos, cattle, or horses which die of disease are promptly eaten.

The Benguet-Lepanto *Igorots* roll their own cigars and prepare from rice a fermented drink known as *tapuy*. Their manufactures of wood are limited to images or *anitos* (Pl. XLIX, figs. 1, *a, b, c,* and *d*), the rude ladles and bowls or trays used in cooking and serving food (Pl. XLIX, fig. 2, *c*), carrying-boxes (Pl. XLIX, figs. 2, *a* and *b*), and carved walking-sticks, spoons and small, wooden dishes, which are produced in some quantity by the people living in the vicinity of Bugias. (Pl. XLVIII, figs. *c, d,* and *e*; Pl. XLIX, figs. 1 and 2.) The men have mined gold for centuries. They work over the faces of exposed cliffs, when necessary suspending themselves by means of rattans, and pick out the streaks of rich ore which show free gold. This they dig with their crude iron or steel implements, the use of powder being unknown among them. The ore, after being dug, is crushed and panned.

Both men and women also wash gold from the sands of the streams, and the women are especially famed for the skill with which they save the very light float gold—a skill which American miners have found it impossible to attain. The gold is usually sold in the form of dust, although it is sometimes melted and run into ingots.

Many of the *Igorots* of northern Benguet and southern Lepanto mine copper and smelt it by a process of their own. From the metal thus obtained they fashion *ollas* and kettles which frequently are of large size. The method employed in making kettles is kept secret by those familiar with it, and numerous attempts on the part of Americans to surprise coppersmiths at their work have proved abortive. At one time a considerable business was done in the vicinity of Suyok in making rude counterfeits of Spanish copper coins. Clay molds were taken from genuine coins, and into these molds the copper was run. These counterfeits, although quite recognizable as such, circulated freely for some time because of the shortage of small change.

The *Igorots* of Benguet make little or no cloth, but some of those of Lepanto bordering on the *Tingian* country have learned the art of weaving from their neighbors, and the same is true of some of the inhabitants of the *rancherias* near the Bontoc border, who weave beautiful blankets. Basket ware of good quality and in considerable variety is quite generally manufactured.

The Benguet-Lepanto *Igorots*, both men and women, carry burdens on their backs as do the Bontoc *Igorots*, differing in this respect from the *Ifugaos* who, so far as possible, carry everything on their heads.

Although seventy-seven years ago the *Igorots* of Benguet offered armed resistance to the Spaniards who first entered the province, they are now the most pacific of people. When the first Spanish expeditions penetrated their territory, the Benguet *Igorots* seem to have used bows and arrows, but this is no longer the case. In an emergency it is still possible for them to hunt up a few old shields and lances, but many years have passed since they have made war on any other tribe or committed any act of armed aggression. They do not take heads, and there seems to be no evidence that they have ever done so. Their war shields were, it is said, usually ornamented with the carved figure of a man. (Pl. LXI, figs. 1, *d* and 2, *d*.) Lances are far more commonly met with than shields at the present time. They have been retained because they are useful in hunting. In general, their heads are smaller and less well made than are those of the lances of the Bontoc *Igorots*, which they resemble in shape.

The music of the Benguet-Lepanto *Igorots* is highly characteristic, and several instruments are used in producing it. Of these the most peculiar is a pair of long, slender-barreled wooden drums, open at one end and having the other covered with pigskin or lizard skin. (Pl. LVI, figs. 1 and 2.) These drums are played with the hands. The operator can change the pitch of the tones produced by pressing his arm or leg, or both, against the wooden barrel. The *gansa*, which is always used when music is wanted, is played with a short stick or slat of bamboo. (Pl. LVI, figs. 1 and 2.) Usually there is also one musician who beats together a stone and a bit of steel or iron. During certain months of the year a Benguet *Igorot* woman will not go on the trail without carrying and constantly playing the bamboo musical instrument shown in Plate LIX, figs. 1, *b* and *c*. This instrument is carried in the left hand and is made to vibrate by striking one of its prongs against the right wrist. The character of the sound thus produced is changed by thumbing the hole near the septum at the undivided end. The Benguet *Igorots* are also fond of vocal music. They sing frequently at their feasts and occasionally when on the trail or resting beside it.

In the dance which is most commonly seen, a man with outstretched arms from which blankets are hung represents a bird. He dances with active movements of the feet and with much flexing of the arms, wrists, and hands. His fair partner dances with her hands stretched upward

and the palms turned forward. (Pl. LVI, fig. 3.) Her steps are less active than those of the man and she occasionally stoops forward until the tips of her fingers almost touch the earth. At times she moves forward by bending the toes, keeping her feet almost constantly in contact with the earth.

The Benguet-Lepanto *Igorots* are monogamous. Children are betrothed at a very early age and often marry at the age of puberty or even before. Strong attachments are not uncommon among the married people and divorce is relatively rare.

Sickness is attributed to *anitos*. Very few native medicines are employed in treating the sick and great reliance is placed in *cañaos*, at which carabaos, cattle, pigs, or chickens, according to the wealth of the sick person, are killed. Gradually, however, southern Benguet representatives of this tribe have learned the value of the white man's medicine, many of them having been treated in the hospital at Baguio. A great triumph was scored a short time since when the wife of an influential chief named Matéo Cariño, was persuaded to place herself in the hands of an American physician when she was nearly dead from dysentery, and was cured.

When a person dies, a funeral feast is held which frequently lasts until the expense involved equals the value of all the property of the deceased. While the feast is in progress the body is kept, usually in a sitting position, in or under the house. It is ultimately placed in a wooden coffin and removed to a burial place, which is often in a cave or under a great rock. (Pl. LXVI, fig. 1.) If the deceased is a distinguished person his relatives visit his grave from time to time and bring him food and drink.

The people of the Kayapa district in Benguet and the so-called *Busaos* who inhabit the mountains near Buguias and Loo are the wildest representatives of this tribe. They show few indications of association with their *Ifugao* neighbors, from whom they are separated by high mountains. Along the Bontoc and Abra boundaries there has been some intermarriage with the Bontoc *Igorots* and *Tingians*, with consequent confusion of customs. However, on the whole the line between the territory of these several peoples is quite sharply drawn.

While all the settlements of the Benguet-Lepanto *Igorots* have their own governments, organized in accordance with the white man's law, there still remain *Igorot* representatives of the families from which came the chiefs of former days, who have more influence than have any of the present elected officials. Not a few individuals of these families have attained to considerable wealth.

All in all, the Benguet-Lepanto *Igorots* must be considered far more highly civilized than any other non-Christian northern Luzon tribe except the *Tingians*. Their boys are now attending school in considerable numbers and are proving to be bright pupils. For a long time they

refused to allow their girls to go to school, but their prejudices have now been overcome to some extent and an interesting experiment in the education of girls is being conducted at Baguio.

Tribe VII. THE TINGIANS.

SYNONYMY.

APAYAOS. Name applied to the *Tingians* living in the district of Apayao, Cagayan.

APAYOS. Synonym of *Apayaos.*

APOYAOS. Synonym of *Apayaos.*

BANAOS. Name applied to the *Tingians* of the upper Saltan River Valley and the *rancherias* of Guinaan and Balatoe.

BURICS. Name applied to the *Tingians* of the Cordillera Central in northern Abra.

BUSAOS. Name applied to the *Tingians* of the mountains of Siguey, near Benang, Abra.

ECNIG. Synonym of *Itneg.*

GINAN. Synonym of *Guinaanes.*

GUINAANES. The name applied to the *Tingians* of Guinaan and neighboring *rancherias.* The statement of the Jesuits that these people are Malay-*Negritos* is incorrect. They show no evidences of *Negrito* blood.

GUINANES. Synonym of *Guinaanes.*

ITANEG. Synonym of *Itneg.*

ITAVEG. Synonym of *Itneg.*

ITETAPANES. Said by the Jesuits to be a tribe "contiguous on the south with the *Igorots* of Benguet, on the north with the *Guinaanes,* and on the west with the *Busaos.*" No such people exist at the present time. In point of fact this name was probably applied to the inhabitants of Tetepan.

ITNEG. The name universally applied by the *Tingians* to themselves.

QUINAANES. Synonym of *Guinaanes.*

QUINANES. Synonym of *Guinanes.*

TINGGIANES. Synonym of *Tingians.*

TINGUES. Synonym of *Tingians.*

YTATAPANES. Synonym of *Itetapanes.*

HABITAT.

The stronghold of the *Tingians* is the subprovince of Abra, where they make up approximately 50 per cent of the population. Numerous *Tingian rancherias* are found in the eastern mountains and foothills of Ilokos Sur and Ilokos Norte, and the inhabitants of the Ablug River Valley, including the old Spanish *comandancias* of Cabugaon and Apayaos and in general the district which has been known as Apayaos, belong to this tribe. It extends south along the eastern slopes of the Cordillera Central as far as Dagara. South of this point the *Tingians* give way to the *Kalingas,* only to reappear again along the headwaters of the Saltan River at Seseean, Balbalasan, Balatoc, and Guinaan. In these latter *rancherias* they have intermarried somewhat with the *Kalingas* and Bontoc *Igorots.* There are considerable numbers of them in the *rancherias* of Tiagan, Concepcion, and Angaki, in the subprovince of Lepanto, where they are living with Benguet-Lepanto *Igorots.* The same condition of things prevails in the township of Sigay, in the subprovince of Amburayan. Finally, there are a number of settlements of

Tingians who have been converted to Christianity, in the vicinity of Rosario and Pozzorubio in Pangasinan, near the mouth of the Bued River canyon, and strangest of all, there is a single *Tingian rancheria* called San Marcelo in the Province of Nueva Ecija. A band of wandering *Tingians* has even been observed by Dr. Barrows in Pangasinan.

DESCRIPTION.

The name *Tingians* or *Tinguianes* has long been applied to the non-Christian inhabitants of Abra and to certain of those of the western slopes of the eastern mountain ranges of Ilokos Norte and Ilokos Sur. These people call themselves *Itneg*, and this appellation would be a fitting tribal designation for them, but the name which I have adopted has been so long and so generally in use that it seems undesirable to change it.

Many of the *Tingians* of Abra and of Ilokos Norte and Ilokos Sur are possessed of a degree of civilization quite equal to that of their Ilokano neighbors, but the inhabitants of some of the settlements of Ilokos Norte and Ilokos Sur and of eastern Abra are not far advanced in civilization. Until very recently the wildest of all the known *Tingians* were the people of Guinaan and Balatoc, in Bontoc, and of Balbalasan and other settlements along the headwaters of the Saltan River.

The people of the district of Apayao have long been known under the name *Apayaos*, although their immediate neighbors call them *Kalingas*. On a recent trip through this hitherto almost unknown region I was greatly surprised to discover that they were *Tingians*, but *Tingians* with a degree of civilization comparable to that possessed by those of Abra a century and a half or two centuries ago. They themselves trace their ancestry without hesitation to the *Tingians* of Ilocos Sur, for whom they still entertain friendship and whom they often visit. They call themselves *Itneg*. A very large proportion of them speak Ilokano, which is not true of the *Kalingas;* and, according to Governor Blas Villamor, who accompanied me on this trip, the language which they use among themselves is, with comparatively minor differences, that of the *Tingians* of Abra. Governor Villamor further states that the costumes which they wear at the present time are practically identical with old *Tingian* ones which have been preserved in Abra for a century and a half. The inaccessibility of the river valley in which the Apayao *Tingians* live doubtless affords a satisfactory explanation of their having retained their primitive dress and customs.

Of this tribe, then, we have a civilized and an uncivilized branch, the people of the former being justly celebrated for their kindness and docility, while those of the latter are equally well known as fierce head-hunters.

On the average, the civilized *Tingians* are perhaps somewhat smaller in size than are the neighboring *Kalingas* and Bontoc *Igorots*. However, the wild *Tingians* of Apayao, of Balbalasan, and of Guinaan are quite

as large as their *Kalinga* and *Igorot* neighbors. One is at once impressed with the fact that the *Tingians* of Abra are somewhat lighter colored than are the people of the other non-Christian tribes of northern Luzon, but this is doubtless in some measure due to their being a scrupulously clean people who bathe with great frequency and thoroughness. Their women are especially well-favored and attractive.

The *Tingian* type of face is very different from that of any other northern Luzon tribe, and many of the men and women have peculiarly sweet expressions, thoroughly in keeping with the mildness and gentleness of their character.

Both the men and women of the more civilized section of the tribe wear the hair uncut, the men confining their long locks at the back of the head by means of handkerchiefs or bits of cloth tied like turbans (Pl. IX, fig. 9), while the women do up theirs nicely with strings of beads, forming knots which are usually at the left sides of their heads. (Pl. XIX, fig. 4.) Among the *Tingians* of Apayao one not infrequently sees men with the hair banged across the forehead after the fashion of the *Kalingas*, but I have never observed the cut over and back of the ear, which completes the *Kalinga* coiffure. (Pl. IX, fig. 8.) The hair is also sometimes ornamented with a wreath of scented grass. It is held in place by a more or less elaborate turban which, when possible, is made of bright scarlet and yellow cloth. (Pl. IX, fig. 7.)

Tattooing is practiced to a considerable extent among the *Tingians* of Ilokos Sur and Ilokos Norte and of Abra, and especially among the people of Guinaan and Balatoc, who come in close contact with the Bontoc *Igorots*. Among the people of Apayao elaborate tattoo patterns are rare, if indeed they occur at all. I have never seen one. Most of the men have a large tattoo mark in the form of a cuff on each wrist, sometimes extending down onto the back of the hand. The only tattoo marks I saw on women had been placed over goiters, presumably because they were believed to have therapeutic value.

The typical dress of the *Tingian* men of Abra and of Ilokos Sur and Ilokos Norte is still the clout (Pl. III, fig. 3), although a large percentage of the men have shirts and trousers, which they wear on festival occasions. Nearly all of them wear hats called *salacots*. The typical dress of the women is a neat skirt of white, cotton cloth, with an indigo-blue border. (Pl. XIII, fig. 3.) This cloth is woven by the women themselves. When at work they usually wear no other garment, but most of them have upper garments which are made short-sleeved so as to show their remarkable arm ornaments, and are worn when they are about the house, or at least on feast days and when they have occasion to visit the neighboring, civilized towns. (Pl XIX, fig. 4.) Under the skirt is worn a clout, supported by coils of braided rattan cord, fastened together in such a way as to remain spread over the hips of the wearer, but to constrict readily into a bundle in front and behind, where the

ends of the clout are tied. (Pl. LIX, fig. 2, *a*.) This curious article of dress is decidedly suggestive of the clout, supported by coils of braided rattan cord (Pl. LIX, fig. 2, *b*), which forms the one garment of married women among the mountain *Mangyans* of Mindoro. (Pl. XVI, figs. 1 and 2.)

The men wear few or no ornaments. At the most they have earrings, or armlets or leglets of brass wire. The women have necklaces and strings of beads which they wind into their hair, but their most remarkable and characteristic ornaments are wristlets and armlets of beads which often almost completely cover their wrists and arms to the shoulders. (Pl. XIX, figs. 3 and 4; Pl. XXII, figs. 2 and 3.)

The women consider it a mark of beauty to have the middle of the forearm constricted, and to this end tight armlets of beads are placed about the forearms of little girls and kept there until the pain caused by the constriction of the growing arms becomes unendurable, when other, slightly larger, armlets are substituted. This leads to unsightly swelling of the wrists, which is, however, fashionable. (Pl. XIX, fig. 4; Pl. XXII, fig. 2.)

Old agate beads of considerable value are worn by the women about their necks, and coins are often attached to their necklaces. In 1903, I saw a necklace on which were strung four coins, each more than a century old. (Pl. XIX, fig. 3.)

As one approaches the Bontoc border, the characteristic arm ornaments are less frequently seen, and in Bontoc they are represented, if at all, by a few bands of beads on the wrist and forearm.

The men of Apayao, in addition to a quite elaborately tied clout, wear a short jacket and a turban which is by choice made up of alternating bands of scarlet and bright-yellow cloth. (Pl. III, fig. 4.)

The dress of the Apayao women consists of a piece of cloth wrapped around the body so as to form a short skirt, extending from the waist to the knees. The line of contact of the two ends usually runs straight up and down the front. Under the skirt is worn a clout, and on the upper part of the body a long-sleeved garment which often barely covers the breasts, so that there is quite a gap left between it and the skirt. (Pl. XIII, fig. 4.) The women frequently wear turbans on their heads. They are much more careful than are their sisters of Ilokos and Abra about exposing the upper half of the body. (Pl. XIX, figs. 1 and 2.)

Both men and women of Apayao often wear ornamental wreaths of sweet-scented grass in their hair. (Pl. VII, fig. 1; Pl. IX, fig. 7.) They are very fond of brass wire, which they fasten about their necks or convert into armlets and leglets, but their most highly prized ornament consists of a series of plates and pendants of mother-of-pearl, fastened together with wire or strong thread, in a great mass, which is attached to a cord about the neck and is worn sometimes hanging over the chest

and at other times down the back. This same mother-of-pearl ornament is also worn by men. The women, like their sisters of Abra and Ilokos, are inordinately fond of beads, which they string and wear around their necks, in their hair, and on their wrists and arms. Probably the explanation of their lack of the elaborate armlets worn by the *Tingian* women of Abra may be found in the scarcity of beads from which to make them. Miniature battle-axes are worn thrust into the hair or the turban. They serve a double purpose, as ornaments and as implements for cutting. (Pl. XXII, fig. 4.) Agate beads are more highly valued than are any others.

Occasionally one meets a man whose fingers are covered with gold, silver, and brass rings, or one with very elaborate ear ornaments.

The more civilized *Tingians* build quite compact towns. Their houses are frequently made almost entirely of bamboo and are roomy and scrupulously cleam. (Pl. XXXV, fig. 2.) They are arranged along well-defined streets. (Pl. XXIX, fig. 1.) With the wild *Tingians* of Apayao a large percentage of the houses have floors and sides of boards, hewn with great labor from forest trees. The roofs, which are concave on the inner side, are made with an inner layer of neatly cleaned stems of *runo* grass, tied so closely together that they touch each other. Over this come several inches of thatch and then two or three layers of bamboo, the individual pieces being halved and laid with convex and concave surfaces alternately turned upward. Over the layers of bamboo comes a very thick one of well-packed thatch. A roof of this sort must last for many years, and is perfectly water-tight. The houses of the *Tingians* of Apayao are often framed with hard wood, and many of the boards are ornamented with carvings. (Pl. XXXV, fig. 1.) In some instances eyes, noses, and mouths are cut out of the boards, so that rude effigies of human faces are produced. (Pl. XLVII, fig. 3.) Frequently the side boards are perforated by round peepholes which enable the occupants to observe people outside without exposing themselves.

Houses of the better class are invariably built on piles and raised well above the ground. Some of the poorer houses of the *Tingians* of Apayao are constructed entirely of bamboo, even the roofs being made of joints of this useful plant. In addition to their dwellings, the *Tingians* of Apayao construct rice-granaries (Pl. XXXVI, fig. 3) and chicken-houses. Those of Abra and Ilokos build quite elaborate rice-granaries (Pl. XXXVI, fig. 4) and sometimes construct stables for their domestic animals. They also make miniature houses called *balaua* (Pl. LXVII, fig. 2), in and around which are given feasts in honor of their ancestors.

Although some of the *Tingians* of Abra and Ilokos fish and hunt on occasion (Pl. L, fig. 3), they are essentially an agricultural people and depend for food far more upon the products of their farms than upon those of fishing and the chase. They have extensive rice-paddies on

fairly level ground and also cultivate tobacco, *taro*, Indian corn, and cotton upon a considerable scale. Near their houses they often plant fruit trees. In general it may be said that their agricultural operations are often both more extensive and more successful than are those of their Ilokano neighbors. They raise carabaos, cattle, and horses in considerable numbers. Their horses are used for riding instead of for eating.

So far as my observation goes, the *Tingians* of Apayao have no irrigated rice-fields. They raise a very limited quantity of mountain rice, which, after being threshed, is preserved in joints of bamboo over the fireplaces in their houses. Upon the steep mountain-sides they grow a considerable quantity of tobacco of excellent quality (Pl. XXXIX, fig. 2), and they also raise *camotes*, *gabi*, tomatoes, and squashes. Their *rancherias*, even when high up in the mountains, are almost invariably buried in coconut trees, and each has a group of palms with fan-like leaves from which rain coats are made. (Pl. XXVIII, fig. 2.) Cacao in small quantity, but of fine quality, is usually found growing near their houses.

All the *Tingians* roll their own cigars and make *basi* from sugar-cane juice for use at their feasts and in ceremonials attendant upon the sealing of friendship. The women grind rice between pairs of specially shaped stones. (Pl. LI, fig. 2.)

The *Tingian* women of Abra, Ilokos, and Union spin, dye, and weave cotton, making narrow strips of cloth of excellent quality which they afterwards fashion into garments for themselves. (Pl. XLIV, figs. 1, 2, and 3; Pl. XLV, figs. 1, 2, and 3.) Most of the cloth used by the *Tingians* of Apayao is obviously imported. However, some cloth, evidently made by the women of that region, was seen by me.

Both the civilized and uncivilized branches of the tribe produce very good basket-work. Their houses are well furnished with pottery. Some pieces, decorated with dragons in relief and showing signs of being very old, are probably of Chinese origin. They themselves, however, make good pottery, ornamenting some of it with raised figures.

Many of the *Tingians* are quite skillful in working steel and iron, and the head-axes used by the warlike *Kalingas* are largely made by their more pacific neighbors of Balbalasan. (Pl. XLII, fig. 2.) The *Tingians* of Apayao make their own steel and iron weapons (Pl. XLII, fig. 1) and probably also brass pipes, which are not uncommon among them.

Apart from the house ornaments above referred to, neither the civilized nor uncivilized *Tingians* seem to do much wood carving and neither branch of the tribe does any mining.

The civilized *Tingians* of Abra and Ilokos are the gentlest and most pacific of people. Nearly all of them are entirely unarmed, although most of the settlements can, on a pinch, produce a few rusty head-axes and lances and an old shield or two. The people of the settlements over the

Bontoc border are, as a result of dire necessity, more warlike. They are forced to keep themselves armed and ready to repel *Kalinga* or Bontoc *Igorot* raids. They therefore carry head-axes, lances, and shields. (Pl. XI, fig. 3.) Their shields and lances are similar to those used by the Bontoc *Igorots* (Pl. LXI, figs. 1, *c* and 2, *e*; Pl. LX, figs. 2, *n* and *o*) and their head-axes to those used by the *Kalingas*. (Pl. LX, fig. 1, *e*.)

The more civilized *Tingians* of Abra, Ilkoos, and Union have not taken heads for many years. However, those of Guinaan, Balatoc, and Balbalasan have, until quite recently, been head-hunters, and those of Apayao are still devoted to this form of sport. The latter section of the tribe uses lances with long, slender blades (Pl. LX, fig. 2, *n*), head-axes of peculiar form (Pl. LX, fig. 1, *f*; Pl. LI, fig. 4), and shields each of which consists of a rectangular board with a spine of wood projecting from the center of each end. The body of the shield is black, and on this are painted ornamental geometric designs in red and yellow. (Pl. LXI, figs. 1, *f* and 2, *f*.)

Scattered through the towns of the more civilized *Tingians* are to be found numerous miniature houses in which are put food and other offerings for the *anitos* or spirits, and beside the trails leading into the towns may often be seen pieces of bamboo with their lower ends sharpened and driven into the ground, and their upper ends split into a dozen slats, which are held apart by other bamboo slats, horizontally interwoven with them in such a way as to form small baskets. (Pl. LXVII, fig. 1.) In these are placed plates of boiled rice, chicken-livers, etc., as offerings to the spirits or *anitos*.

The warlike *Tingians* of Apayao also exhibit in these baskets the heads of their victims; eight heads were so displayed at the *rancheria* of Nagsimbangan at the time of our visit to it. During my short stay in Apayao I was unable to gather any reliable information relative to the customs and ceremonies connected with the head-hunting of the men of that region.

The musical instruments of the more civilized *Tingians* are the *gansa*, which is played with the hands (Pl. LVII, fig. 3), the bamboo mouth-organ (Pl. LVII, fig. 1), and the nose-flute of bamboo. The operator of the latter instrument plugs up one nostril with a mass of soft vegetable fiber, and blows the flute with the other (Pl. LVII, fig. 2); or he may press the flute against the nose in such a way as to close one nostril while he blows through the other.

The *Tingians* of Apayao make musical instruments of bamboo, which, for the lack of a better name, may be called "jew's-harps." A single joint of *caña bojo* is taken, one end is cut off, and more than half of one side cut away so as to leave a projecting tongue. Near the septum at the end of the joint a round hole is pierced, over which the thumb of the operator may be placed. The projecting tongue is then struck upon the head of a battle-axe and the musical tone produced by the resulting

vibration can be varied by thumbing the hole pierced near the septum. The men often play these instruments when on the march.

The dances of the civilized *Tingians* take place inside a typical *cañao* circle and are usually participated in by one man and one woman, although if the man is an especially noted dancer, two or more women may honor him by entering the circle and showing off their fancy steps. Both men and women dance with handkerchiefs or larger pieces of cloth stretched between their hands. (Pl. LVIII, fig. 1.) The dance music is furnished by *gansas* alone and is of a decidedly lively character, as are the dances themselves. The participants often evidently try to dance each other down, and the exercise involved is so vigorous that one or another of them is sure soon to give out. When a dancer has had enough, he or she indicates the fact by giving a sharp snap to the piece of cloth held in the hands and then immediately retires. If a man is danced down by a woman, he is jeered by the crowd. *Basi* circulates freely during the dancing. In fact, the *Tingians* will not attempt to give a dance unless *basi* is to be had in abundance. The dancers often add to their performances by composing extemporaneous songs dealing with important current events, and they are frequently answered in song by some of the spectators.

I was unfortunate in failing to see dances among the *Tingians* of Apayao, but was told that they were similar to those of the people of Abra. However, I did see *gansas* and nose flutes among them, and was surprised to run across a long, wooden drum similar in shape to those used by the Benguet-Lepanto *Igorots.*

The civilized *Tingians* are polygamous. The headmen may have two or three wives, but this privilege seems to be quite strictly confined to them. The men not infrequently keep *queridas,* but very secretly, for if the facts became known, their wives may secure divorce from them and compel them to pay heavy fines into the bargain.

Betrothals are arranged by parents between very young children. In fact, in some instances, they are arranged prior to the birth of a child, of course with the proper proviso as to its proving to be of the right sex. The marriage ceremony among the *Tingians* of Abra is interesting. After the preliminaries have been arranged between the families of the bride and bridegroom the family of the bride invites that of the bridegroom to come for her on a certain fixed date. The latter arm themselves with bolos on the evening of the day before the one set and at midnight feign an attack upon the house of the bride. The bridegroom is the only person to enter the house. He leads the bride out by the hand, releasing her at the bottom of the stairway. She accompanies him to his house. On the next day her family follows her and a feast begins which usually lasts for about four days, at the end of which time the relatives of the bridegroom kill animals and distribute the flesh liberally to the guests in order that, in their desire to carry it home, they may go

away. The marriage can not take place until the bridegroom has a house of his own.

A couple ordinarily has three or four children. The old man of the *rancheria* baptises a new-born infant when it is two or three days old, giving it the name of any object which particularly impressed itself upon his mind as he was on his way to the ceremony or which happens to occur to him at the moment. If he stubs his toe on a stone, for instance, Stone may be the baptismal name. The *Tingians* have no family names.

They are very kind to their sick and take the best possible care of them. They have some knowledge of the uses of medicinal plants, but depend chiefly upon *cañaos* or feasts in attempting to drive away the evil spirits through whose influence they believe illness to be caused.

They have a great variety of *cañaos* and each one has its peculiar and characteristic sign. The sign of a feast, held in order to drive away illness, is an egg balanced on the point of a lance thrust into the ground. Obviously, much skill is required to make the egg stand on a lance point and the lance must be placed in a very sheltered spot, as a breath of air will cause the egg to fall. Hogs or other animals are killed, according to the directions of the medicine man or medicine woman who has charge of the case. The flesh of the animal sacrificed is eaten, *basi* circulates freely, and the crowd is apt to get very drunk. The feast ordinarily lasts one or two days. If the *anito* is not driven away, but kills its victim, the body of the deceased may be kept in the house for ten or fifteen days until the value of his personal property has been expended on the funeral feast, or so long as any relatives are still absent. (Pl. LXVI, fig. 2.)

The dead are dressed in their best clothes, adorned with their most valuable ornaments, and are buried under their houses. When a very poor man dies, if he has no property which can be disposed of in order to meet the expenses of a feast, and no good clothes in which he may be interred, he is buried at once near the outskirts of the *rancheria*. The grave is protected with stones and logs and is sometimes roofed over. (Pl. LXV, fig. 2.) Children are buried soon after death without any special ceremony, although the parents of a deceased child remain silent, when in their houses, during a period of ten or fifteen days, out of respect to its memory.

Near the dwelling houses of a *Tingian rancheria* there often may be seen certain structures, some of which look like children's playhouses, while others are nearly or quite as large as dwelling houses. Such structures are known as *balaua*. (Pl. LXVII, fig. 2.) In one of them the father of the family, or some person representing him if he is dead, takes up his quarters for a period of ninety days after the conclusion of a funeral feast. During this time he may not enter his own house. If the deceased person was too poor to have a funeral feast the occupant of the *balaua* must remain there for four or five months.

Anniversaries of the deaths of adult persons are celebrated annually, by feasts held in and about the *balauas*.

The civilized *Tingians* know their own ages, differing in this respect from the people of any other non-Christian tribe of northern Luzon. In reckoning time they have weeks of seven days each, and months of which there are eleven to the year. Their year begins during our month of January, when the moon is a quarter full.

The *Tingians* of Abra have advanced further in civilization than have the members of any other non-Christian tribe of the Philippines. They are a most attractive people, cleanly in their personal habits, and of excellent disposition. They are peaceable and law abiding to an astonishing degree. Crime is almost unknown among them. Their towns are well built and well kept. Their fields are often better tilled than are those of their Ilokano neighbors. They save their money and some of them become quite wealthy. They are anxious to receive the benefits of civilization now that they may have them without being compelled to change their religious belief, and there is hardly a *rancheria* in Abra which does not have one or more schoolmasters, paid by local revenues or by voluntary contributions. Considerable numbers of *Tingian* children attend the public schools in the Christian municipalities in spite of the hostility which exists between their people and the Ilokanos.

The *rancherias* of Abra and of North and South Ilokos have been given independent governments of their own, which have progressed very satisfactorily. The *Tingian* is a born politician and thoroughly appreciates being allowed to run his own local affairs.

While there have long been bloody feuds between the *Tingians* of Apayao and their civilized neighbors, the fault is by no means all with the wild people, and when order is once established throughout their territory there is no reason why they should not advance rapidly in civilization and in material prosperity, for they too are cleanly, intelligent, and industrious. The degree of civilization to which they have already attained is surprising when one remembers that they have been almost completely shut off from the outside world from the date of the discovery of the Philippines up to the present time.

A careful study of this section of the tribe would doubtless be well repaid and would throw much light on the early history of the *Tingians* of Abra and Ilokos, from whom the Apayao people are, according to their own traditions, descended.

THE ISINAYS, GADDANES, AND REMONTADOS.

The inhabitants of southern Nueva Vizcaya, at the time when the Spaniards first entered the territory now embraced in that province, were called *Isinays* (*Isnays, Isinac, Isinayas*). Nearly all of them were subsequently converted to Christianity, but on the eastern slopes of the mountains which separate southern Nueva Vizcaya from Benguet and

along the Padre Juan Villaverde trail there still remain a few wild people called *Isinays*. I have never seen them. Dr. Barrows states that they resemble the Benguet-Lepanto *Igorots* more than the *Ifugaos*, and Governor Knight of Nueva Vizcaya says that they are very similar to the former people. It is not easy to decide whether or not they originally belonged to the same tribe and represent only a dialect group, but pending further information relative to them I shall so treat them.

Many of the civilized inhabitants of Isabela and of Cagayan are descended from a people who were called *Gaddanes*, and this name is still sometimes used as a designation for the long-haired, wild people of these two provinces. I do not believe that the *Gaddanes* were at any time more than a dialect group of the *Kalingas*.

Dr. Barrows has treated the so-called *Remontados* as if they constituted a separate tribe. This is not the case. It is very generally true that there will be found in the vicinity of non-Christian tribes in these Islands renegade Christian natives who have abandoned civilized life and taken to the hills. Not infrequently they marry women of the hill tribes and have half-caste children, but I see no more fitness in assigning to such people and their offspring the rank of a tribe than there would be in following the same course with reference to the people of mixed blood who are usually to be found in greater or smaller numbers wherever two non-Christian tribes adjoin each other.

DIALECT GROUPS.

As I have already stated, it seems to me far wiser to class peoples which are substantially alike except for differences of dialect in one tribe and to divide them into dialect groups rather than to attempt to make as many tribes as there are dialects spoken.

Were we to adopt the other basis it would lead us into manifest absurdity in classifying the civilized tribes. While the *Ilokanos* of North Ilokos, South Ilokos, Union, and Abra can understand each other after a fashion, Governor Villamor, himself an Ilokano, assures me that there are very great differences in their dialects. This holds to even a greater extent among the Visayans, yet no ethnologist thinks of dividing them into *Ilongos, Cebuanos, Cuyunos*, etc.

A considerable amount of new work must be done before a satisfactory conclusion can be reached as to the dialect groups into which the seven tribes of northern Luzon should be divided.

The *Negritos* have very generally adopted the language of their civilized neighbors. This can hardly hold for the *Negritos* of eastern Cagayan and Isabela, who, on account of the extent of the territory which they occupy and their comparative isolation, must, it would seem, have a language of their own; but of these people we know next to nothing at the present time. I saw about one hundred of them at Dumabato in 1905 but had little opportunity to study them.

So far as we at present know, the *Ilongotes* have but a single dialect, but it is probable that those of northern Tayabas speak a different dialect from those of Nueva Vizcaya.

The *Ifugaos* should be divided into numerous dialect groups.

In the absence of Lietuenant Case, who has lived among them for years, I have no information to add to that gathered by Dr. Barrows and therefore provisionally adopt his conclusions as to the number of such groups which should be recognized.

As yet we know very little as to the language of the *Kalingas.* The people known as *Dadayags* and *Calauas* are said to have peculiar dialects, as are also the *Catalanganes.*

I have not sufficient information relative to the dialects spoken by the Bontoc *Igorots* to be able to form any conclusions as to the subdivisions of this tribe.

The two important dialects of the Benguet-Lepanto *Igorots* are *Nabaloi,* spoken in central and southern Benguet, and *Kankanai,* spoken in eastern and northern Benguet, in Amburayan, and in southern Lepanto. There is, it is said, another dialect called *Kataugnan,* spoken by the *Igorots* of central and northern Lepanto.

So far as concerns the *Tingians,* it may prove that the people of Apayao form a dialect group and that those in the region of Guinaan, Balatoc, and Balbalasan can be differentiated on account of peculiarities of speech, but more work needs to be done before definite and satisfactory conclusions on this subject can be reached.

ORIGIN OF THE NON-CHRISTIAN TRIBES OF NORTHERN LUZON.

I agree with the conclusion reached by Dr. Barrows that the only races to which we need give consideration in accounting for the origin of the tribes under discussion are the *Negrito* race and the *Malay* race. Possibly an exception should be made in the case of the *Kalingas,* many of whom have eyes which are decidedly suggestive of Chinese or Japanese origin, but there is no direct evidence that central or northern Luzon has ever been occupied by Chinese in large numbers, and if such occupation really occurred, a study of the language of the *Kalingas* should show affinities with Chinese.

The *Ibilaos* are the only northern Luzon people who have intermarried extensively with the *Negritos,* and in my opinion the influence of *Negrito* blood may be left out of account in considering the origin of the other tribes.

The *Tingians* differ physically in important particulars from the other northern Luzon tribes and seem to have much in common with the *Mangyans* of Mindoro and the *Dyaks* of Borneo, but there is no evidence that they have had other than a Malay origin.

ILLUSTRATIONS.

The halftone illustrations which accompany this paper are all from absolutely authentic photographs. Of these, four were taken by Mr. Reed, formerly of the Ethnological Survey, or by a photographer working under his direction; two were taken by Dr. Albert E. Jenks, formerly Chief of the Ethnological Survey; two by Dr. M. L. Miller, present Chief of the Division of Ethnology of the Bureau of Education; ninety-one by the Government photographer, Mr. Charles Martin; and ninety-nine by myself.

CONCLUSION.

It is my hope that this paper may serve to awaken interest in the classification and distribution of the non-Christian tribes of northern Luzon, so that the conclusions herein set forth may be verified or corrected and that we may obtain further information relative to the people of the several tribes.

A law has been enacted for the government of the settlements of non-Christian tribes throughout the Philippine Islands, exclusive of the Moro Province where special legislation is in force, and in many of the provinces this law is rapidly being put into effect. A special provincial government act, providing a government particularly adapted to the needs of primitive people, is in effect in the Provinces of Nueva Vizcaya, Lepanto-Bontoc, and Benguet.

Many of the *Tingians* of Abra and North and South Ilokos are already the equals in civilization of their Ilokano neighbors. Their old customs are rapidly being forgotten. On a recent occasion, when the members of two important *Tingian* families attempted to celebrate a wedding in the old-fashioned way, the party of bolo men which accompanied the bridegroom when he went to bring home the bride actually created alarm among the inhabitants of the settlement where that fair lady lived.

Head-hunting has almost entirely ceased among the Bontoc *Igorots* and the *Ifugaos*. The *Ilongots* in Tayabas, Nueva Vizcaya, and Isabela are gradually being brought under the control of the governments of those provinces. Special governments will in the near future be established for the *Kalingas* and the wild *Tingians* of Apayao.

It is therefore of great importance that the several tribes of northern Luzon should be studied carefully and thoroughly before customs which still prevail have been as completely forgotten as have the alphabets in which several of the civilized tribes formerly wrote their languages.

ILLUSTRATIONS.

PLATE I:

Figs. 1 and 2. Adult *Negrito* man and woman of Mount Mariveles, Province of Bataan, taken with Mr. Worcester in order to show relative size. Their dress is typical.

PLATE II:

Fig. 1. A typical *Negrito* man of Zambales, showing physical characteristics and dress.

Fig. 2. A typical *Ilongot* man of Nueva Vizcaya, showing physical peculiarities, dress, and ornaments.

Fig. 3. A typical *Kalinga* man of Isabela, showing physical characteristics and dress. Note this man's magnificent muscular development. His jacket, ornamented with beads, and his clout similarly ornamented are of *Kalinga* make.

Fig. 4. A typical *Ifugao* man of Banaue, Nueva Vizcaya, showing physical characteristics, typical dress, and ornaments. Note especially the girdle made from opercula of seashells, the beads about the neck, and the copper wire ornaments on the legs.

PLATE III:

Fig. 1. A typical Bontoc *Igorot* man, showing physical characteristics, dress, and ornaments. Note especially the pearl-shell ornament at his left side.

Fig. 2. A typical Benguet-Lepanto *Igorot* man of Iresan, Benguet, showing physical characteristics and dress.

Fig. 3. A typical civilized *Tingian* of Lanao, Abra, showing physical characteristics and ordinary working dress. When in town this man would wear a hat, shirt, and trousers.

Fig. 4. Two typical wild *Tingian* men of Acan, Apayao district, Cagayan, showing physical characteristics and dress.

PLATE IV:

Figs. 1 and 2. A typical *Negrito* man of Mount Mariveles, Bataan, showing physical characteristics. Note the full beard which has been close clipped.

Figs. 3 and 4. Two typical *Ilongot* men of Nueva Vizcaya. The one shown in fig. 3 has a good deal of *Negrito* blood, while the one shown in fig. 4 is an almost pure *Malay*.

PLATE V:

Fig. 1. A young *Kalinga* man from Patiquian, Bontoc, showing physical characteristics. Note especially the woven rattan cap and bamboo ear ornaments.

Fig. 2. A *Kalinga* man from near Ilagan, Isabela, showing physical characteristics. This man has typical *Kalinga* eyes.

Fig 3. A young *Ifugao* man of Qiangan, Nueva Vizcaya, showing physical characteristics.

Fig. 4. An *Ifugao* man of Banaue, Nueva Vizcaya, showing physical characteristics. Note the white feather ornaments in his hair.

PLATE VI:

Fig. 1. A Bontoc *Igorot* man of Bontoc, Bontoc. Note the woven rattan cap ornamented with dog's teeth and with a piece of mother-of-pearl; also the metal tobacco-pipe and pipe-cleaner.

Fig. 2. A Bontoc *Igorot* man of Bontoc, Bontoc, showing physical characteristics. Note the plug of wood in the ear.

Fig. 3. A young Benguet-Lepanto *Igorot* man of Bua, Benguet, showing physical characteristics. Note the short-cut hair and the turban.

Fig. 4. Chapdai, an old Benguet-Lepanto *Igorot* priest of Bua, Benguet, showing physical characteristics.

PLATE VII:

Fig. 1. A wild *Tingian* man of Aoan, district of Apayao, Cagayan, showing physical characteristics and dress.

Fig. 2. A typical *Tingian* man of Manobo, Abra, showing physical characteristics.

Fig. 3. An *Ilongot* man of Dumabato, Isabela. Note the long hair, tied up, the peculiar hair ornaments, the ornament fastened to the cartilage of the upper ear, the fine, braided cord worn over the right shoulder and under the left arm, and the tobacco pouch of bark cloth ornamented with seeds hanging down the back.

Fig. 4. A young *Kalinga* man of the settlement of Bontoc, Cagayan (this settlement should not be confused with the settlement of Bontoc in the subprovince of the same name). Note the plugs of wood in the lobes of the ears, the bead collar, and the buttons sewed on the neck of the jacket as ornaments; also the bag hanging about the neck, which is opened and closed by sliding metal rings, the silk blanket knotted over the right shoulder, and the head-axe.

PLATE VIII:

Fig. 1. The *Kalinga* chief of a settlement on the Rio Grande de Cagayan, near Ilagan, Isabela. Note the hair ornaments of feathers, beads, and mother-of-pearl; also the jacket of *Kalinga*-made cloth ornamented with beads.

Fig. 2. A young *Ifugao* man of Quiangan, Nueva Vizcaya. Note the huge metal ear-ornaments and the girdle of opercula.

Fig. 3. An *Ifugao* man of Quiangan, Nueva Vizcaya, showing typical tattoo pattern.

Fig. 4. A Bontoc *Igorot* man of Labuagan, Bontoc, showing typical tattoo pattern.

PLATE IX:

Views showing typical methods of cutting and dressing the hair in vogue among the men of the several non-Christian tribes of northern Luzon.

Fig. 1. *Negrito* of Mariveles with hair cut short and crown of head shaved.

Fig. 2. An *Ilongot* of Delapping, Nueva Vizcaya, hair uncut and confined in front by a net peculiar to the men of this tribe.

Fig. 3. A *Kalinga* of Cagayan. Note the high cheek bone.

Fig. 4. An *Ifugao* of Quiangan, Nueva Vizcaya.

Fig. 5. A Bontoc *Igorot* of Bontoc, Bontoc, showing typical hair-cut and ornamental, woven rattan cap on which are fastened a piece of mother-of-pearl and two dog's teeth.

Fig. 6. A Benguet-Lepanto *Igorot* of Ambuklao, Benguet.

Fig. 7. A wild *Tingian* man of Aoan, Apayao district, Cagayan, showing the hair confined by a tasseled turban and ornamented with a wreath of fragrant grass.

Fig. 8. A wild *Tingian* man of Aoan, Apayao district, Cagayan, showing typical fashion of wearing the hair.

Fig. 9. A civilized *Tingian* of Manobo, Abra.

PLATE X:

Fig. 1. A *Negrito* man of Mount Mariveles, Bataan. Note the boar's-bristle ornaments on his legs.

Fig. 2. An *Ilongot* man of Canadem, Nueva Vizcaya, holding a hunting lance and a bow and arrows.

Fig. 3. A *Kalinga* warrior of Bunuan, Cagayan. Note the shield and head-axe, the silk blanket, the bead collar, and the bag worn about the neck which is closed with sliding silver rings.

PLATE XI:

Fig. 1. A fully armed *Ifugao* warrior of Banaue, Nueva Vizcaya. He carries a typical *Ifugao* shield, head-knife, and lance.

Fig. 2. A fully armed Bontoc *Igorot* warrior of the *ranoheria* of Bontoc. Note the three-barbed lance, the shield, and the head-axe.

Fig. 3. Atumpa, the *Tingian* chief of Guinaan. Note his feather head ornaments and typical lance, head-axe, and shield.

PLATE XII:

Fig. 1. A typical *Negrito* woman of Dumabato, Isabela, with two children, showing typical dress. Note the skirt of bark cloth.

Fig. 2. An *Ilongot* woman of Canadem, Nueva Vizcaya, showing typical dress. Note the shell girdle and the fold of the skirt which serves as a pocket.

Fig. 3. A young *Kalinga* woman of a settlement on the Rio Grande de Cagayan near Isabela, showing typical dress. The jacket and skirt are of *Kalinga* weave.

Fig. 4. An *Ifugao* woman of Quiangan, Nueva Vizcaya, showing typical dress.

PLATE XIII:

Fig. 1. A Bontoc *Igorot* woman of the settlement of Bontoc, showing physical characteristics and typical dress.

Fig. 2. A Benguet-Lepanto *Igorot* woman of Baguio, Benguet, showing dress of the women of the better class. Note the numerous superimposed skirts; also the metal ornaments suspended from the chain about the neck.

Fig. 3. A young *Tingian* woman of Lanao, Abra, showing dress and ornaments.

Fig. 4. A wild *Tingian* woman of Masimut, district of Apayao, Cagayan, showing dress and method of carrying young child.

PLATE XIV:

Fig. 1. A young *Ifugao* warrior of Quiangan, Nueva Vizcaya, showing typical dress and ornaments. Note the girdle of opercula, the ear ornaments, the lance, and the rattan carrying basket which serves also as a raincoat.

Fig. 2. An *Ifugao* family of Banaue, Nueva Vizcaya, showing typical dress and manner of carrying young children. Note the white cock's feathers in the woman's hair.

Fig. 3. Two *Negrito* women, Zambales, showing typical dress. Note especially the peculiar hair-cut of the woman at the left.

PLATE XV:

Fig. 1. A typical *Tingian* woman of Guinaan, Bontoc, showing peculiarly shaped clout-supporter made of braided rattan cord.

Fig. 2. A *Mangyan* woman of the Baco River country, Mindoro, showing typical dress. The original costume of the *Tingian* women may have been similar to that of the *Mangyan* women, the skirt having been added later. Many of the *Mangyan* women on the Baco River are beginning to adopt skirts, which they wear over their clouts.

Figs. 3 and 4. *Ilongot* arrows, two of which have detachable heads fastened with cord to their shafts. Delapping, Nueva Vizcaya.

PLATE XVI:

Fig. 1. Full-blooded *Negrito* woman of Mount Mariveles, Bataan, showing physical characteristics, ear ornaments, and "medicine" about the neck.

Fig. 2. A so-called *Negrito* woman of Abra. She really has a large amount of *Malay* blood.

Fig. 3. *Ilongot* woman of Oyao, Nueva Vizcaya, showing physical characteristics, method of dressing the hair, and ear ornaments of mother-of-pearl.

Fig. 4. *Ilongot* woman of Canadem, Nueva Vizcaya, showing physical characteristics.

PLATE XVII:

Fig. 1. *Kalinga* woman of a *ranchcria* in Isabela near Ilagan, showing physical characteristics and ornaments. She is wearing both imitation and genuine agate beads. Note especially the peculiarly shaped eyes.

Fig. 2. A *Kalinga* woman of Sili, Isabela, showing physical characteristics and typical dress and ornaments. Note particularly the beads in the hair, the bead and mother-of-pearl ear ornaments, the agate necklaces and the bead ornaments on the jacket.

Figs. 3 and 4. Two *Ifugao* women of Quiangan, Nueva Vizcaya, showing physical characteristics, ornaments, and method of dressing the hair.

PLATE XVIII:

Fig. 1. A middle-aged Bontoc *Igorot* woman of the settlement of Bontoc, showing physical characteristics and typical ornaments.

Fig. 2. A young Bontoc *Igorot* woman of the settlement of Bontoc, showing physical characteristics and typical ear ornaments.

Figs. 3 and 4. Two young Benguet-Lepanto *Igorot* women of Pico, Benguet, showing physical characteristics, typical dress, and manner of wearing the hair. These women by preference use towels for turbans.

PLATE XIX:

Fig. 1. A *Tingian* woman of Dallaoas, district of Apayao, Cagayan, showing physical characteristics, typical dress, and ornaments. Note especially the elaborate rings.

Fig. 2. A young *Tingian* woman of Dallaoas, district of Apayao, Cagayan, showing physical characteristics and typical dress.

Fig. 3. Young *Tingian* woman of Danglas, Abra, showing physical characteristics, typical dress, and ornaments. The light-colored beads on the armlets of this girl were of solid gold. On her necklace were strung four coins, each more than a century old.

Fig. 4. Young *Tingian* woman of Abra, showing physical characteristics, typical method of dressing the hair, ornaments, and dress typical for those *Tingian* women who live near the Christian towns or who come much in contact with Christian natives. Note the constriction of the forearms and the swelling of the wrists. These artificially produced deformities are considered to be marks of beauty by the *Tingian* women.

PLATE XX:

Fig. 1. *Ilongot* woman of Dumabato, Isabela, showing physical characteristics and typical ornaments. Note especially the shell girdle, the heavy wire ornament on the left forearm, and the fine, braided rattan cord about the neck.

Fig. 2. Young *Kalinga* woman of Patiquian, Bontoc, showing physical characteristics and ornaments. Earrings of the type here shown are in almost universal use among the *Kalinga* women.

Fig. 3. Young *Kalinga* woman of a settlement on the Rio Grande de Cagayan near Ilagan, Isabela, showing physical characteristics and typical ornaments. Note especially the huge beads and large mother-of-pearl ornaments; also the splendid head of hair.

PLATE XX—Continued.

Fig. 4. A very wealthy *Kalinga* woman of Tooktook, Cagayan, showing elaborate dress and ornaments. Note the great mass of dead hair, the scarlet and yellow feather hair ornaments, the bead collar, the typical ear ornaments, and the necklace of agate beads. When first seen this woman was wearing only a very abbreviated skirt, but before being photographed she adorned herself as shown.

PLATE XXI:

Fig. 1. Head of young Bontoc *Igorot* woman of the settlement of Bontoc, showing method of stretching the hole in the lobe of the ear preparatory to the insertion of the characteristic ear ornaments. Additional pieces of wood are inserted from time to time until a hole of the desired size is produced.

Fig. 2. Old Bontoc *Igorot* woman of the settlement of Bontoc, showing physical characteristics. Note the wrinkled skin, also the mass of dead hair which she is wearing.

Fig. 3. Benguet-Lepanto *Igorot* woman of Kabayan, Benguet, showing physical characteristics, typical dress, and especially a peculiar ornament of beaten gold worn between the front teeth and the lips, and completely closing the mouth.

Fig. 4. A *Negrito* man from the mountains back of Porac, Pampanga, showing pointed teeth.

PLATE XXII:

Fig. 1. *Tingian* woman of Balbalasan, Bontoc, showing physical characteristics and especially tattoo.

Fig. 2. Young *Tingian* woman of Lanao, Abra, showing physical characteristics and typical ornaments. Note especially the constriction of the left forearm and the swelling of the left wrist produced by the arm ornaments.

Fig. 3. Arm of *Tingian* girl of Abra, showing ornaments.

Fig. 4. Wild *Tingian* girl of Dallaoas, district of Apayao, Cagayan, showing physical characteristics, typical dress, and ornaments. Note especially the beads, and the ornament composed of numerous pieces of mother-of-pearl suspended from a bead collar about the neck. Note also the point of the miniature head-axe projecting at the right side of the head. Such miniature head-axes are worn by the women of Apayao as ornaments and are also used for harvesting rice and for various household purposes.

PLATE XXIII:

Fig. 1. Full-blood *Negrito* woman of Mount Mariveles, Bataan, showing scar-patterns on chest and abdomen, and "medicine" about neck and in left ear.

Fig. 2. *Kalinga* woman of Patiquian, Bontoc, showing physical characteristics, and especially tattoo marks on the arms.

Fig. 3. *Ifugao* woman of Banaue, Nueva Vizcaya, showing physical characteristics, typical ornaments, and especially tattoo marks on the arms. Note the peculiar fern-leaf pattern of these marks.

Fig. 4. A Bontoc *Igorot* woman of the settlement of Bontoc, showing physical characteristics and typical ornaments and especially tattoo marks on the arms.

PLATE XXIV:

Fig. 1. Two young Bontoc *Igorot* women of the settlement of Bontoc, showing usual rainy-day costume.

Fig. 2. *Ifugao* man and woman of Quiangan, Nueva Vizcaya. Full-length front views showing marriage costumes of the *Ifugaos*.

PLATE XXV:

Fig. 1. Legs of *Negrito* woman of Mount Mariveles, Bataan, showing scar-patterns.

Fig. 2. Arm of Benguet-Lepanto *Igorot* woman showing tattoo pattern.

Fig. 3, *a*. Gold earrings of the Benguet-Lepanto *Igorots* of Suyok, Lepanto. Rings of this general form, made of gold, silver, copper, or brass are in very general use among the Benguet-Lepanto *Igorots*, Bontoc *Igorots*, and *Ifugaos*.

Fig. 3, *b*. Peculiar brooch-like ornament of solid gold found in the possession of a Benguet-Lepanto *Igorot* woman of Suyok, Lepanto.

Fig. 4. *Negrito* woman of Mount Mariveles, Bataan, showing bamboo hair comb with attached horsehair and feather ornaments.

Fig. 5, *a*. Four *Ilongot* earrings of mother-of-pearl ornamented with scratch-work.

Fig. 5, *b*. Two peculiar *Ilongot* ear ornaments.

PLATE XXVI:

View of two of the numerous groups of houses which go to make up the *Ifugao* settlement of Banaue, Nueva Vizcaya. Note the remarkable system of terraced rice fields, which at this point extend up the mountain sides to a great height.

PLATE XXVII:

Fig. 1. The *Kalinga* settlement of Bunuan, Cagayan.

Fig. 2. The Bontoc *Igorot* town of Sumader, subprovince of Bontoc. Note the series of rice terraces extending far up the mountain side.

PLATE XXVIII:

Fig. 1. A Benguet-Lepanto *Igorot* settlement in Kayapa, Province of Benguet.

Fig. 2. View of the site of Masimut, a settlement of wild *Tingians* on the Ablug River, district of Apayao, Cagayan. Like all the settlements on this river, it is buried in coconut trees so that the houses can hardly be seen. Note the *camote* fields extending nearly to the top of the hills in the background. In the foreground are some of the bamboo rafts on which Mr. Worcester and his party descended the river.

PLATE XXIX:

Fig. 1. Part of the *Tingian* settlement of Tui, Abra. Note that the houses are grouped along a well-defined street.

Fig. 2. A typical *Negrito* house with some of its occupants, Tauit, Ablug River, Cagayan.

PLATE XXX:

Fig. 1. An *Ilongot* house of the poorer class, Delapping, Nueva Vizcaya.

Fig. 2. An *Ilongot* house of the better class, Dumabato, Isabela. Note the peculiar horn-like wooden ornaments extending from the peak of the roof.

PLATE XXXI:

Fig. 1. A *Kalinga* tree house near Ilagan, Isabela.

Fig. 2. A typical *Kalinga* house at Ubel, Cagayan. Note the very thick thatch; also the fire wood under the eaves in front.

PLATE XXXII:

Fig. 1. A *Kalinga* house with bamboo roof, Bunuan, Cagayan. Note the adze marks on the boards.

Fig. 2. A typical *Ifugao* house, Quiangan, Nueva Vizcaya. Note the baskets in which chickens are confined at night. Note also the shoulders on the four corner timbers of the house. These are to prevent rats from climbing the timbers.

PLATE XXXIII:

Fig. 1. A typical Bontoc *Igorot* house of the settlement of Bontoc. Note the firewood under the eaves.

Fig. 2. A Benguet-Lepanto *Igorot* house of the better class, Baguio, Benguet.

PLATE XXXIV:

Fig. 1. A Benguet-Lepanto *Igorot* grass house of the poorer class, Packdal, Benguet. Note the ceremonial platform at the left corner of the house.

Fig. 2. A Benguet-Lepanto *Igorot* house, Bagnan, Lepanto. Note the high-peaked roof.

PLATE XXXV:

Fig. 1. House of a wealthy wild *Tingian* of Bolo, district of Apayao, Cagayan.

Fig. 2. House of a civilized *Tingian* of Daguioman, Abra.

PLATE XXXVI:

Fig. 1. An *Ilongot* temporary rice granary, Dumabato, Isabela. It is said that rice is stored in this way until the people of the settlement take a human head, in order to assure a good crop for the coming year. The rice is then transferred to a permanent granary.

Fig. 2. Bontoc *Igorot* rice granary, settlement of Bontoc.

Fig. 3. Wid *Tingian* rice granary, Bolo, district of Apayao, Cagayan.

Fig. 4. Rice granaries of civilized *Tingians*, Baac, Abra.

PLATE XXXVII:

Fig. 1. An *Ilongot* clearing, Oyao, Nueva Vizcaya.

Fig. 2. *Ifugao* rice terraces near Quiangan, Nueva Vizcaya. Note the group of houses at the right, protected from the sudden approach of enemies by the terraces.

PLATE XXXVIII:

Fig. 1. Bontoc *Igorot* rice terraces, Bulugan, Bontoc.

Fig. 2. Coffee and rice terraces of Benguet-Lepanto *Igorots*, Kabayan, Benguet.

PLATE XXXIX:

Fig. 1. *Ilongots* of Oyao, Nueva Vizcaya, planting rice. The woman makes holes in the ground with a hard-wood stick, the man drops in seed and covers it.

Fig. 2. Tobacco field of wild *Tingians* of Dallaoas, district of Apayao, Cagayan. Note the steepness of the hillside.

PLATE XL:

Fig. 1. *Tingian* rice fields, Abaya, South Ilokos. *Tingian* houses at the right.

Fig. 2. An *Ilongot basi* mill. The long pole on which the operator is resting his hands is pivoted between two sticks. The longer end is made to vibrate by the treadle on which his right foot rests. Sugar cane is placed on the block of wood under the short end and the juice which is pressed out runs through a trough into an earthen jar and is subsequently boiled and allowed to ferment.

PLATE XLI:

Fig. 1. An *Ifugao* basi mill, Qiangan, Nueva Vizcaya. This mill works on the same principle as the one shown in Plate XL, fig. 2. Note the shoulders on the supporting timbers of the house.

Fig. 2. Bontoc *Igorot basi* mill turned by man power, settlement of Bontoc.

PLATE XLII:

Fig. 1. Smithy of wild *Tingians* of Masimut, district of Apayao, Cagayan.

Fig. 2. *Tingian* smithy, Balbalasan, Bontoc. Note the iron shaping-hammer and tongs used by the smith, the heavy stone flattening-hammers, the fire-clay conduit into which the bamboo tubes from the bellows lead, and at the right the smooth stone for sharpening and the trough of water for tempering.

PLATE XLIII:

Fig. 1. A Bontoc *Igorot* woman making thread by rolling strands of fibrous bark over her knee. Finished thread in the foreground. A bundle of unrolled strands of bark at her feet. Settlement of Bontoc.

Fig. 2. An *Ifugao* woman weaving, Quiangan, Nueva Vizcaya.

PLATE XLIV:

Fig. 1. A *Tingian* woman ginning cotton, Bulilising, Abra.

Fig. 2. A *Tingian* woman beating ginned cotton on a carabao hide in order to prepare it for spinning, Tiagan, Lepanto.

Fig. 3. A *Tingian* woman spinning. The top-like affair which she holds in her right hand is spun between the hand and calf of the leg and made to whirl on the bit of cloth on which its lower end rests.

PLATE XLV:

Fig. 1. Young *Tingian* girl of Baac, Abra, skeining cotton thread.

Fig. 2. *Tingian* woman of Tiagan, Lepanto, dyeing cotton thread with indigo.

Fig. 3. *Tingian* woman of Baac, weaving.

PLATE XLVI:

Fig. 1. A typical *Ifugao* food bowl, Banaue, Nueva Vizcaya.

Fig. 2. An *Ifugao* carved, wooden bowl, Banaue, Nueva Vizcaya.

Fig. 3, *a*. An *Ifugao* lime-box of bamboo, ornamented with scratchwork, Banaue, Nueva Vizcaya.

Fig. 3, *b*. An *Ifugao* lime-box made from a human bone. Note the drawing on the upper end of the bone showing how its original owner met his death, Banaue, Nueva Vizcaya.

Fig. 4. A peculiar *Ifugao* carved, wooden bowl, Banaue, Nueva Vizcaya.

PLATE XLVII:

Fig. 1. An *Ifugao anito* supposed to possess the power of insuring good crops, Banaue, Nueva Vizcaya. Note the knife for harvesting rice under the right arm, also the large, brass earrings. These things have been presented to the *anito* to propitiate it.

Fig. 2. An *Ifugao* wooden bowl, carved in imitation of a pig, Banaue, Nueva Vizcaya.

Fig. 3. Carved boards from the house of a wild *Tingian* of Dallaoas, district of Apayao, Cagayan.

Fig. 4. An *Ifugao* carved, wooden resting bench, Quiangan, Nueva Vizcaya.

PLATE XLVIII:

Fig. *a*. Top of a Bontoc *Igorot anito* head post. Photographed beside the Bontoc-Taluhin trail in 1903.

Figs. *b*, *c*, *d*, and *e*. Samples of Benguet-Lepanto *Igorot* wood-carving from Buguias, Benguet.

PLATE XLIX:

Fig. 1 *a*, *b*, *c*, and *d*. Benguet-Lepanto *Igorot anitos*.

Fig. 2, *a* and *b*. Wooden carrying-boxes worn suspended from the right shoulder and hanging under the left arm.

Fig. 2, *c*. A food-bowl with auxiliary bowls for holding condiments.

Fig. 2, *d*. A wooden food-bowl.

PLATE L:

Fig. 1. Bontoc *Igorots* fishing, settlement of Bontoc.

Fig. 2. Benguet-Lepanto *Igorot* girls fishing, Trinidad River, Benguet.

Fig. 3. Civilized *Tingians* fishing, San Andrez, Abra. Note the man in the act of throwing the circular casting-net.

PLATE LI:

Fig. 1. A Benguet-Lepanto *Igorot* woman on horseback, Tublay, Benguet.

Fig. 2. A *Tingian* woman grinding rice between stones, Salapadan, Abra.

Fig. 3. A Benguet-Lepanto *Igorot* man mounting a horse, Pico, Benguet.

Fig. 4. Three styles of head-axe in use among the wild *Tingians* of Masimut, district of Apayao, Cagayan.

Fig. 5. Back view of an *Ifugao* shield, Banaue, Nueva Vizcaya.

PLATE LII:

Fig. 1. *Negrito* circle dance, Zambales.

Fig. 2. *Negrito* circle dance, Mount Mariveles, Bataan.

Fig. 3. *Negritos* of Zambales doing buck and wing dance.

Fig. 4. *Negritos* of Mount Mariveles, Bataan, playing *gansas* and at the same time dancing on their knees.

PLATE LIII:

Fig. 1. *Ilongots* playing bamboo musical instruments, Delapping, Nueva Vizcaya.

Fig. 2. An *Ilongot* executing a war-dance to the tune of a bamboo musical instrument, Delapping, Nueva Vizcaya.

PLATE LIV:

Fig. 1. A typical *Ifugao* dance, Quiangan, Nueva Vizcaya.

Fig. 2. A Bontoc *Igorot* head-dance, settlement of Bontoc. The man at the extreme right who holds a head-axe in his right hand is the principal actor. Note that the women who are dancing all wear blankets.

PLATE LV:

Fig. 1. Two Bontoc *Igorot gansa* players. Note their drumsticks, also the handles of their *gansas* consisting in each case of a human lower jaw; settlement of Bontoc.

Fig. 2. Bontoc *Igorot* funeral dance, executed at Manila by people from the settlement of Bontoc.

PLATE LVI:

Fig. 1. Musical instruments of Benguet-Lepanto *Igorots* consisting of a wooden drum with skin head; a *gansa* with boar-tusk handle and a wooden stick for use in playing the *gansa*.

Fig. 2. Benguet-Lepanto *Igorot* musicians. The jar at the left contains *tapuy*, a fermented drink made from rice with which both musicians and dancers frequently refresh themselves.

Fig. 3. A typical Benguet-Lepanto *Igorot* dance. Note the woman with the palms of her hands turned forward and the man with the blankets over his shoulders.

PLATE LVII:

Fig. 1. A *Tingian* woman of Balbalasan playing a bamboo mouth organ.

Fig. 2. A *Tingian* man of Manobo, Abra, playing a nose-flute.

Fig. 3. *Tingian gansa* players of Balbalasan. The *gansas*, the handles of which are hooked into the belts of the men's clouts, are beaten with their hands.

PLATE LVIII:

Fig. 1. A *Tingian* dance, Padangita, Abra. Note the feather ornaments on the heads of the dancers and the blankets in their hands. When one of the dancers wishes to stop dancing, that fact is indicated by giving the blanket a sharp snap.

Fig. 2. *Kalingas* of Tooktook, Cagayan, taking a raft down a dangerous rapid of the Mabaca River.

PLATE LIX:

Fig. 1, *a*. *Ilongot* bamboo musical instrument.

Fig. 1, *b* and *c*. Bamboo musical instrument of the Benguet-Lepanto *Igorots*, constantly played by the women when on the trail during certain months of the year.

Fig. 1, *d* and *e*. Bamboo flutes of Benguet-Lepanto *Igorots*.

Fig. 1, *f*. Bamboo jew's-harp of Benguet-Lepanto *Igorots*. An entirely similar instrument is used by the Bontoc *Igorots*.

Fig. 1, *g*. An *Ifugao* carved, bamboo lime-box, Banaue, Nueva Vizcaya.

Fig. 2, *a*. Clout supporters of braided rattan worn by *Tingian* women of Abra, North and South Ilokos and Bontoc.

Fig. 2, *b*. Clout supporters, of braided rattan and plain rattan respectively, worn by *Mangyan* women of the Baco River, Mindoro.

PLATE LX:

Fig. 1, *a*. *Ilongot* head-knife and scabbard, Oyao, Nueva Vizcaya.

Fig. 1, *b*. *Kalinga* head-axe.

Fig. 1, *c*. *Ifugao* head-knife and scabbard, Mayoyao, Isabela.

Fig. 1, *d*. Bontoc *Igorot* head-axe, settlement of Bontoc.

Fig. 1, *e*. *Tingian* head-axe, Guinaan, Bontoc.

Fig. 1, *f*. Head-axe of type used by wild *Tingians* of the Apayao district, Cagayan.

Fig. 2, *a*. *Ilongot* lance, Dumabato, Isabela.

Fig. 2, *b*, *c*, *d*, *e*, and *f*. *Kalinga* lances, Isabela. Note the shafts which are ornamented with highly colored, woven rattan and with horsehair. Note also the different forms of head. That shown in Fig. 2, *f* is of bamboo.

Fig. 2, *g*, *h*, and *i*. *Ifugao* lances, Nueva Vizcaya. The steel heads of these lances were made at Sapao.

Fig. 2, *j*, *k*, *l*, and *m*. Bontoc *Igorot* lances, showing different styles of head; settlement of Bontoc.

Fig. 2, *n*. Lance of a wild *Tingian* of Masimut, district of Apayao, Cagayan.

Fig. 2, *o*. Lance of a wild *Tingian*, northern Bontoc.

PLATE LXI:

Fig. 1. Front views of typical shields belonging to the following tribes: *a*, *Ilongots*; *b*, *Kalingas*; *c*, Bontoc *Igorots*; *d*, Benguet-Lepanto *Igorots*; *e*, *Tingians* of Guinaan, Bontoc; *f*, *Tingians* of district of Apayao, Cagayan.

Fig. 2. Back views of shields shown in fig. 1.

PLATE LXII:

Fig. 1. Entrance to a *Kalinga* house of Bunuan, Cagayan, showing bloody emblems over the door. Each piece of bark cloth with a blood-stain on it indicates that the owner of the house has participated in a headhunt during which one or more of his companions took heads. Bark cloth, dipped in the blood of such a head and hung over the door, is supposed to avert the vengeance of the friends of the beheaded warrior and to keep off illness.

Fig. 2. An old *Ifugao* warrior of Quiangan, Nueva Vizcaya, with a part of his collection of enemies' skulls.

PLATE LXIII:

Fig. 1. Entrance to an *Ifugao* house of Banaue, Nueva Vizcaya, showing *anito* door posts, and skulls of enemies beheaded by the owner of the house.

Fig. 2. A beheaded *Ifugao* warrior being carried out on his shield for burial, Banaue, Nueva Vizcaya.

PLATE LXIV:

Fig. 1. Grave of a beheaded *Ifugao* warrior on the crest of a mountain above Ayangan, Nueva Vizcaya. The lance indicates the fact that the occupant of the grave was killed in battle. Note the *anito* made of grass. The two bamboos projecting upward are part of the stretcher on which the body was carried. It has been interred in a tunnel leading into the hillside and the stretcher stands vertically against the end of the tunnel. Note the steep mountains in the background. They form typical *Ifugao* country. War-trails lead along their treeless ridges and cultivated fields in many instances extend to their very crests.

Fig. 2. Public buildings of an *áto* of Bontoc *Igorots*, Talubin, Bontoc. Note the dead tree with sharpened branches on which heads may be placed while the head-feast is celebrated. The stone court of the *pobafúnan* was occupied by the *áto* council at the moment the picture was taken.

Fig. 3. A basket of skulls from a Bontoc Igorot *fáwi*, settlement of Bontoc.

PLATE LXV:

Fig. 1. An *Ifugao* burial house, Banaue, Nueva Vizcaya.

Fig. 2. The grave of an impecunious *Tingian* man, Balbalasan, Bontoc.

PLATE LXVI:

Fig. 1. Burial place of Benguet-Lepanto *Igorots*, Baguio, Benguet. Note the wooden coffin carved in rude imitation of a carabao.

Fig. 2. *Tingian* mother mourning over her dead daughter, Ablug, Bontoc. Note the ornaments worn by the daughter. They were doubtless buried with her.

PLATE LXVII:

Fig. 1. Small structure of the sort in which the civilized *Tingians* place offerings for the *anitos*. Such little buildings are numerous about the outskirts of the civilized *Tingian* towns. Note the two conical, bamboo baskets at the left of this structure. Offerings are also placed in these baskets.

Fig. 2. A *Tingian balaua*, or house in which annual festivities are held in honor of deceased relatives. After the death of an adult person the head of the family is obliged to sleep in the *balaua* for three to five months during which period he may not enter his own house; Daguioman, Abra.

PLATE I.

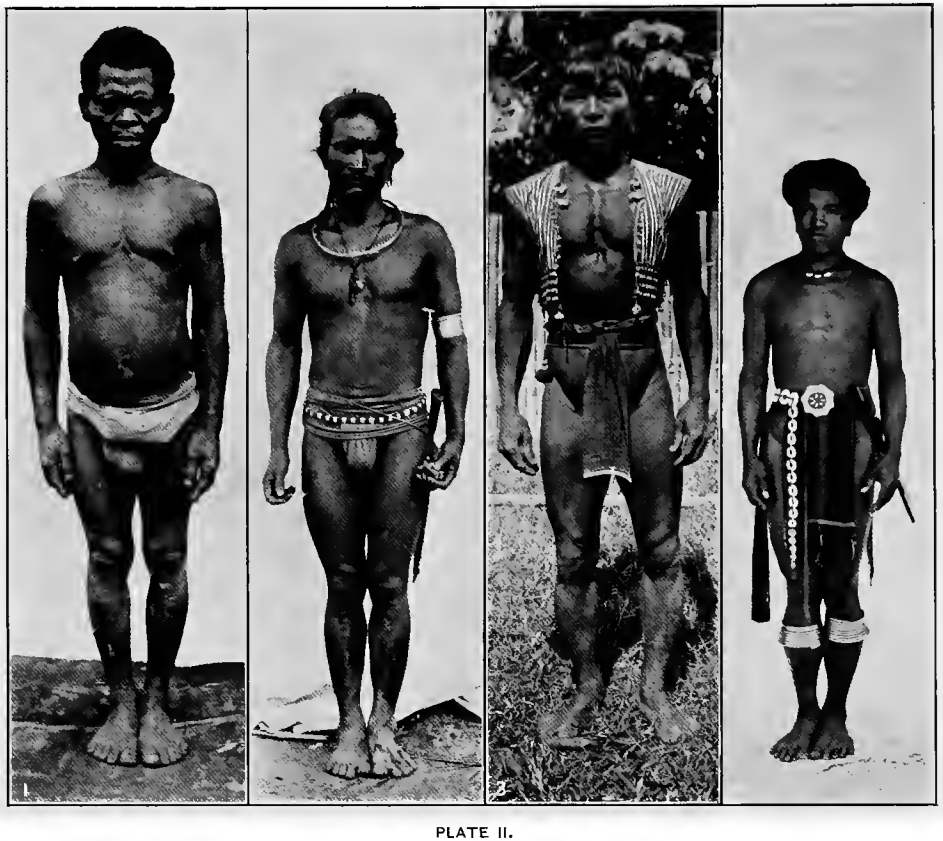


PLATE II.

PLATE III.

PLATE IV.

PLATE V.

PLATE VI.

PLATE VII.

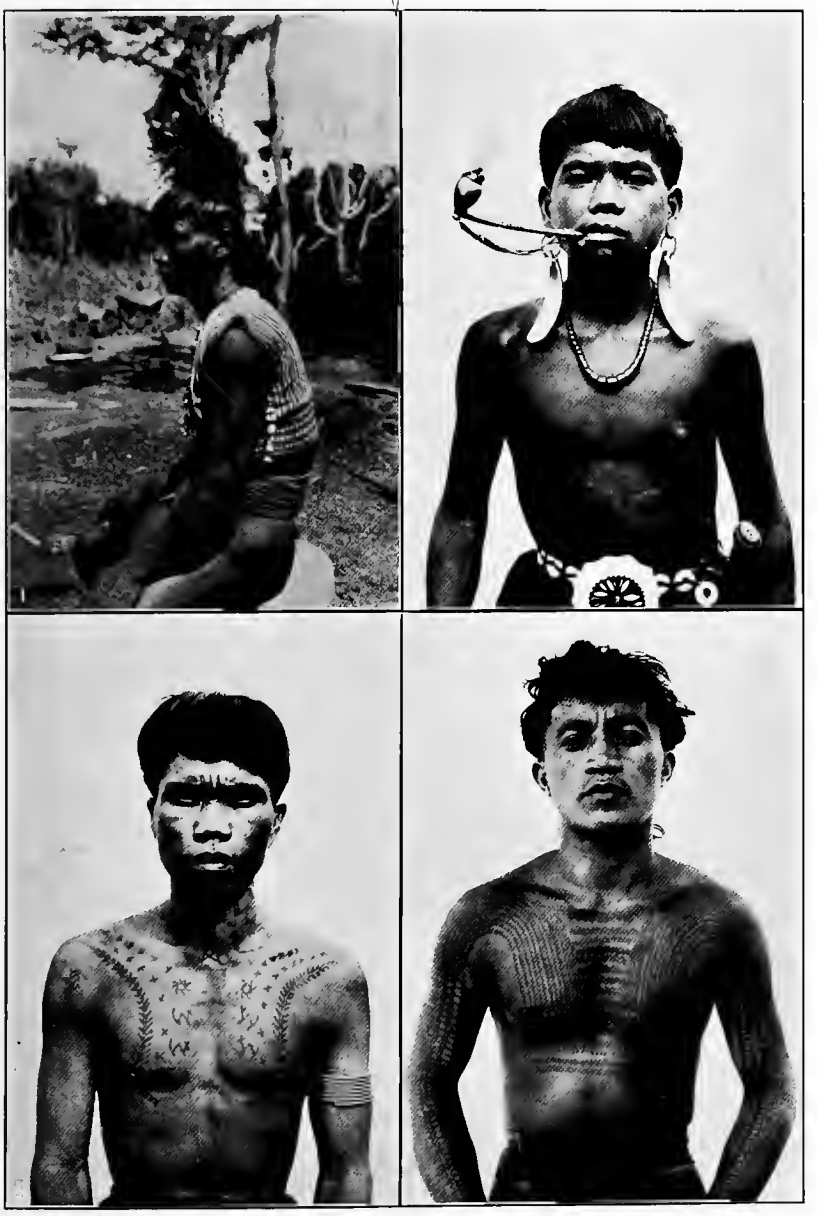


PLATE VIII.

PLATE IX.

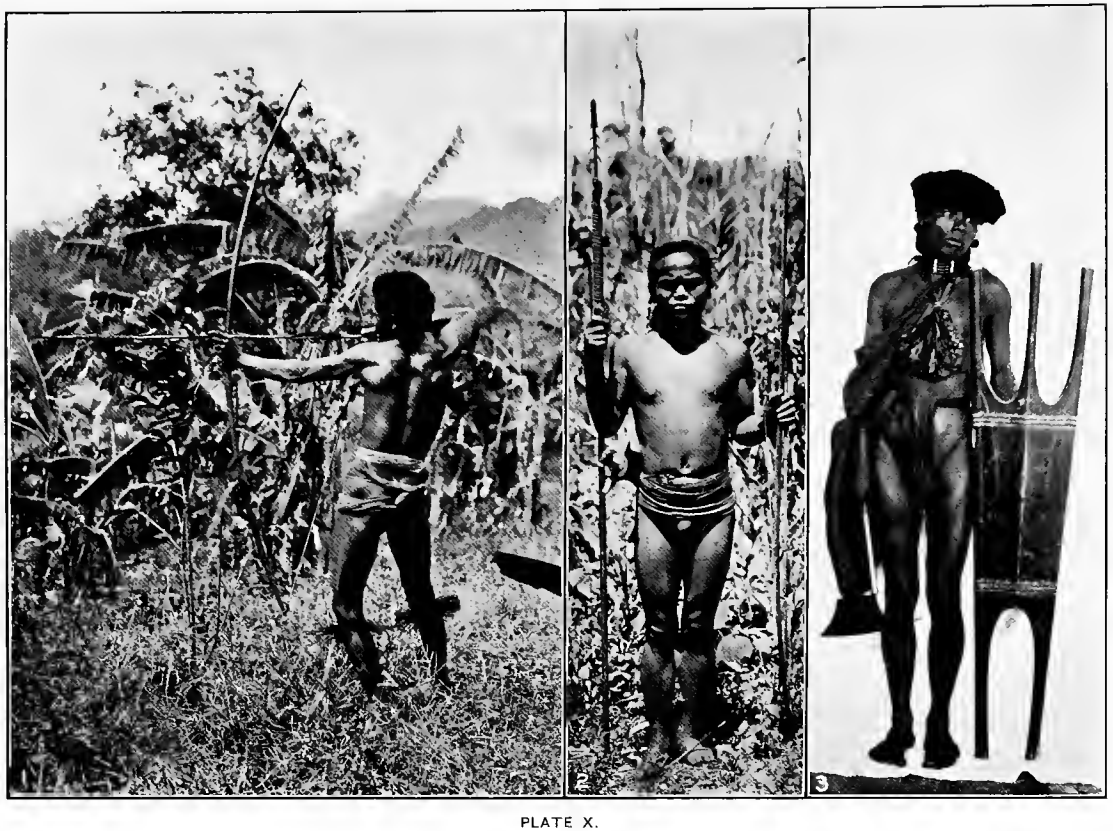


PLATE X.

PLATE XI.

PLATE XII.

PLATE XIII.

PLATE XIV.

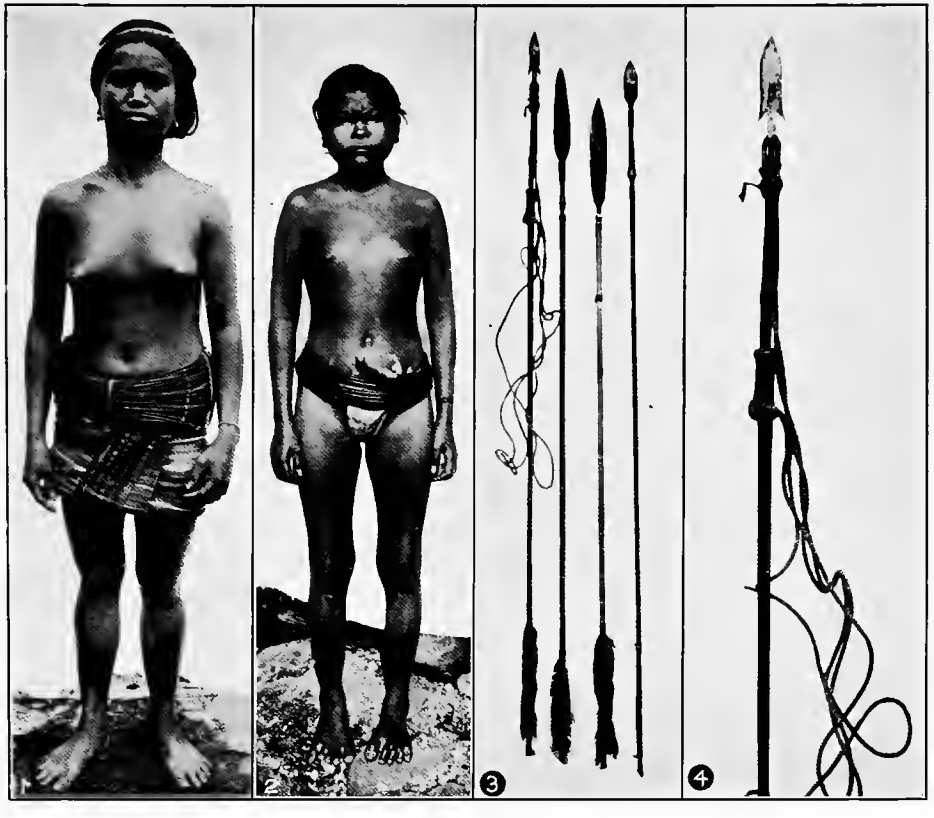


PLATE XV.

PLATE XVI.

PLATE XVII.

PLATE XVIII.

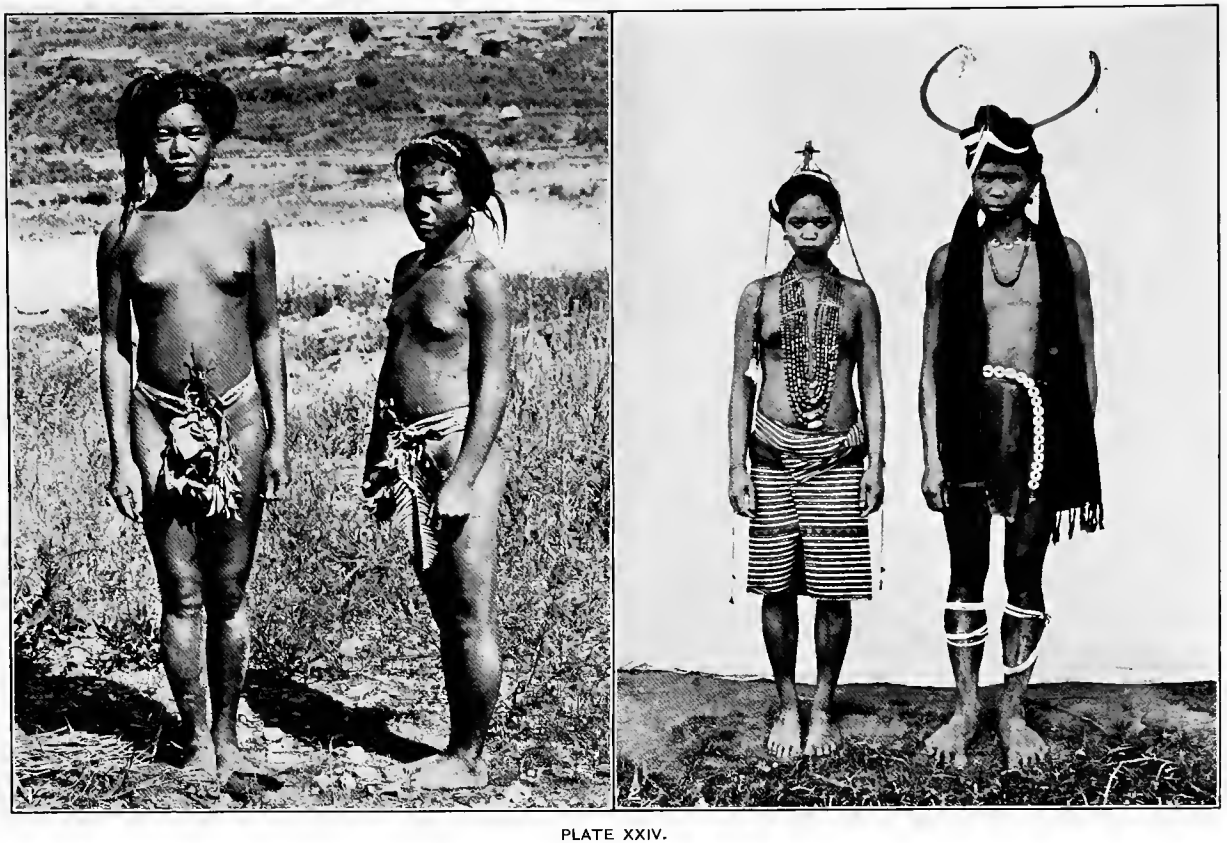
PLATE XIX.

PLATE XX.

PLATE XXI.

PLATE XXII.

PLATE XXIII.



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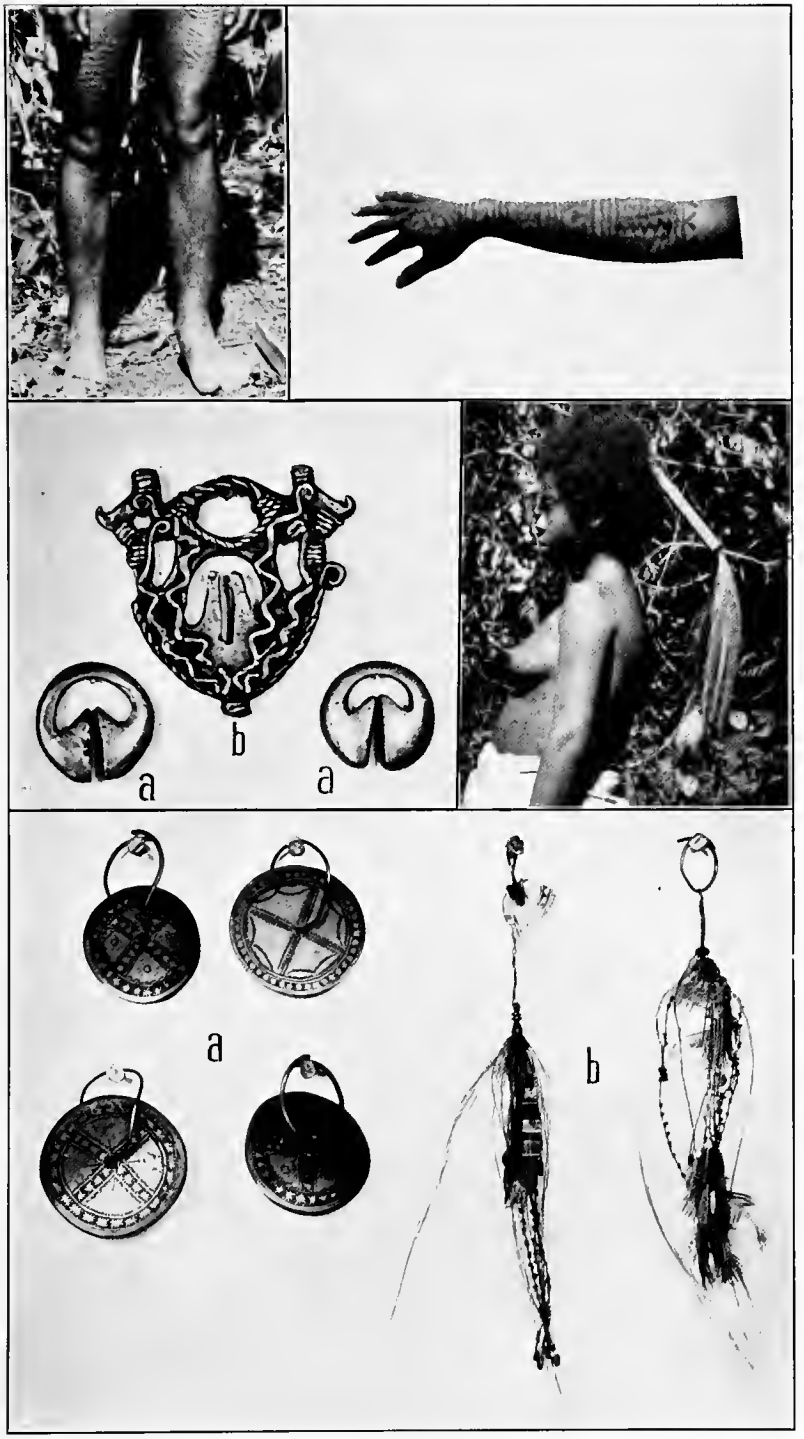


PLATE XXV.

PLATE XXVI.

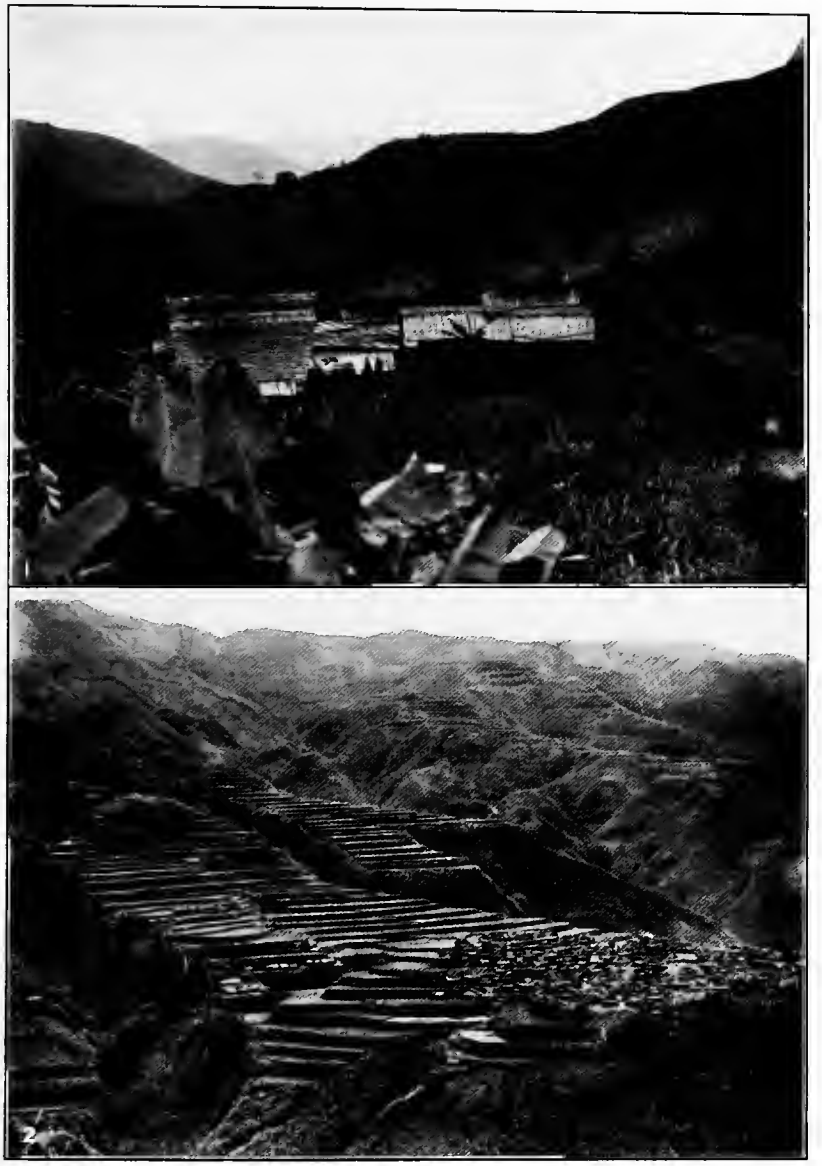


PLATE XXVII.

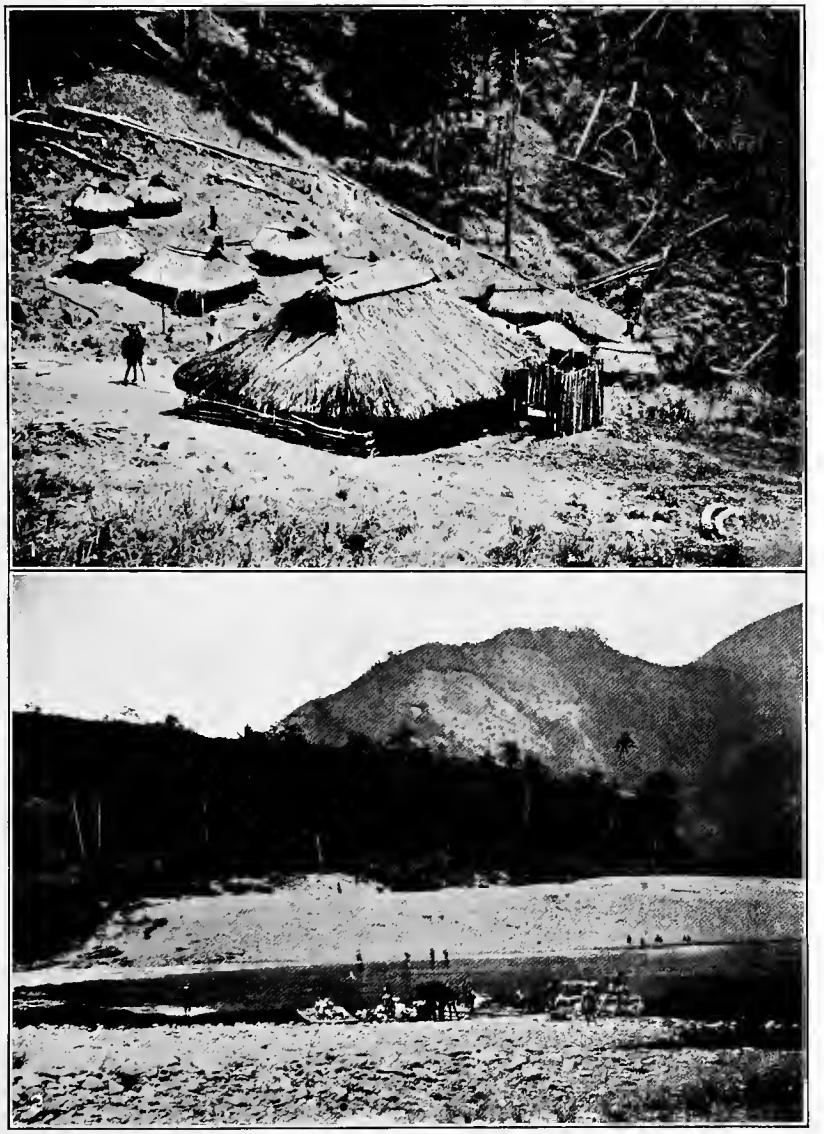


PLATE XXVIII.

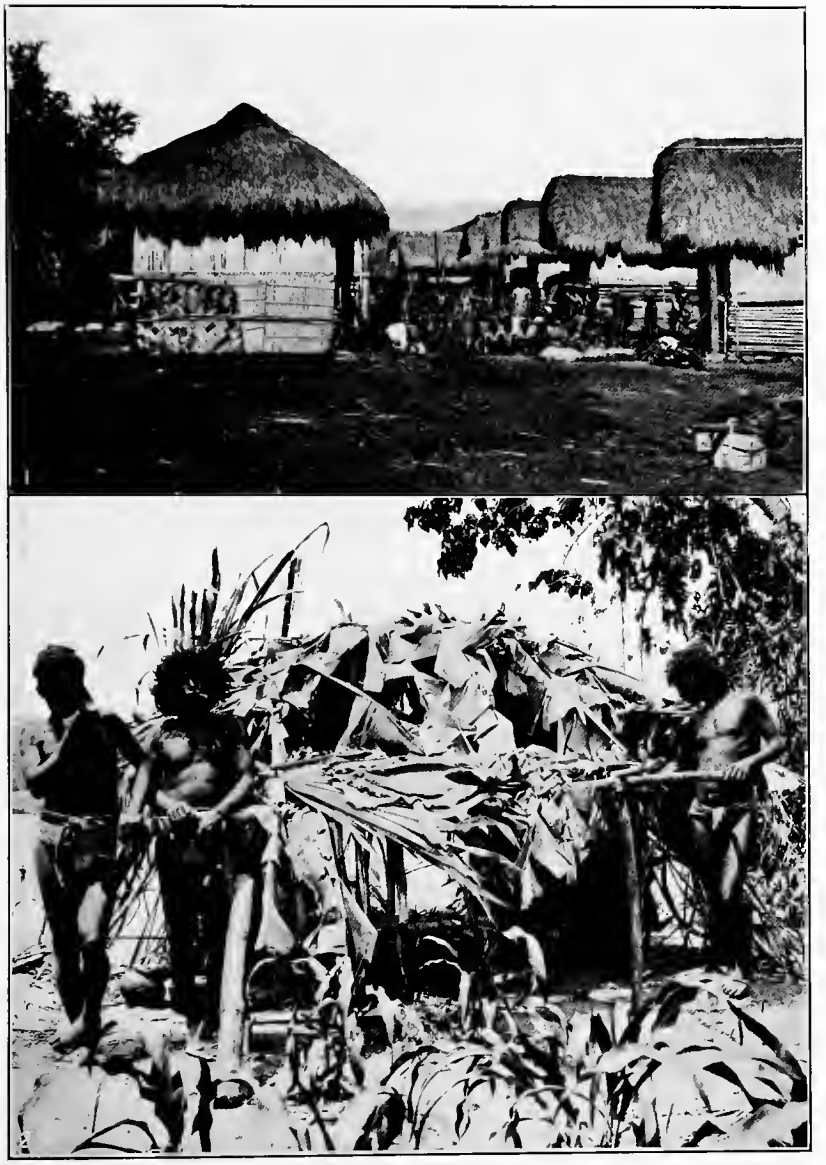
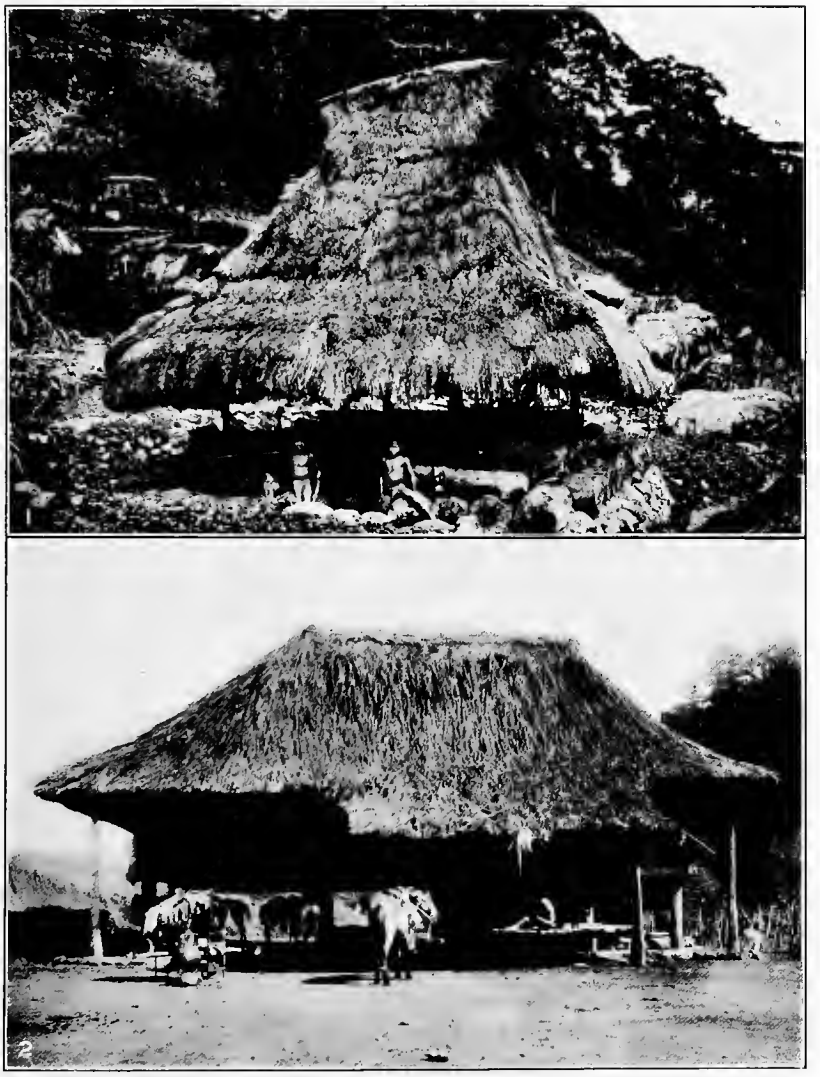


PLATE XXIX.

PLATE XXX.

PLATE XXXI.

PLATE XXXII.



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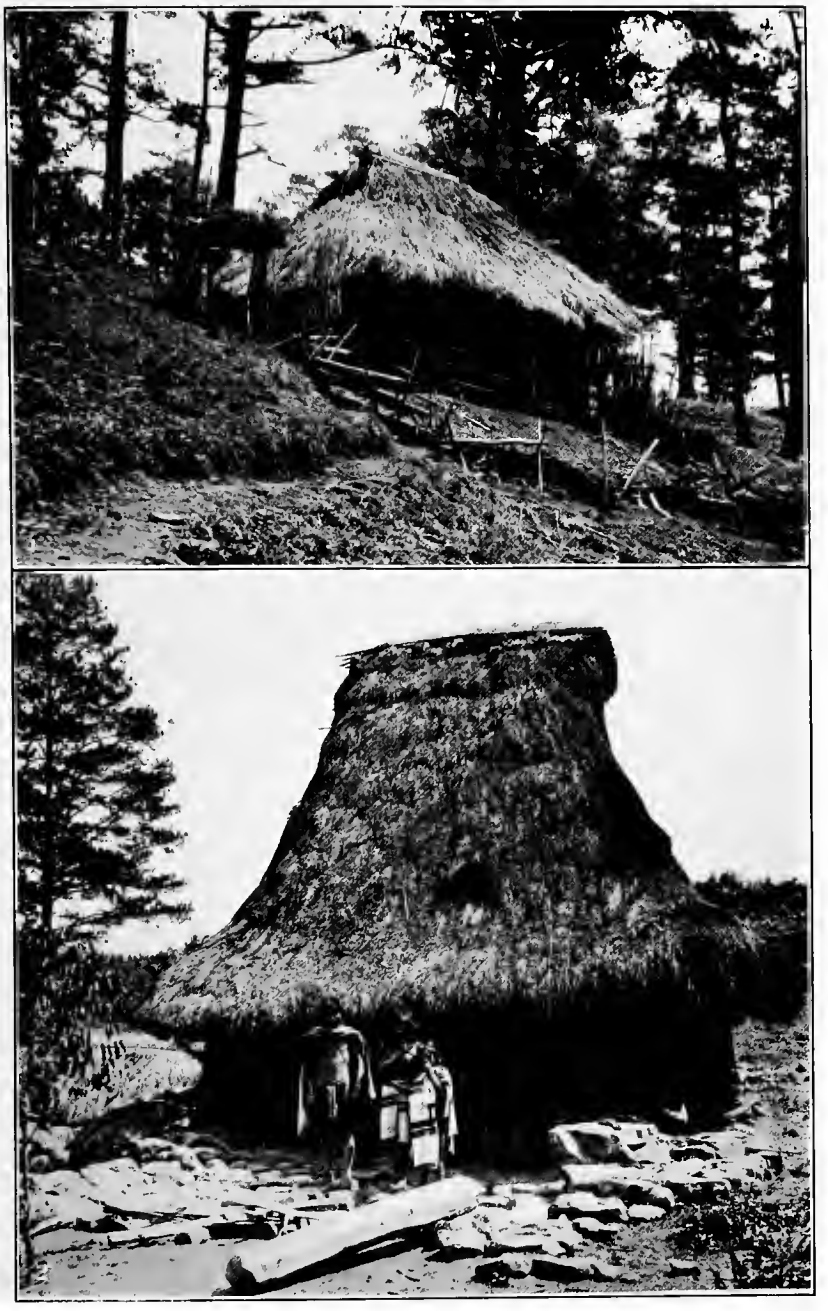

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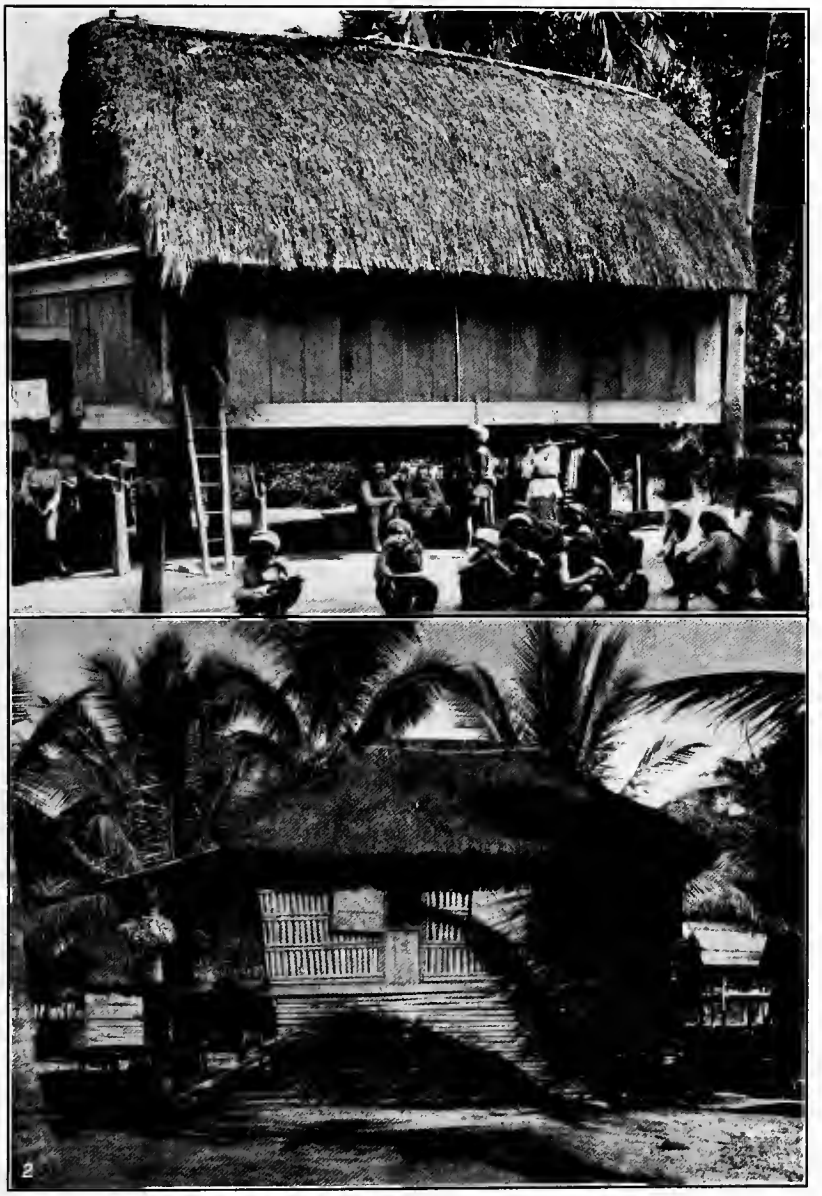
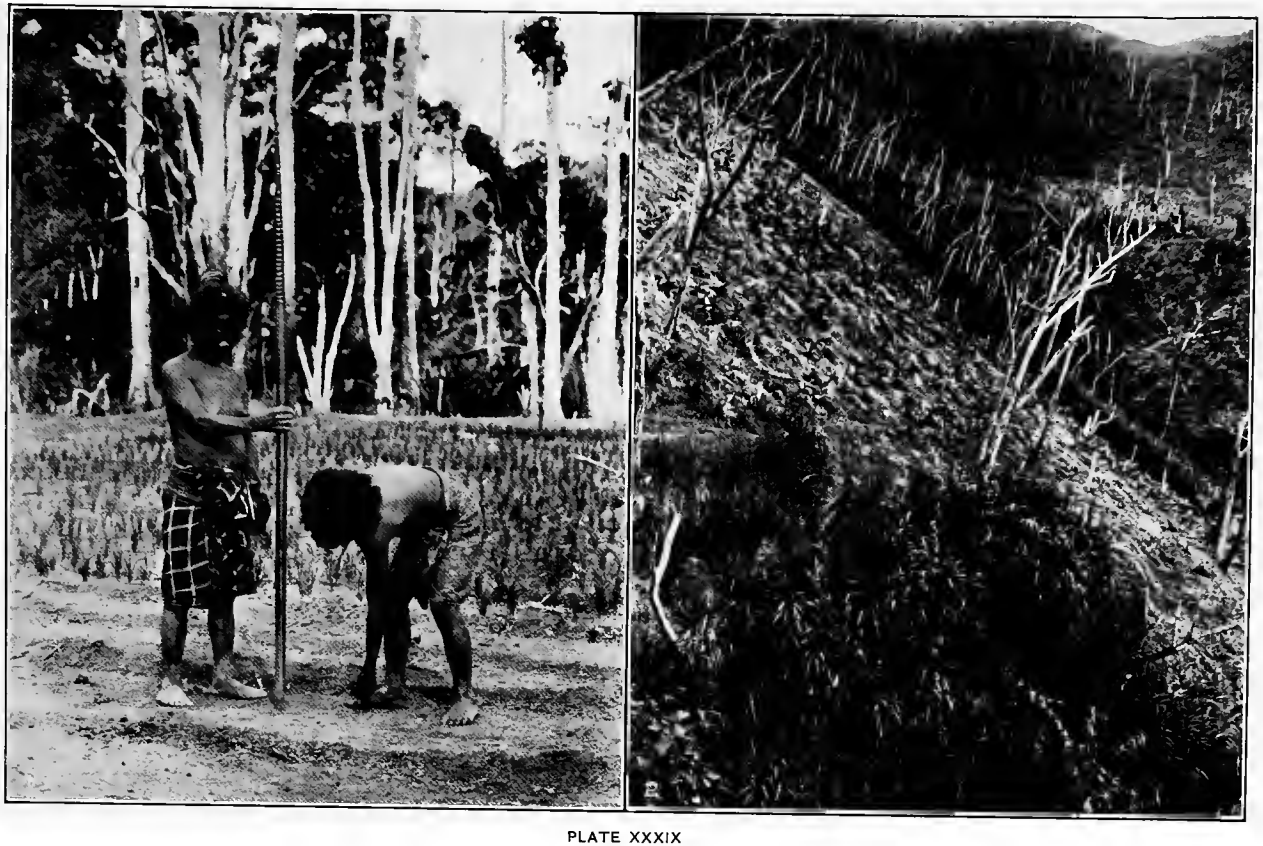


PLATE XXXV.

PLATE XXXVI.

PLATE XXXVII.

PLATE XXXVIII.



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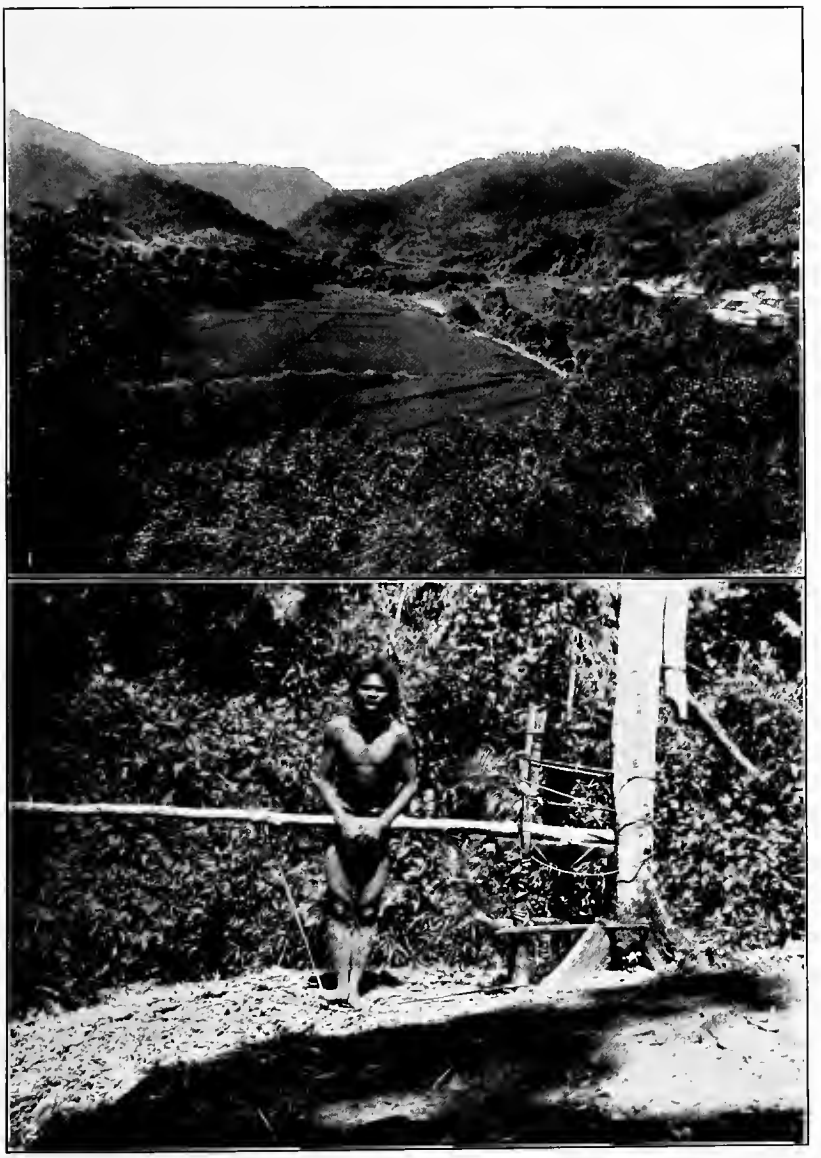

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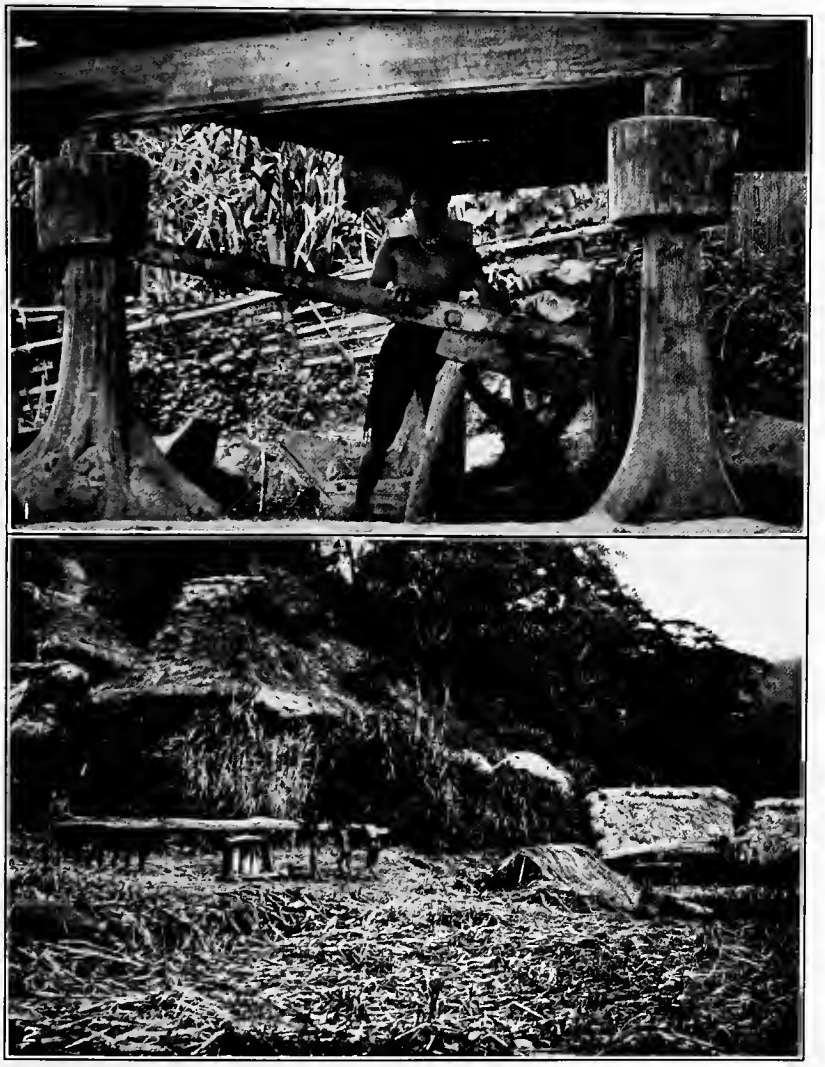

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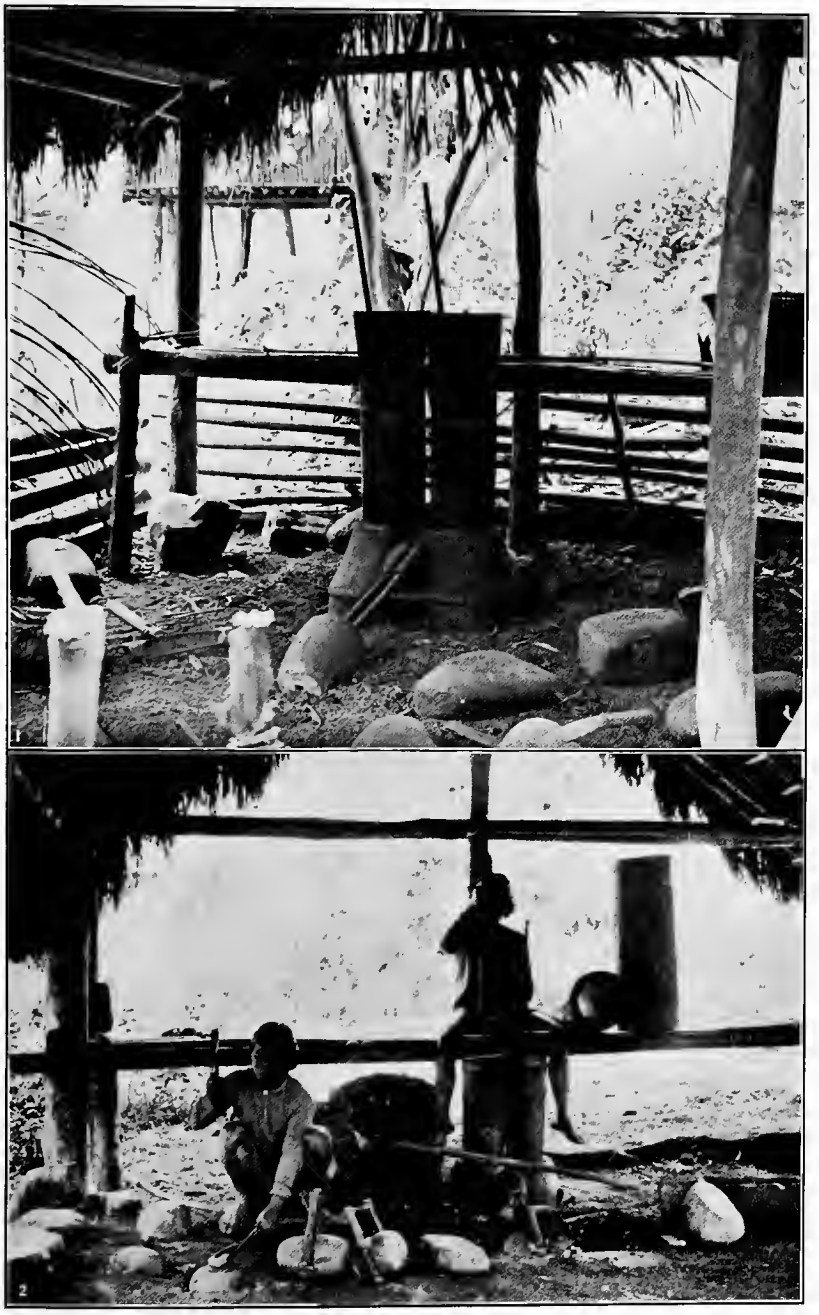


PLATE XLII.

PLATE XLIII.

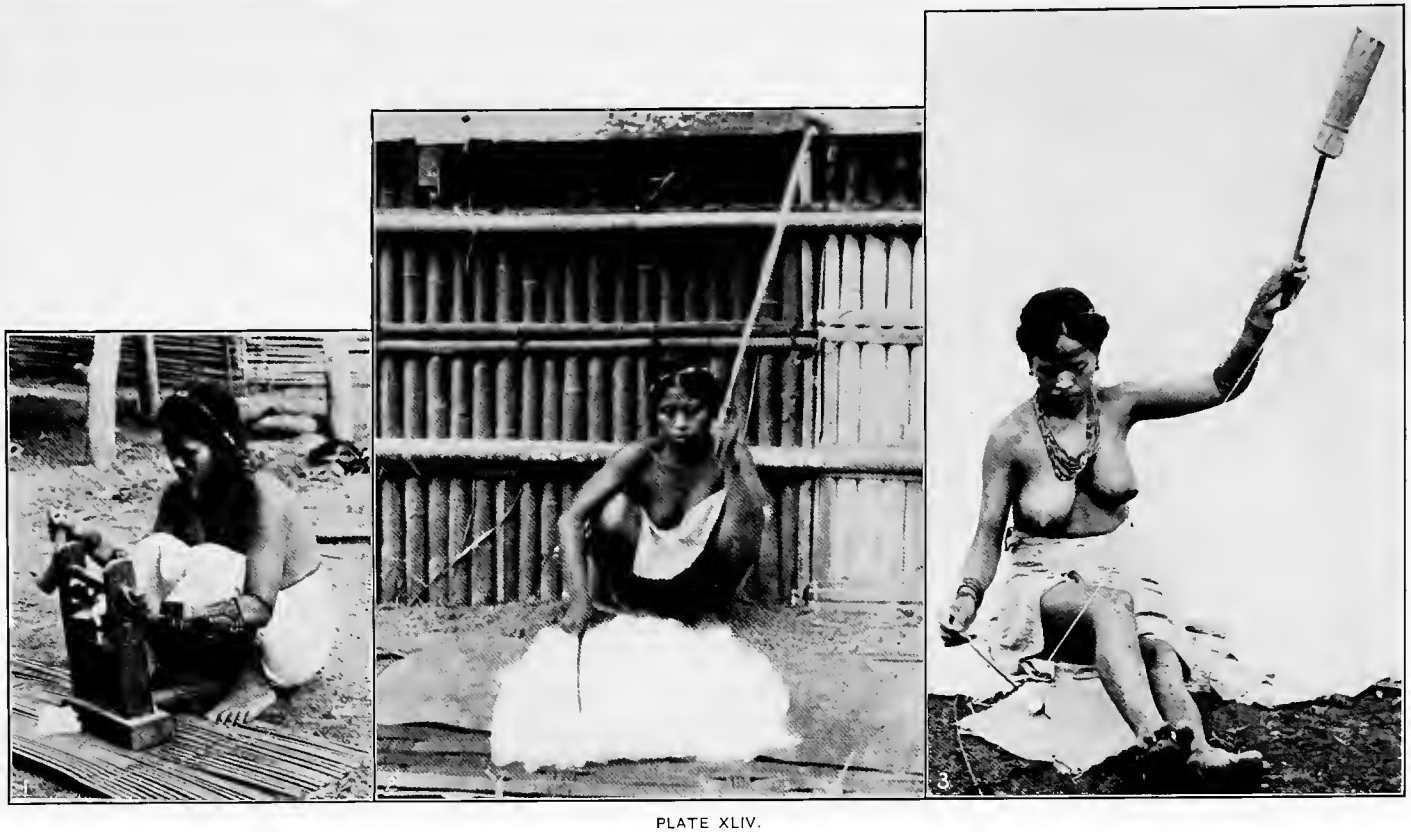


PLATE XLIV.

PLATE XLV.

PLATE XLVI.

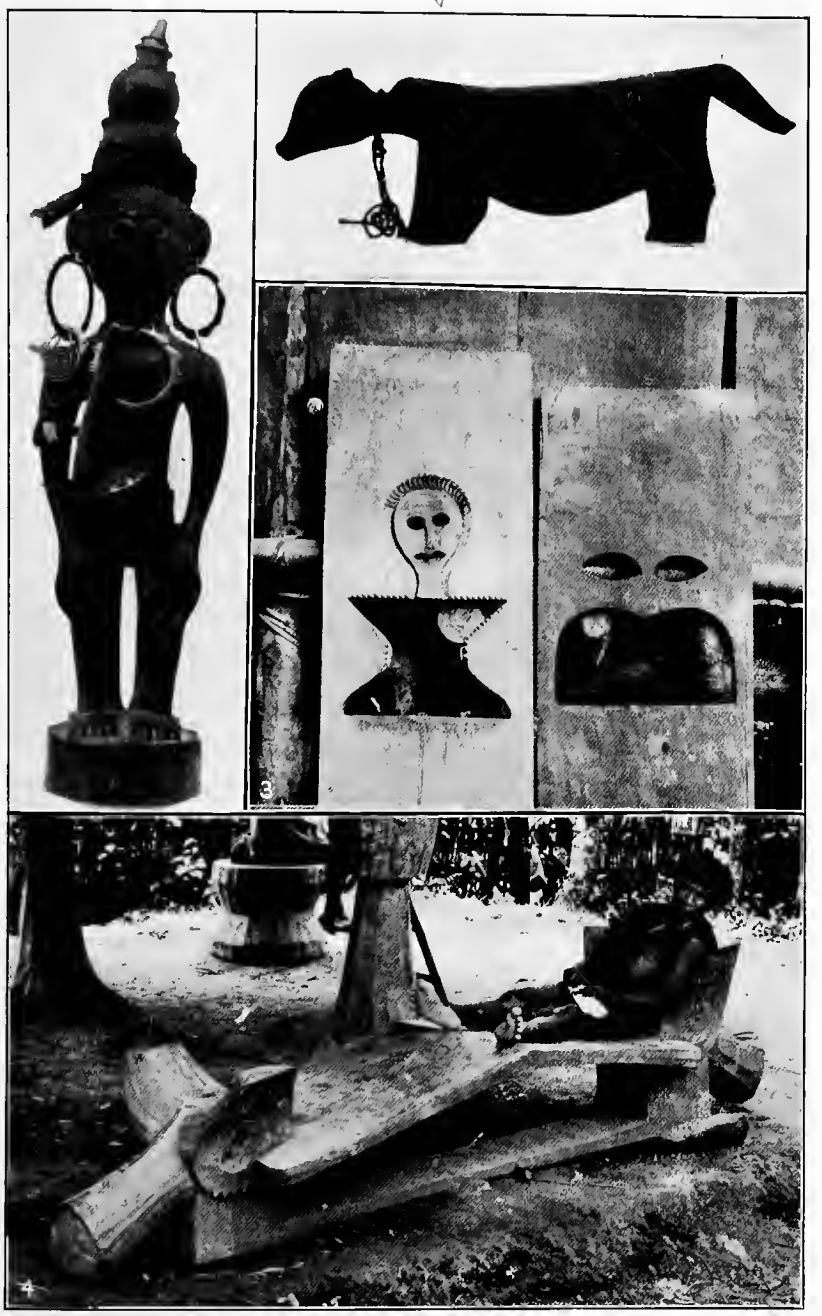
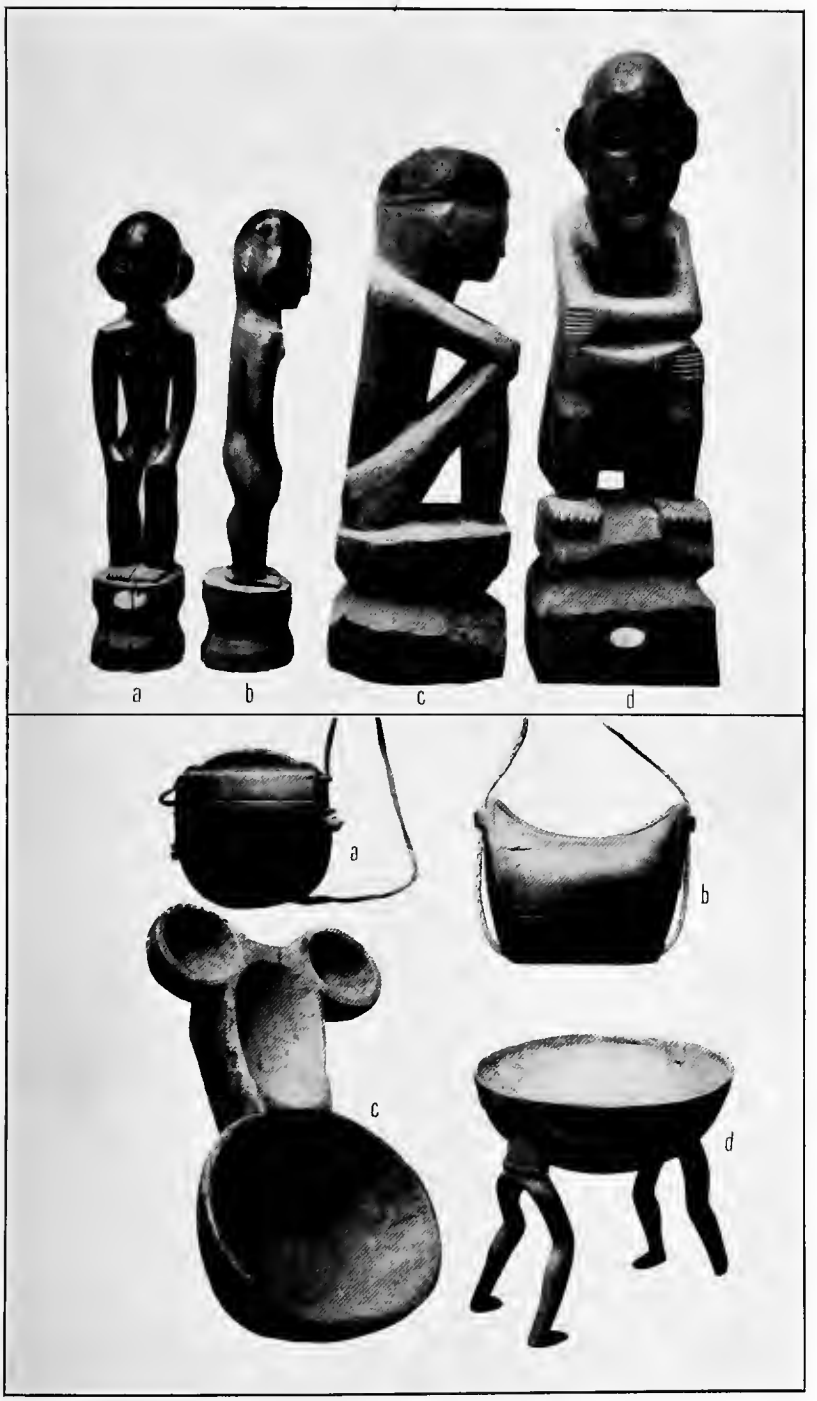


PLATE XLVII.

PLATE XLVIII.



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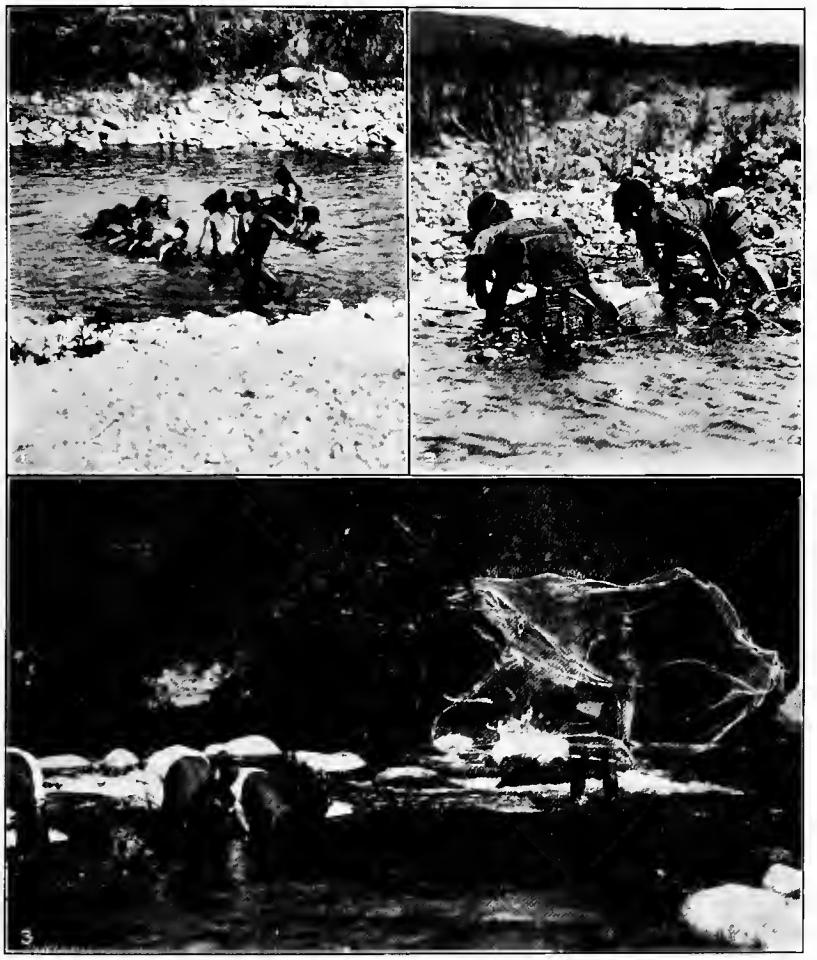


PLATE L.

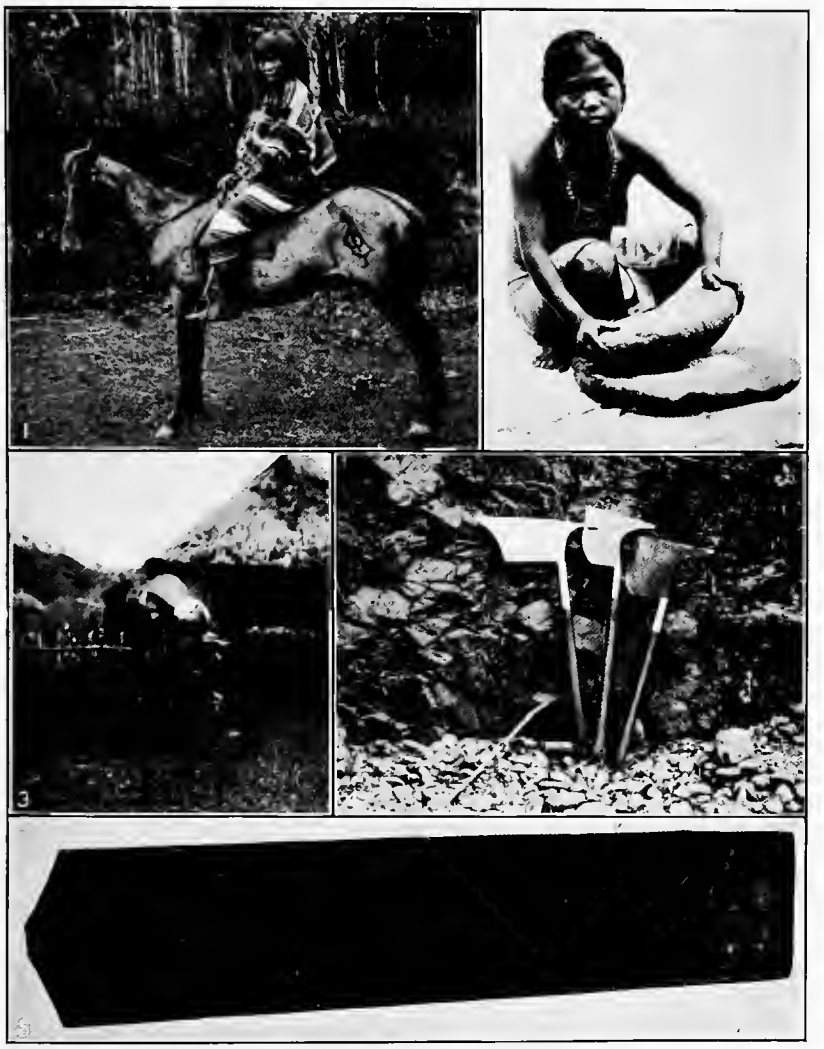


PLATE LI.

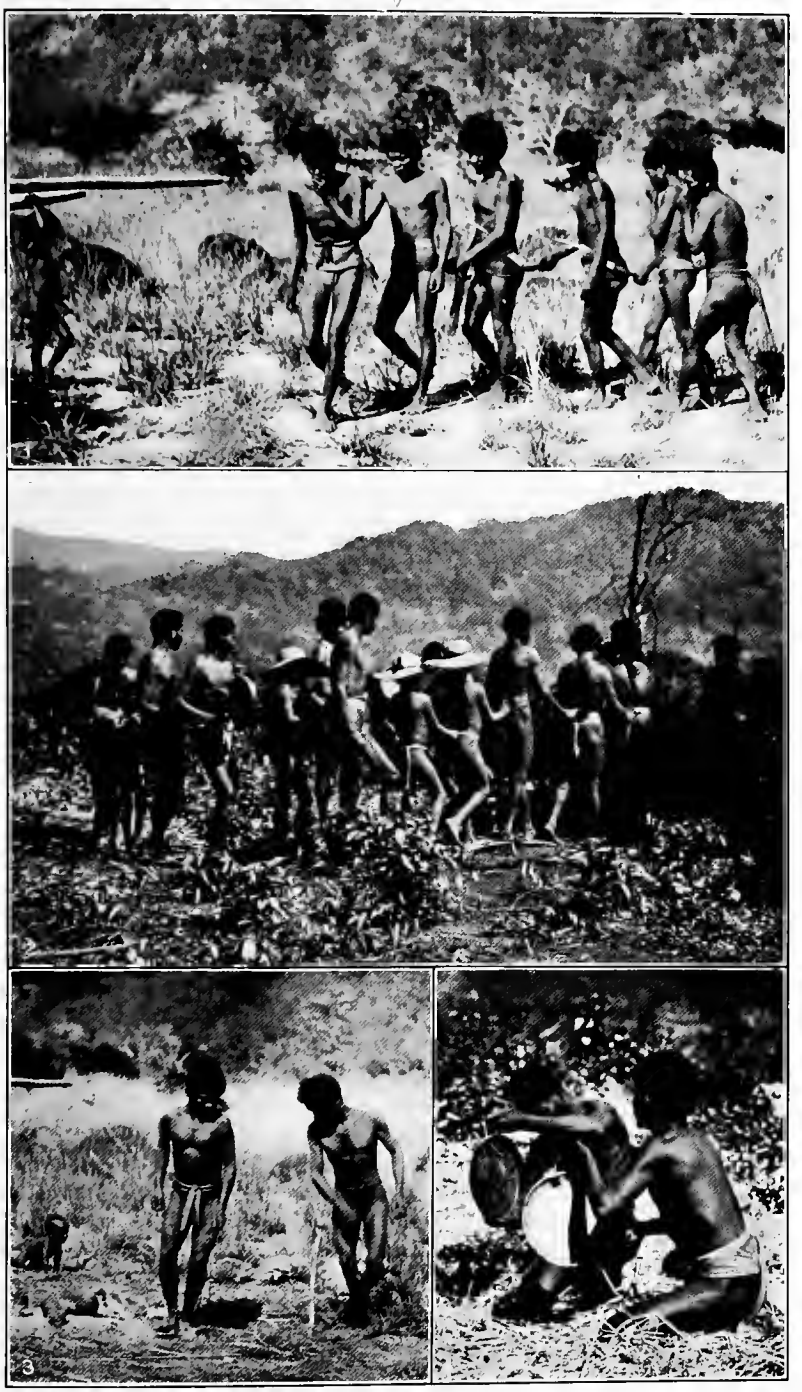
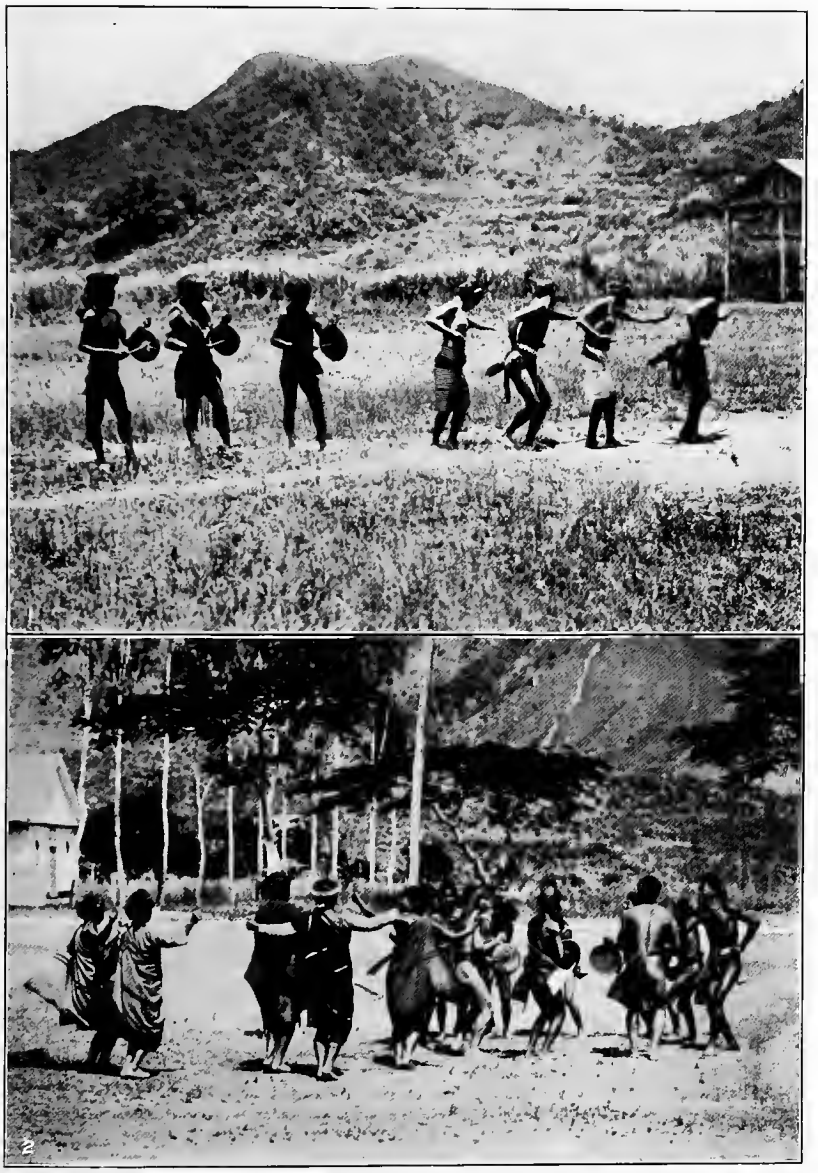


PLATE LII.

PLATE LIII.



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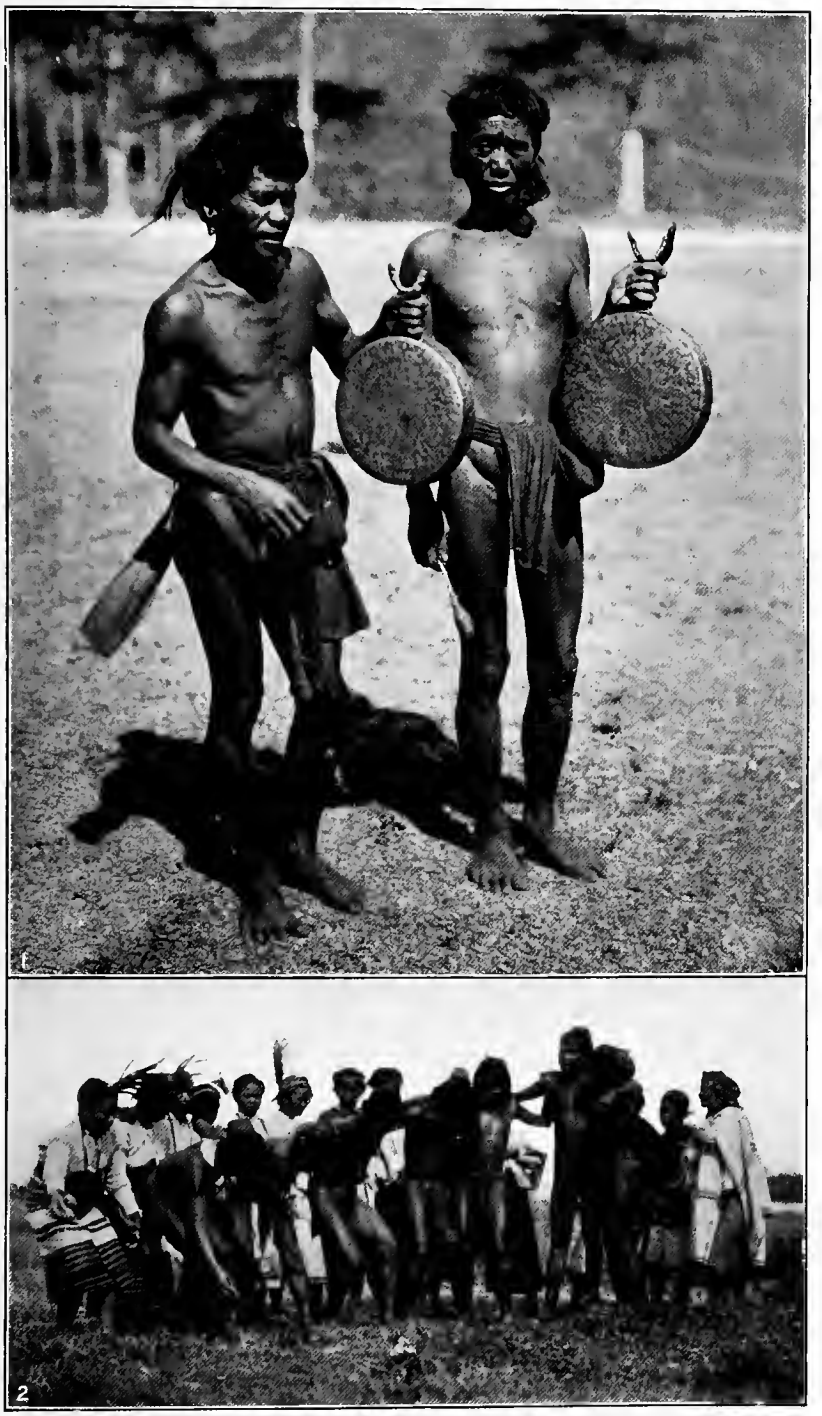


PLATE LV.

PLATE LVI.

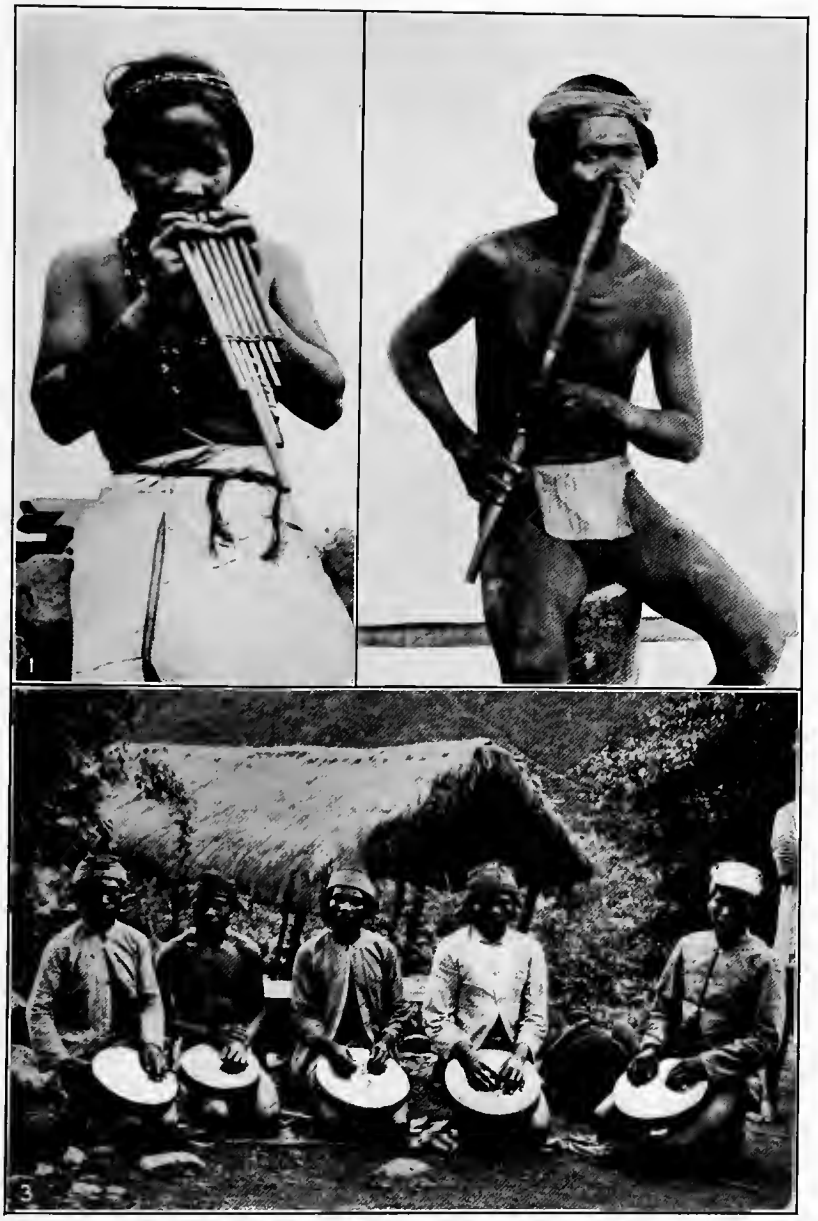
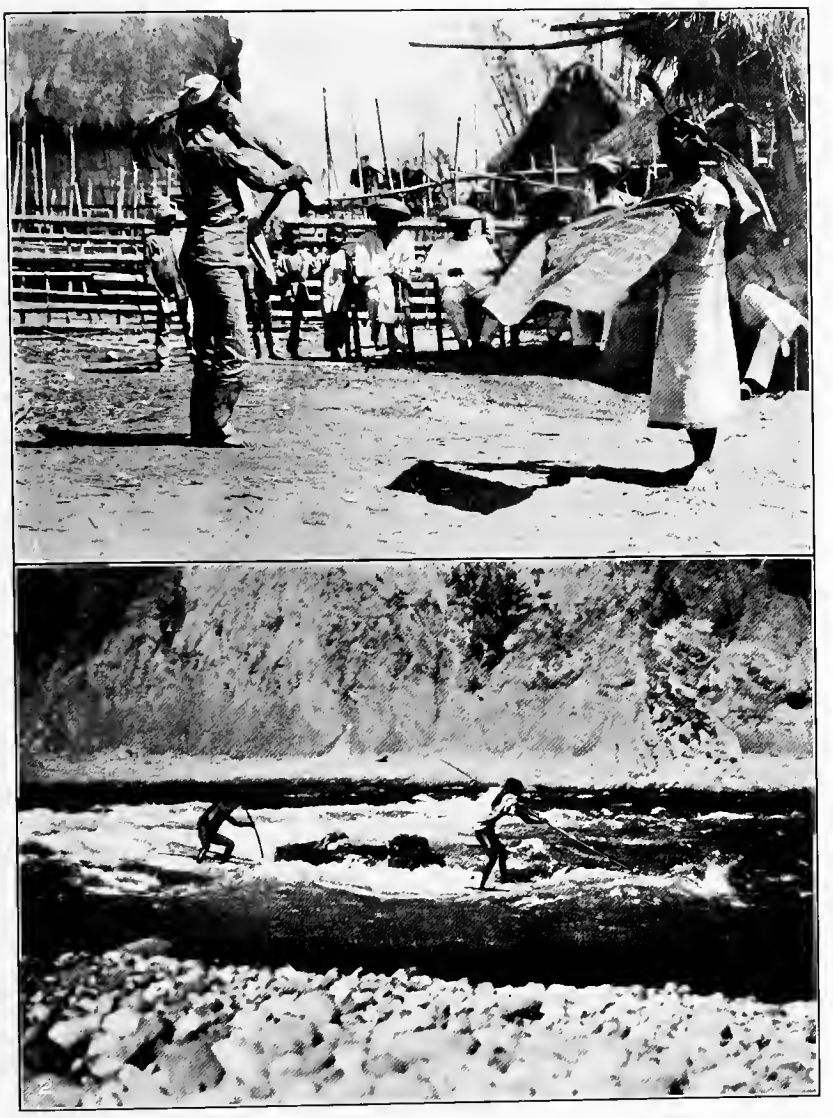


PLATE LVII.



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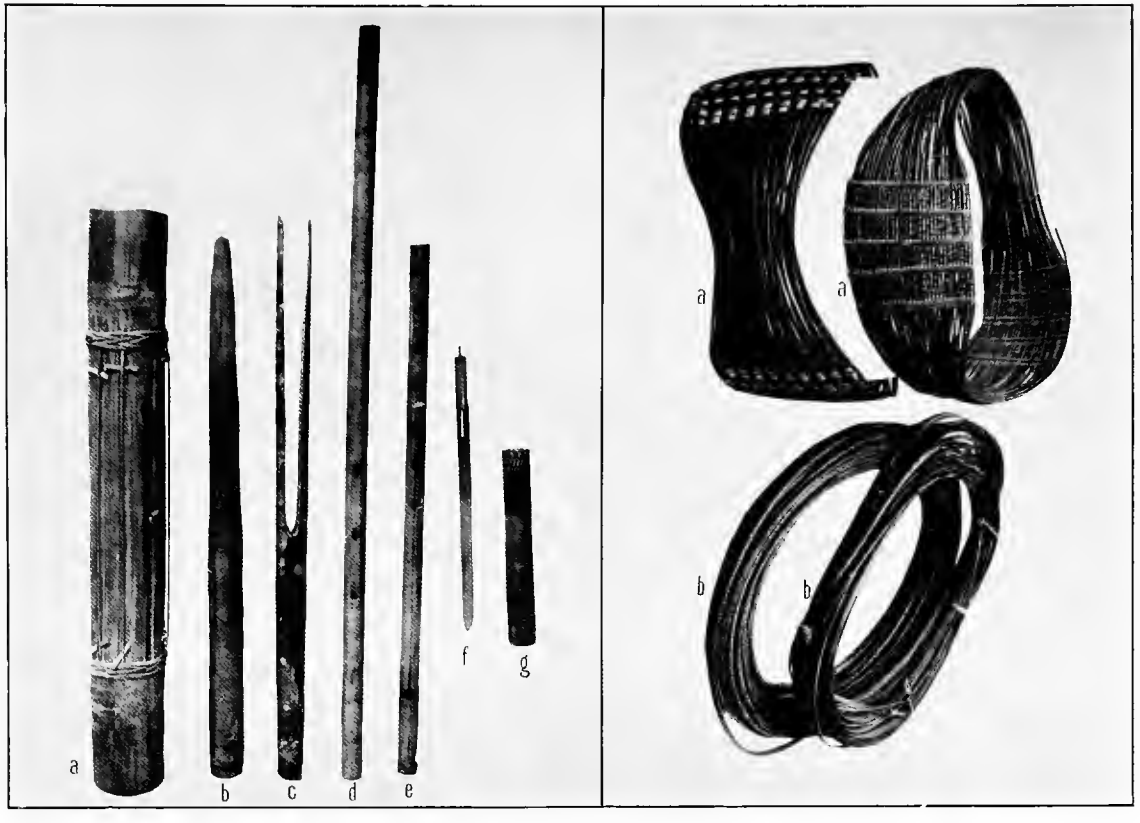

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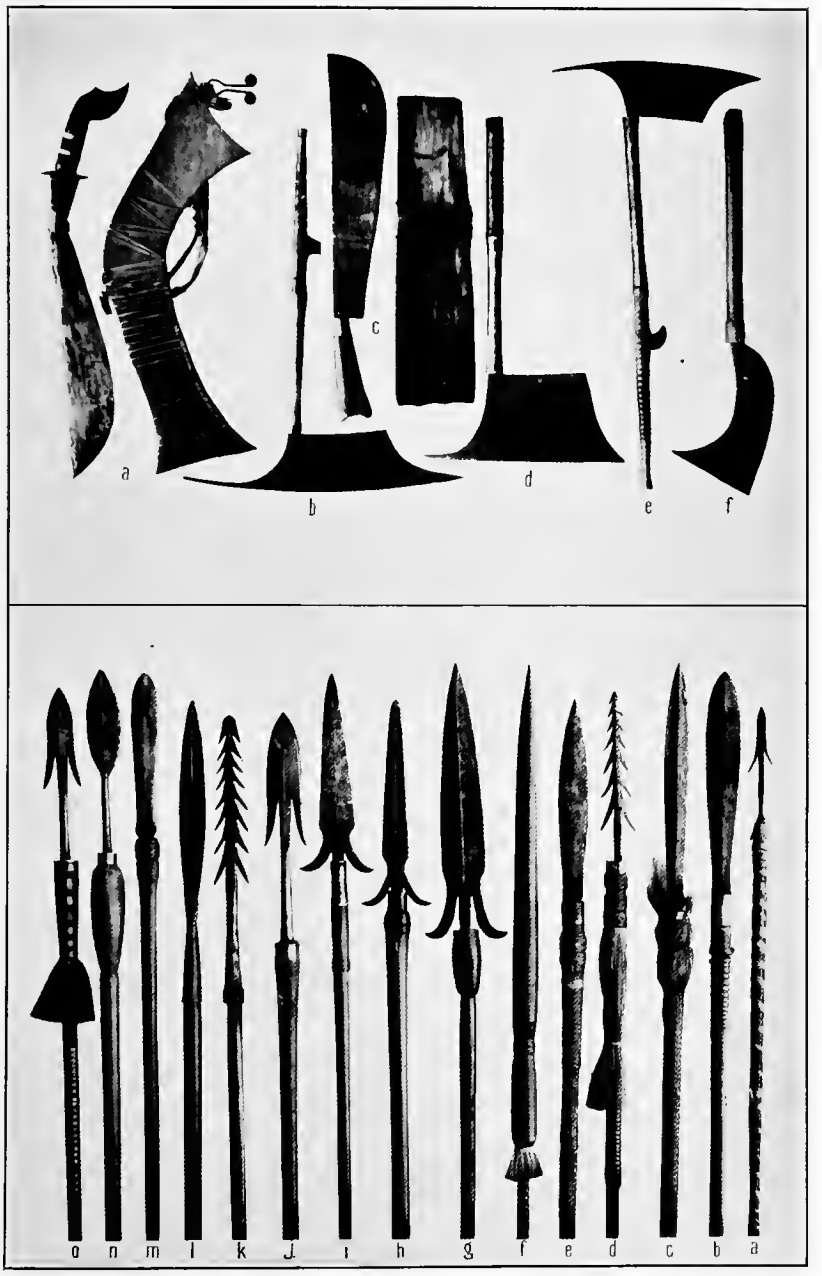

PLATE LX.

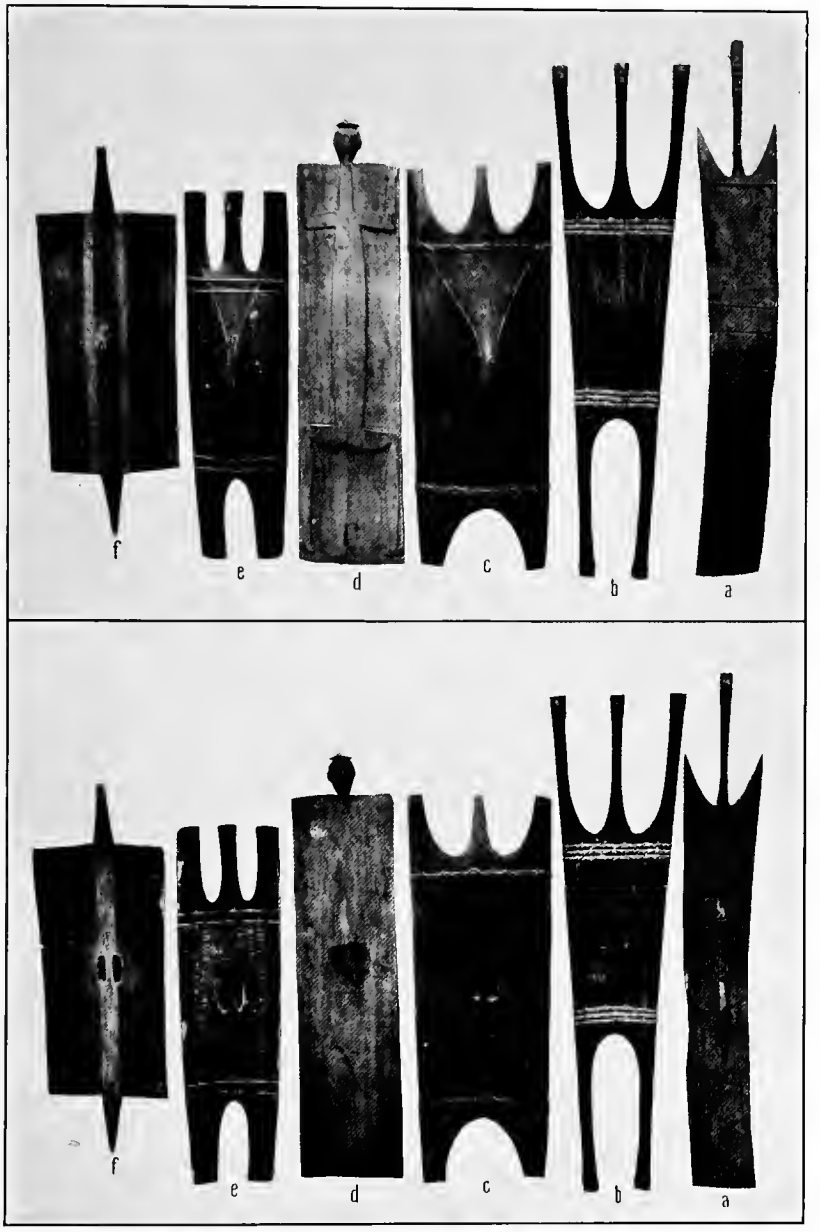

PLATE LXI.

PLATE LXII.

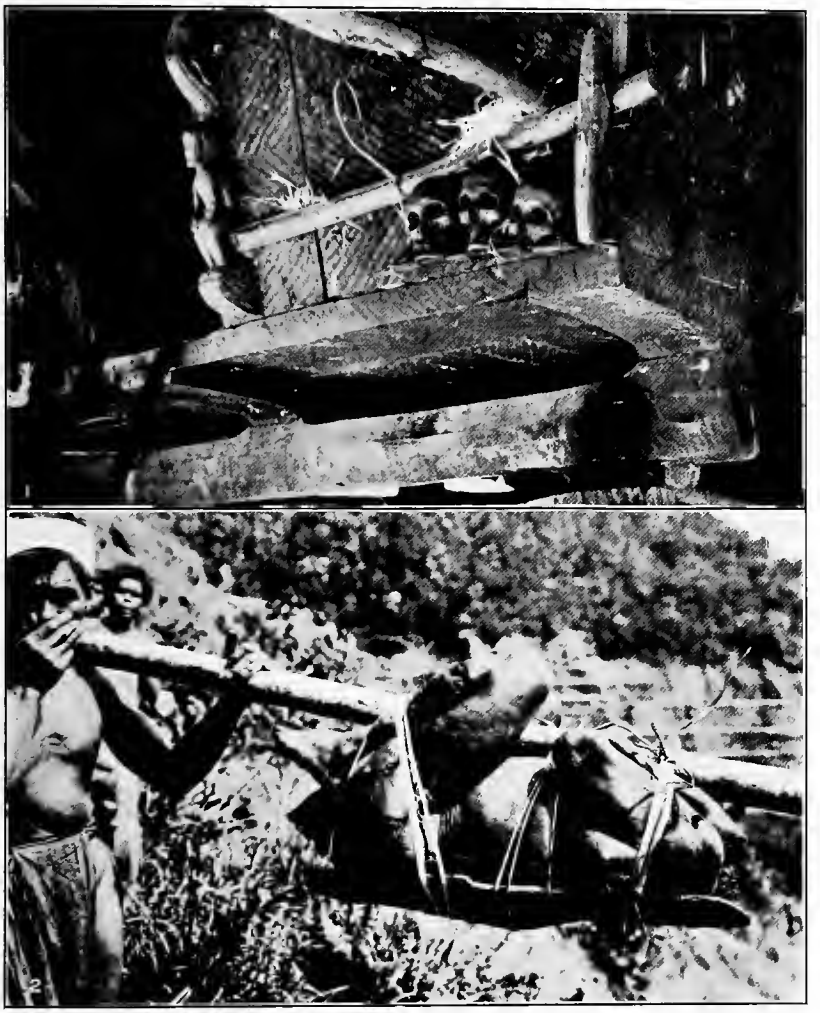

PLATE LXIII.

PLATE LXIV.

PLATE LXV.

PLATE LXVI.

PLATE LXVII.

PHILIPPINE COALS AND THEIR GAS-PRODUCING POWER.

By ALVIN J. COX.
(*From the Chemical Division, Bureau of Science.*)

Although coal occurs so abundantly in the Philippines, native coal is used only sparingly as a fuel. It has been employed on the small vessels plying along the coast with fairly satisfactory results, but, largely owing to the undeveloped condition of the mines and the difficulty of transportation, it has come very little into competition with the coal imported from Japan and Australia.

The Philippine coals are deposits of the so-called black lignites but are superior to ordinary lignite in every respect. It is rather the exception for these coals to have a brownish color and they never show a woody structure. In appearance they are usually black and shiny, much resembling bituminous coal, but have a slightly lower calorific value than the latter. On the other hand, they have a much higher calorific value than ordinary brown lignite.

A great many formulæ which have been found to approximate the truth have been proposed [1] for the calculation of the total amount of heat obtainable on the combustion of coals, from their ultimate analyses. Dulong's formula is said to give results with a probable error not exceeding 2 per cent—that is, they differ by not more than 2 per cent from the value obtained by experiment in the bomb calorimeter.

Fewer attempts have been made to derive a formula for the calculation of the calorific value of coals from their proximate analyses. In 1896 Goutal [2] deduced a formula from the calorific determinations of some 600 coals of different kinds, by which the results of calculation in nearly every case agree within 1 per cent with those of experiment. Gill [3] says that the results upon a series of American coals varied less than 2 per cent from those obtained by the calorimeter. Such a formula is

[1] Formulæ of Dulong, Gmelin, Cornut, Ser, Scheurer-Kestner and Meunier-Dollfus, *Ann. Chim. Phys.* (1886) (6), 8, 267; and Bunte, *J. f. Gasbeleuchtung*, 34, 21–26 and 41–47.

[2] *Rev. d. Chim. ind.* (1896) 7, 65.; *Compt. rend. Acad. d. sc.*, Par. (1902) (12), 135, 477–479.

[3] Gill, A. H.: Gas and Fuel Analysis for Engineers, New York (1902), p. 90.

purely empirical and depends on the volatile combustible matter of one coal having the same calorific value as that of every other coal of the same percentage composition, which fact is questionable. The facts expressed in *Table X* of this investigation show that this statement is more or less true, and since the error from this source can influence only one factor, it is thought that an empirical formula of sufficient accuracy may be obtained which will be of some assistance to practical workers. The formula as proposed by Goutal is as follows:

$P = 81.5\ C + aV$ where,

P = The heating power in calories.

C = Percentage of fixed carbon, as determined by analysis.

V = Percentage of volatile combustible, as determined by analysis.

a = An empirical value, varying with the percentage of volatile combustible to total combustible matter in the coal—i. e.,

$$\frac{\text{per cent volatile combustible}}{100 - (\text{per cent moisture} + \text{per cent ash})}.$$

The values given are as follows:

When the percentage of volatile combustible to total combustible matter is equal to—	Then a is equal to—
5	145
10	130
15	117
20	109
25	103
30	98
35	94
40	85

The numbers given by Goutal have not been carried far enough to be of any assistance in determining the calorific power of Philippine coals. I have therefore collected proximate analyses of coals, on which calorific determinations have been made, of the same grade as those from this Archipelago, from as many sources [4] as possible and have calculated values for a from them. The total number of analyses used in this collection was 150, and the results of calculating by means of these numbers agreed in nearly every case within 1.5 per cent with those determined by experiment. The numbers are as follows:

[4] *U. S. G. S.*, P. P. 48 (1905), 1; *W. Virginia G. S.* (1903), 2; *Maryland G. S.* (1905), 5; *U. S. G. S. 22d An. Rep.* (1900–1901), 3; *U. S. G. S. Bull.* 218 (1903).

When the percentage of volatile combustible to total combustible matter is equal to—	Then a is equal to—
25	102
27.5	97
30	92
32.5	87
35	82
37.5	77
40	72
42.5	67
45	63
47.5	59
50	58
52.5	—
55	56

As yet we have not sufficient data thoroughly to test the accuracy of the formula when applied to coals of this region. Greater discrepancies between calculated and determined values have been noted on the coals analyzed in this Bureau than on the 150 others. In two of the determinations the results of the calorimeter tests fall 12 per cent below the calculated calorific values. These are both outcrop coals, and like many of our poor coals they probably contain carbonates which lose their carbon dioxide on ignition. In such cases the volatile combustible matter is largely volatile rather than combustible. The average variation of a series of eight, which is thought to be representative, is exactly 1 per cent; hence it is thought that the formula will give approximate results for average coals.

The oldest and largest deposits of Philippine coal known are on Batan Island,[5] Cebu, and Polillo, although it occurs in greater or less quantities in Negros, Zamboanga, Mindoro, Surigao, Rizal, Nueva Vizcaya, and Samar.

In order to give a more accurate idea of these districts I have summarized the analyses made by this Bureau, and give them in the following tables. The calorific power has been figured according to the formula $P = 81.5\ C + aV$ where the values of a are as given above:

[5] Smith W. D.: The Coal Deposits of Batan Island. *Bull. Min. Bur.*, Manila (1905), 5.

TABLE I.—*Outcrop and upper-bed coals of Batan Island.*

No.	Laboratory index.	Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Color of ash.	Total sulphur.	Phosphoric anhydride.	Iron.	Specific gravity.	Calculated calories.	$\frac{100\ V.C.^a}{V.C.+F.C.}$	Fuel ratio.[b]
1	3908	6.08	40.36	51.24	2.32	Yellowish brown.	4.00	------	------	1.30	[c]6,775	44.1	1.270
2	227	5.00	42.21	49.70	3.08	----------	0.22	0.05	0.52	------	6,695	45.9	1.178
3	3907	7.40	40.84	48.06	3.70	Light gray.	1.62	------	------	1.33	6,470	45.9	1.177
4	1638	9.4	38.5	43.8	8.3	----------	------	------	------	1.37	5,945	46.7	1.137
5	1637	6.90	36.9	40.0	16.20	----------	0.33	------	------	------	5,455	48	1.085
6	2396	5.80	41.2	44.5	8.5	----------	0.42	------	------	------	6,080	48.1	1.080
7	3908	9.53	41.56	44.86	4.05	Brown ----	2.37	------	------	1.30	6,125	48.1	1.078
8	2397	6.00	42.2	44.0	7.8	----------	0.49	------	------	------	6,080	49	1.044
9	3908	5.10	38.28	39.84	16.78	Light brown.	1.11	------	------	1.34	5,506	49	1.042
10	4096	20.80	37	37.3	4.9	----------	1.13	------	------	1.36	5,210	49.8	1.008
11	226	18.50	37.73	38.10	5.66	----------	0.87	------	0.48	------	5,309	49.8	1.010
12	3907	17.18	39.08	38.25	5.49	White ----	1.15	------	------	1.32	5,397	50.6	0.980
13	3908	15.33	42.05	40.45	2.17	Yellowish brown.	1.08	------	------	1.36	5,750	51	0.962
14	3662	11.09	44.02	40.67	4.22	----------	2.36	------	------	1.40	5,845	51.9	0.924
15	3907	11.35	45.75	41.01	1.89	Brownish gray.	2.00	------	------	1.31	5,965	52.7	0.897
16	3907	12.18	42.84	37.96	7.02	White ----	1.97	------	------	1.37	5,554	53	0.887
17	3908	18.30	40.44	35.88	5.38	Light brown.	0.38	------	------	1.31	5,250	53	0.887
18	2348	11.48	40.26	34.76	13.50	----------	0.83	0.06	0.45	------	5,135	53.6	0.862
19	3662	14.82	43.28	37.06	4.84	----------	1.33	------	------	1.52	5,485	53.8	0.857
20	3907	17.88	41.32	34.77	6.03	Light brown.	2.16	------	------	1.32	5,170	54.3	0.842
21	3907	17.56	42.72	35.56	4.16	Brown ----	2.23	------	------	1.37	5,315	54.6	0.833
22	3907	9.86	47.58	38.89	3.67	Gray ------	2.73	------	------	1.29	5,855	55.1	0.817
23	3907	18.96	43.14	32.79	5.11	Brown ----	2.15	------	------	1.30	5,105	56.8	0.762
24	3907	17.77	45.18	32.71	4.34	Light brown.	2.00	------	------	1.33	5,220	58	0.724
25	3908	17.06	50.73	29.12	8.09	Brown ----	1.24	------	------	1.32	5,180	63.6	0.574
26	2348	10.69	50.47	26.39	2.45	----------	0.54	0.12	0.53	------	4,945	65.7	0.523
27	3907	17.22	51.08	25.77	5.93	Light brown.	2.16	------	------	1.35	4,912	66.5	0.505

[a] Percentage of volatile combustible to total combustible matter.

[b] $\frac{\text{Fixed carbon.}}{\text{Volatile combustible.}}$

[c] Calorimeter calories, 6,487.

TABLE II.—*Drill samples or lower coal seams of Batan Island.*

No.	Laboratory index.	Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Color of ash.	Total sulphur.	Phosphoric anhydride.	Iron.	Specific gravity.	Calculated calories.	100 V. C. / V. C. + F. C.	Fuel ratio.
1	3661	5.62	38.68	54.42	1.28	----------	0.14	------	------	1.35	7,085	41.6	1.405
2	3661	5.39	36.23	48.28	10.10	----------	0.26	------	------	1.46	6,387	42.9	1.333
3	3661	5.38	39.62	51.96	3.04	----------	0.11	------	------	1.37	6,875	43.2	1.312
4	2780	5.82	40.29	52.40	1.49	Orange----	0.66	------	------	1.58	6,960	43.4	1.301
5	2780	5.74	39.98	48.88	5.40	Yellow----	0.66	------	------	1.57	6,625	45.	1.223
6	3661	5.08	42.03	50.31	2.58	----------	0.25	------	------	1.41	6,775	45.6	1.197
7	2369	6.3	39.4	46.8	7.5	White-----	0.53	------	------	------	6,320	45.7	1.190
8	2370	6.4	39.7	46.5	7.4	-----do----	0.45	------	------	------	6,295	46.	1.172
9	3661	5.03	40.82	47.15	7.0	----------	0.45	------	------	1.41	6,355	46.4	1.156
10	2371	6.5	40.6	46.0	6.9	White-----	0.6	------	------	------	6,125	46.8	1.133
11	2780	5.89	39.68	45.04	9.39	Brown ----	0.97	------	------	1.57	6,115	46.8	1.133
12	2780	5.17	41.28	45.91	7.64	-----do----	0.96	------	------	1.64	6,195	47.3	1.112
13	2780	5.47	40.23	44.51	9.79	Gray -----	2.17	------	------	1.53	6,020	47.5	1.107
14	2780	5.83	40.16	43.82	10.19	-----do----	2.69	------	------	1.60	5,950	47.8	1.090
15	3491	4.53	45.89	46.96	2.62	White-----	0.59	------	------	1.43	6,515	49.4	1.025
16	3661	5.10	45.86	44.20	4.84	----------	0.18	------	------	1.40	6,285	50.8	0.965
17	3661	4.88	45.47	43.09	6.56	----------	0.12	------	------	1.47	6,200	51.4	0.947

TABLE III.—*Outcrop and upper-bed coals of Cebu.*

No.	Laboratory index.	Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Color of ash.	Total sulphur.	Phosphoric anhydride.	Iron.	Specific gravity.	Calorimeter calories.	Calculated calories.	100 V. C. / V. C. + F. C.	Fuel ratio.
1	406	8.96	35.11	52.92	3.00	----------	------	------	------	1.26	------	6,841	39.8	1.508
2	405	8.83	35.10	52.78	3.28	----------	------	------	------	1.30	------	6,836	39.9	1.505
3	2482	16.60	33.6	47.8	2.0	Light brown.	------	------	------	------	------	6,245	41.3	1.421
4	2481	17.3	32.8	46.2	3.7	White ----	------	------	------	------	------	6,060	41.5	1.409
5	404	9.3	39.24	48.64	2.81	----------	------	------	------	1.32	------	6,435	44.7	1.240
6	2348	3.73	42.02	50.20	4.45	----------	1.88	0.01	0.73	------	------	6,744	45.6	1.195
7	4742	14.13	39.44	44.66	1.77	----------	0.12	------	------	------	5,928	6,050	46.9	1.134
8	2413	5.0	44.1	48.7	2.2	Slightly red.	0.37	------	------	------	------	6,587	47.5	1.105
9	2483	14.7	38.4	41.6	5.3	White ----	------	------	------	------	------	5,658	48.	1.085
10	2348	5.19	34.69	37.16	22.96	----------	0.86	0.04	0.96	------	------	5,077	48.3	1.072
11	408	13.35	42.2	43.73	0.71	----------	------	------	------	1.30	------	6,054	49.1	1.036
12	4742	15.45	40.78	40.47	3.30	----------	1.05	------	------	------	5,535	5,665	50.2	0.993
13	2348	11.13	44.22	41.68	2.97	----------	0.54	0.05	0.78	------	------	5,960	51.5	0.943
14	4742	14.21	41.40	36.69	7.70	----------	1.70	------	------	------	5,248	5,350	53.1	0.888
15	4742	13.06	44.99	35.83	6.12	----------	0.23	------	------	------	5,497	5,440	55.7	0.797
16	403	17.30	44.51	34.67	3.52	----------	------	------	------	1.29	------	5,320	56.2	0.780

TABLE IV.—*Outcrop and upper bed coals of Polillo.*

No.	Laboratory index.	Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Color of ash.	Total sulphur.	Phosphoric anhydride.	Iron.	Specific gravity.	Calorimeter calories.	Calculated calories.	$\frac{100\ V.\ C.}{V.\ C. + F.\ C.}$	Fuel ratio.
1	4096	5.70	35.4	45.6	13.3	----------	0.57	-----	-----	1.35	-----	6,055	43.7	1.288
2	4096	4.90	42.3	49.1	3.7	----------	0.27	-----	-----	1.31	-----	6,660	46.2	1.162
3	2426	4.70	43.5	50.1	1.70	Light brown.	0.28	-----	-----	-----	6,897	6,820	46.5	1.152
4	4096	-----	-----	-----	-----	----------	-----	-----	-----	-----	5,883	-----	-----	-----
5	2792	10.06	41.19	46.45	2.30	Brown-----	-----	-----	-----	-----	-----	6,215	47.0	1.126
6	4052	5.40	45.22	45.96	3.42	Light brown.	0.44	-----	0.82	-----	-----	6,365	49.6	1.016
7	4355	5.0	48.0	43.3	3.70	----------	-----	-----	-----	-----	-----	6,270	52.5	0.902

TABLE V.—*Outcrop and upper-bed coals of Negros.*

No.	Laboratory index.	Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Color of ash.	Total sulphur.	Phosphoric anhydride.	Iron.	Specific gravity.	Calorimeter calories.	Calculated calories.	$\frac{100\ V.\ C.}{V.\ C. + F.\ C.}$	Fuel ratio.
1	409	15.03	33,5	44.67	6.79	----------	-----	-----	-----	1.325	-----	5,880	42.8	1.334
2	407	19.33	32.37	39.91	8.39	----------	-----	-----	-----	1.39	-----	5,295	44.8	1.234
3	2348	12.67	44.42	35.46	7.45	----------	1.67	0.10	0.61	-----	-----	5,370	55.6	0.798
4	966	21.2	40.80	31.5	6.5	Red ------	0.6	-----	-----	-----	5,521	4,860	56.4	0.773
5	2348	11.17	50.15	29.19	9.49	----------	0.99	0.18	1.01	-----	-----	5,130	63.3	0.582
6	2348	9.39	42.90	21.56	26.15	----------	1.75	0.03	0.96	-----	-----	4,117	66.6	0.503
7	2348	12.31	49.28	24.27	14.10	----------	1.61	0.04	0.91	-----	-----	4,685	66.9	0.494
8	2348	13.11	51.10	5.27	10.52	----------	1.28	0.03	0.69	-----	-----	4,870	66 9	0.494

TABLE VI.—*Outcrop and upper-bed coals of other localities.*

No.	Laboratory index.	Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Color of ash.	Total sulphur.	Phosphoric anhydride.	Iron.	Specific gravity.	Calorimeter calories.	Calculated calories.	$\frac{100\ V.C.}{V.C.+F.C.}$	Fuel ratio.
ZAMBOANGA.														
1	427	4.64	38.38	55.19	1.78	----------	------	------	------	1.27	------	7,401	41.0	1.437
2	2348	6.90	39.91	48.03	5.16	----------	0.62	0.01	0.94	------	------	6,450	45.4	1.205
MINDORO.														
3	1337	13.82	40.69	41.62	3.87	Reddish---	0.74	------	------	------	------	5,771	49.4	1.024
SURIGAO.														
4	402	17.37	41.80	33.44	7.38	----------	------	------	------	------	------	5,080	55.5	0.800
5	2348	9.35	51.22	20.73	18.60	----------	2.66	0.03	1.45	------	------	4,464	71.2	0.404
RIZAL.														
6	358	1.75	38.19	47.86	12.19	----------	------	------	------	1.26	------	6,335	44.4	1.252
7	2348	6.88	38.69	47.90	5.53	----------	0.74	0.06	0.53	------	------	6,400	44.7	1.238
8	2348	5.19	34.69	37.16	22.96	----------	0.86	0.04	0.96	------	------	5,022	52.7	1.071
9	4028	8.17	49.32	36.58	6.93	----------	0.43	------	------	1.36	------	5,710	57.4	0.743
NUEVA VIZCAYA.														
10	3147	13.61	36.56	31.71	18.12	Light brown.	1.95	------	------	------	------	4,683	53.5	0.868
11	2570	14.25	53.09	27.64	5.02	Brown-----	1.72	------	------	------	------	5,186	65.8	0.520
TAYABAS.														
12	2348	11.04	38.87	27.06	23.02	----------	0.45	0.07	1.50	------	------	4,358	58.9	0.696
SAMAR.														
13	4369	25.2	40.6	31.6	2.6	----------	------	------	------	------	------	4,865	56.2	0.778
PHILIPPINE COAL (SOURCE UNKNOWN).														
14	1123	13.89	32.71	40.23	13.16	Red ------	0.77	------	------	------	5,567	5,388	44.8	1.230
15	3195	2.98	40.96	46.98	9.08	Brown-----	1.35	------	------	------	------	6,395	46.6	1.148
16	3915	24.80	32.4	36.3	6.50	Reddish---	------	------	------	------	------	4,887	47.2	1.120
17	1831	4.30	28.5	30.8	36.4	Red ------	------	------	------	------	------	4,205	48.1	1.081
18	3702	12.70	29.30	30.76	27.24	----do----	6.07	------	------	1.37	------	4,248	48.8	1.050
19	4743	13.03	41.73	42.78	2.46	----------	0.15	------	------	------	------	5,930	49.4	1.025
20	4743	11.91	42.68	38.93	6.48	----------	0.26	------	------	------	------	5,620	52.3	0.911
21	4833	28.1	34.4	30.0	7.5	----------	------	------	------	1.32	4,992	4,420	53.4	0.872
22	4773	16.10	42.30	34.2	7.4	----------	------	------	------	------	------	5,170	55.4	0.809

TABLE VII.—*Analyses of foreign coals.*

No.	Laboratory index.	Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Color of ash.	Total sulphur.	Phosphoric anhydride.	Iron.	Specific gravity.	Calorimeter calories.	Calculated calories.	$\frac{100 \text{ V. C.}}{\text{V. C.} + \text{F. C.}}$	Fuel ratio.
AUSTRALIAN.														
1	225	2.47	32.15	58.20	7.17		0.22	0.66	0.24			7,330	35.6	1.810
2	1032	2.0	32.6	56.6	8.8	White	1.0				7,559	7,255	36.6	1.737
3	4121	2.7	31.7	54.	11.6						6,637	6,895	37.	1.704
4	3113	2.81	33.05	52.92	11.22	Gray	0.86					6,865	38.2	1.604
5	1209	2.77	36.11	52.66	8.46	do	0.8					6,910	40.6	1.460
6	4216	2.49	36.53	53.02	7.96	Yellowish brown.						6,975	40.8	1.450
7	1209	2.94	36.57	51.37	9.12	Reddish	0.88					6,770	41.6	1.421
8	3265	2.74	38.63	53.65	4.98	Brown						7,100	41.9	1.390
JAPANESE.														
9	229	1.71	25.53	67.06	5.70		0.14	1.07	0.42			7,970	27.6	2.630
10	1207	3.43	36.06	55.51	5.00	Reddish	1.64					7,140	39.4	1.538
11	228	2.38	38.27	52.58	6.77		0.21	0.32	0.33			6,880	42.2	1.375
12	2540	2.48	39.82	53.02	4.68		0.24					7,015	42.8	1.335
13	1207	2.89	37.68	50.50	8.93	Reddish	0.69					6,660	42.8	1.335
14	2781	2.64	39.26	51.91	6.19	Brown	0.56	0.03	0.45			6,880	43.1	1.323
15	2779	2.81	38.77	50.85	7.57		0.88			1.70		6,820	43.3	1.313
16	2540	3.05	37.67	49.34	9.94		0.42					6,530	43.3	1.309
17	2781	2.62	39.25	50.68	7.45	Gray	0.28	0.02	0.21			6,710	43.7	1.290
18	2346	1.87	40.34	51.85	5.94							6,855	43.7	1.288
19	3113	2.49	39.12	50.26	8.13	Gray	0.77					6,660	43.8	1.286
20	2346	1.88	40.53	51.73	5.86							6,853	44.0	1.276
21	2540	2.91	38.71	48.01	10.37		0.39					6,375	44.7	1.241
22	1207	2.56	39.65	49.03	8.76	Reddish gray.	0.49					6,513	44.7	1.239
23	1207	1.26	38.36	47.13	13.25	Gray	1.38					6,274	44.8	1.230
24	3411	2.10	39.51	48.19	10.20	Light brown.	0.47					6,436	45.1	1.221
25	1033	2.1	38.1	45.90	13.90		2.90				6,652	6,165	45.3	1.206
26	2526	2.78	42.88	51.11	3.23		0.36					6,890	45.6	1.192
27	3288	2.48	40.66	47.20	9.66	Light brown.	1.11					6,350	46.3	1.160
28	2346	1.86	40.16	39.46	18.53							5,565	50.4	0.983
29	2627	2.66	40.34	35.94	21.06		0.44					5,245	52.8	0.892
INDIAN.														
30	3546	2.04	35.16	52.00	10.80	Light gray	0.62					6,795	40.3	1.480

The upper beds of Philippine coal which have thus far been discovered, and which outcrop at certain places, should for the greater part be classed under the name sub-bituminous, which has recently been adopted by the

United States Geological Survey. The question of the proper classification of coals of this class has often been the subject of discussion,[6] but the new name, in a single word, gives the best idea and is therefore satisfactory.

The moisture, as shown by our many determinations, varies from 5 to 20 per cent in coals otherwise having common properties. From this it is self-evident that any classification attempted on the basis of water content would be entirely false, and in no way applicable to these upper beds.

The fuel ratio and the content of volatile combustible, or of fixed carbon which is a proportional ratio, are not wholly satisfactory as a basis of classification, but for practical purposes are of much assistance, as can be seen by an examination of the above tables. These classifications are the best which can be obtained from proximate analyses. Probably the best simple method for a scientific arrangement is by means of the calorific values as determined in the calorimeter, but as yet we have not sufficient data at hand for this purpose.

Other systems based on the ultimate analysis of coal are important, but neither can any of these be considered thoroughly with reference to Philippine coals for the same reason. Proximate and ultimate analyses and calorific tests of a sample of Batan Island coal were made[7] at St. Louis, Missouri, during the operation of the Fuel Testing Plant of the United States Geological Survey. The analyses are as follows:

Content.		Air-dried sample.	Sample as received.
Proximate	Moisture	7.06	22.21
	Volatile combustible	43.94	36.77
	Fixed carbon	43.44	36.36
	Ash	5.56	4.65
Ultimate	Sulphur	1.36	1.14
	Hydrogen	5.55	6.46
	Carbon	62.91	52.66
	Nitrogen	1.33	1.11
	Oxygen	23.29	33.98
	Ash	5.56	4.65
Calories		6,101	5,107
British thermal units		10,983	9,193

A comparison of the above proximate analysis with those of many samples made in this laboratory, and published in *Table I* of this report, demonstrates that the sample now under consideration is almost a perfect average of the published table, and it is believed to be a fair average of the upper beds of Batan Island coal. The carbon-hydrogen ratio, calculated from the ultimate analysis, is $\frac{C}{H} = 11.35$. By adjusting this

[6] Collier A. J.: *U. S. G. S. Bull.* **218**, (1903) 58 et seq.; Smith, W. D.: *Loc. cit.*

[7] By Mr. F. M. Stanton.

value in the scheme proposed by Mr. M. R. Campbell in a chapter on the classification of coals on a basis of their carbon-hydrogen ratios [8] this sample falls into its proper place—i. e., a sub-bituminous coal.

Reference to *Tables I* and *II* shows that the coals represented by *Table II* are superior to those of *Table I*, when judged from the standpoint of the usual criterion for steaming purposes. In time it is expected that a much better quality of coal will be developed from the lower beds, as is indicated by the drill sample analyses. At present, practically all the coal which is mined in the Archipelago is that taken out by the natives for local consumption. However, coal from Batan has been subjected to careful, systematic tests by the United States Army transports *Chukong, Sacramento,* and *Palawan,*[9] and Polillo coal has also been carefully tested by Government employees at the Insular Cold Storage and Ice Plant [10] with very satisfactory results. Several other steam tests on a large scale have been attempted by private persons, but as the equipment of the steam boilers was not designed for this class of fuel the results were very unsatisfactory. A furnace with a short fire-box, planned for a high-grade steaming coal, which burns with a short, hot, smokeless flame, is entirely unsuited to Philippine coal. The fire-box must be greatly lengthened or else a large part of the fuel value of the volatile combustible matter, which approximates 50 per cent, will be lost. This accounts for the fact that the temperature of the escaping gases of many smokestacks is 450° C., when in a carefully and economically operated plant it should not exceed 310° C.

How best to utilize the coal deposits of this country is a question which has long attracted attention; however but little progress has been made toward its solution. Recently experiments with a producer gas plant [11] have given unusually promising results. It was at first thought impossible successfully to use lignites in a gas producer, but these fuels worked well and the gas had a higher calorific value than that from any other coal which was used. For instance, it was at first supposed that New Mexico coals could not be used to advantage in the manufacture of producer gas, but later the best results were obtained from lignites of even poorer quality than those from New Mexico.

Coal converted into producer gas and burned in a gas engine resulted in a gain of efficiency of from 110 to 144 per cent [12] over the same coal burned in a carefully operated Heine boiler. A simple engine was used in making the boiler tests. The efficiency of these tests might have been

[8] *U. S. G. S.*, P. P. 48 (1906), 1, 156.

[9] "Coal Effieiency Report," furnished by the military secretary. *Bull. Min. Bur.*, Manila (1906), 5, 47 et seq.

[10] *The Far Eastern Review*, Jan. (1906).

[11] *U. S. G. S.*, P. P. 48 (1906), 3.

[12] The result from one coal from the Indian Territory.

increased by substituting a compound engine; but the fact must not be overlooked that there is even a greater chance of increasing the efficiency by improving the gas engine, which is still new and unperfected.

Some of the lignites of the Philippines contain sulphur in sufficient quantity to injure a boiler in the course of time. The United States Geological Survey has shown that similar coals from the United States can be used satisfactorily when they are converted into producer gas, and it is thought that all native coals can be utilized in that way. The results given by the producer gas plant on Kentucky coals were satisfactory, although the report says that the percentage of sulphur was very near the limit allowable for the purifying apparatus. The amount of sulphur contained in these coals was over 4 per cent, whereas of all the Philippine coals analyzed in this laboratory (over 100), none have contained such a high percentage of sulphur.

The majority of our coals have been classed as non-coking. This Bureau has made several attempts to obtain a satisfactory coke, but has not yet succeeded. If we are successful in securing such a one from the Philippine coals, it may have too high a sulphur content to be used in an iron furnace, but it could be utilized in other ways. However, although the sulphur might interfere in some respects, the coals appear to be in every way suitable for use in a producer gas plant. The fact that they are non-coking has an advantage in this method of their utilization. The ash can be discharged easily and there will be no clogging of the furnace.

To assist in the demonstration of the efficiency of the coals of the Philippine Islands in the manufacture of producer gas, their gas-producing power upon dry distillation has been investigated. A proximate or an elementary analysis of a coal is not by any means a good criterion as to the amount and quality of gas which can be obtained from it, for one must know certain physical properties which can not be determined by an ordinary analysis. Attention has already been called to the fact[13] that, in consulting most of the written works on gas manufacture, the chemist finds only a description of a rather large amount of special apparatus which is designed for use in the gas works. However ingenious the apparatus may be, it is generally too expensive and too cumbersome for the purposes of the scientific chemist. The instructions accompanying the apparatus leave nothing to the skill and judgment of the analyst. One publication,[14] after mentioning the size of a cast-iron D-shaped retort to be used, says:

> On starting a test of a sample of coal it is of course very essential that an average sample is taken and small pieces, about the size of a walnut, used. Three quantities of 2.24 pounds each will be found sufficient to give a reliable opinion

[13] Rhodin, J. G. A.: *J. Soc. Chem. Ind.* (1902), **19**, 12.
[14] Phillips: *Engineering Chemistry*, London (1902).

as to the value of the coal. The retort must be first got up to a bright red heat before the charge is introduced and must be maintained at this temperature during the whole of the distillation.

The instructions are to take an average sample, but there is very serious doubt in my mind if this is consistent with the limitations of "lumps the size of a walnut" and of approximately a kilo. In considering this question I can see no reason why work on a smaller scale, selecting the sample more carefully, crushing the coal to smaller particles, and quartering to a sample of 40 or 50 grams should not give as good or even much more accurate results than would such approximate work done on the large laboratory scale recommended by Phillips. The work of the committee on uniform chemical analyses[15] indicates that a gram, if properly selected, is an excellent sample of a ton of mineral, and a mineral is much harder to sample than coal. There seems to be no reason then why a carefully prepared sample of 40 or 50 grams is not ample, and this brings the size of the apparatus within the range of the ordinary chemical laboratory.

The method, as given in the above quotation, is representative of many, and it seems that one of two things must happen in charging the retort, either some of the volatile hydrocarbons are lost before the apparatus is closed, or the retort cools down in the charging. As a matter of fact these methods have been criticised by gas manufacturers as being apt to give low results both as to quality and quantity of gas. With a cool retort, which can be heated only gradually, the products of the aromatic series, such as toluene, naphthalene and anthracene, which ought to go into the gas, go into the tar. It is thought that both of these difficulties are eliminated and the yield more nearly like that obtained in a commercial way, by using the apparatus described below.

Description of the apparatus.—Plate I, X and X′ (the latter is not shown in the figure) are two combustion furnaces, fitted together so as to form one continuous piece of apparatus. B is a piece of galvanized gas pipe of 1.5 centimeters internal diameter capped at one end, and about 3 centimeters from the other end is a water jacket.[16] Into the open end of the iron tube is fitted a rubber stopper, carrying a glass tube which delivers into the top of a Fresenius tower (C) filled with glass wool. The lower hole of the Fresenius tower is fitted with a rubber stopper, carrying a Geissler three-way stopcock (D).[17] To one long tube of this stopcock are connected, by means of a second Geissler three-way stopcock, (E), two manometers (F and G), the former to indicate the degree of exhaustion and the latter the return to normal pressure. A Geryk air pump and a gasholder (K) are connected by means of an ordinary three-way stopcock to the other arm of the Geissler three-way stopcock (D). Between the three-way stopcock and the air pump are imposed two drying tubes, the first containing calcium chloride

[15] *J. Am. Chem. Soc.* (1906), **28**, 223.

[16] The apparatus worked splendidly with non-coking coals, but a coal retort of this size might be troublesome with coking coals.

[17] The only advantage which a Geissler three-way stopcock has over an ordinary T-tube is to facilitate the discovery of leaks in the apparatus.

and the second phosphorus pentoxide. All of the rubber tubing and rubber connections are of vacuum tubing and all joints are sealed with a solution of rubber in carbon disulphide.

Manipulation of the apparatus.—After the apparatus has been shown to be tight, it is disconnected at A and the sample of coal weighed by difference into the iron tube B from a 40-centimeter bulb tube. By this means the inner surface of the iron tube is kept free from coal to a considerable distance from its open end. The apparatus is again connected as shown in the figure. The gasholder (K) is completely filled with water and the stopcock closed. With the stopcock (H) in the position shown in the figure, the air is exhausted from the apparatus. The air is then exhausted from the tube connecting H and K into the apparatus and the apparatus again exhausted to a pressure indicated by the manometer (F). In the meantime, the eight burners on the right in the illustration have been lighted and that portion of the furnace raised to a red heat. The water is next allowed to flow through the jacket, and the iron tube (B) is put in place in the furnace with the water jacket close to the furnace cover. As soon as the iron tube is red, the number of lighted burners is gradually increased and before long the distillation begins. As soon as the pressure within the apparatus is equal to the atmospheric pressure, the gas is turned into the gas holder (K).

The rate of the production of the gas is regulated by the rapidity with which the number of lighted burners is increased. The best yield is produced with this apparatus when the rate of production is 100 to 200 cubic centimeters per minute. With the use of a higher temperature than that of the experiment, such as is used in a large gas works, this rate could be greatly increased. With this apparatus all of the distillation products must pass through the red-hot iron tube and therefore the quantity of tar is not increased at the expense of the gas, as is apt to be the case in the majority of miniature gas works.

The water discharged from the gasholder is carefully measured as soon as all the gas has been driven off from the coal. When the apparatus has uniformly cooled to a known temperature the volume of gas is corrected to atmospheric pressure.

Condition of conducting tests.—No pyrometer was at hand, therefore it was necessary to construct one in order to read the distillation temperature. The apparatus was made in the following manner:

An ordinary Schaffer & Budenberg pressure-gauge was fitted to a piece of gas pipe of 1 centimeter internal diameter about half a meter long, capped at one end, bent to a right angle in the middle and surrounded by a water jacket close to the pressure-gauge. The gas pipe was filled with mercury and the steel tube of the pressure-gauge with an inert gas (carbon dioxide) to prevent oxidation. When the mercury expands, this gas is compressed, the tube of the pressure-gauge straightens out, and the indicator moves over the gauge face. The usual scale of the pressure-gauge was covered with white paper and the pyrometer calibrated by determining its highest point by immersion in a crucible of melting aluminium. For more accurate work, the calibration may be effected by using the following melting and boiling points:

Aluminium	650°
Sulphur	448°
Mercury	360°
Naphthalene	218°
Water	100°

A uniform temperature was maintained in the combustion furnace throughout all the distillations and this was shown by the pyrometer to be 625°.[18]

The possibility of maintaining an average, uniform temperature in the Tropics is not a serious problem. All gas measurements and gas analyses were made at 30° and all data are given at this temperature.

It was not possible to exhaust the air completely from the apparatus, but from its known capacity (864 cubic centimeters) and the pressure, as read by the manometer (F), the amount of air contaminating the gas was determined and is given in column 3 of the experimental results.

The coal analyses were made according to the directions recommended by the committee appointed by the American Chemical Society.[19] In the determination of volatile combustible matter it has been found that these give very inaccurate results. The committee state that the most serious objection brought against their method is that the rapid heating causes mechanical loss in the case of certain non-coking coals; that no evidence has been given as to the amount of such loss, while in the light of certain experimental determinations which are described, they state that the loss can only have been insignificant. It has been observed in this laboratory that the error from this source on our coals is very large, possibly amounting to a few per cent in some cases. It has also been found that this could be largely, if not entirely, eliminated by expelling the moisture and most of the volatile matter at a low heat before subjecting to "the full flame of a Bunsen burner for seven minutes." Four to five minutes' gentle heating is sufficient to do this. With this exception the official method has been followed in detail.

[18] A value of 600° was approximated by judging the color of the iron tube in the furnace. However, such results are unsatisfactory, as there is a large personal equation to be considered as well as the degree of illumination under which the observation is made. The table used was that constructed by M. Pouillet, given in *Kent's Mechanical Engineer's Pocket-book*, New York (1903), page 454, as follows:

Color of iron.	Degrees C.
Incipient red heat	625
Dull red heat	700
Incipient cherry-red heat	800
Cherry-red heat	900
Clear cherry-red heat	1,000
Deep orange heat	1,100
Clear orange heat	1,200
White heat	1,300
Bright white heat	1,400
Dazzling white heat	1,500 to 1,600

[19] *J. Am. Chem. Soc.* (1899), **21**, 1116–1132. *J. Soc. Chem. Ind.* (1900), **19**, 174.

The gas analyses were made according to standard methods. The methane and hydrogen were determined by explosion over mercury and the nitrogen by difference.

The calorific value of the coal was figured according to the formula given on page 878.

The calorific value of the gas was calculated at 30° from the following numbers of J. Thomsen:[20] For the heat of formation of water from hydrogen, Thomsen[21] obtained, as an average of three very closely agreeing numbers, the value $H_2O+O=H_2O+68{,}388$ calories. The heat of combustion of methane has often been determined and the number obtained under the most painstaking conditions by Thomsen,[22] and a fair average of the reliable values of other investigators is, $CH_4+4O=CO_2+2H_2O+211{,}900$ calories. The heat of combustion of ethylene, according to the measurements of Thomsen, is $C_2H_4+6O=2CO_2+2H_2O+333{,}300$ calories. The number obtained by Thomsen for carbon monoxide has not been used, but by preference the round value recommended by Ostwald,[23] which lies between those obtained by J. Thomsen[24] and Berthelot,[25] i. e., $CO+O=CO_2+68{,}000$ calories. One gram molecule of a gas=22.32 liters under standard conditions.

The following factors have been figured from the foregoing data:[26]

	Calories per c. c.
Carbon monoxide (CO)	2.744
Heavy hydrocarbons (C_nH_{2n})[27]	13.455
Methane (CH_4)	8.553
Hydrogen (H_2)	2.756

The gas-producing power of five native coals has been determined. For the purpose of comparison a very superior, coking, Australian steaming coal has also been investigated.

RESULTS.

A sample of coal from *Batan Island*[28] gave the following results:

[20] Thomsen, J.: *Thermochemische Untersuchungen*, II.

[21] Idem: *Loc. cit.*, 44; *Pogg. Ann.* (1873), **148**, 368.

[22] Idem: *Loc. cit.*, 94.

[23] Ostwald, W.: *Lehrbuch allg. Chem.* p. 173.

[24] Thomsen, J.: *Loc. cit.*, 284.

[25] Berthelot: *Ann. Chim. Phys.* (1878), (5) **13**, 11.

[26] If it is desired to compare in any way these numbers with those of the Report on the Operations of the Coal-testing Plant at the Louisiana Purchase Exposition, St. Louis, Mo., 1904, *U. S. G. S.*, P. P. 48 (1906), **3**, Producer-gas, etc., it must be remembered that in each of the last three lines on page 1004 "per c. c." should read, per percentage-content.

[27] All the heavy hydrocarbons are assumed to be present as ethylene. This probably gives too low a result, but the error is on the conservative side.

[28] This was taken from the southeastern end of the island. It is a well-known fact that the coals from this region are of a much poorer grade than those from the western end.

Proximate analysis of the coal.

Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Total sulphur.	Calculated calories—		$\frac{100 \text{ V. C.}}{\text{V. C.} + \text{F. C.}}$	Fuel ratio.
					Of coal.	Of combustible.		
15.10	40.82	40.10	3.98	0.22	5,630	7,015	50.45	0.935

Production of gas (in liters).

Weight of coal in grams.	Yield of gas.	Air in gas.	Actual yield of gas.	Actual yield of gas per kilo of coal.
44.021	16.167	0.057	16.110	365.955

Analysis of gas.

	Carbon dioxide (CO_2).	Heavy hydrocarbons (C_nH_{2n}).	Oxygen (O_2).	Carbon monoxide (CO).	Metbane (CH_4).	Hydrogen (H_2).	Nitrogen (N_2).
Analysis of gas as obtained (per cent)	25.9	2.3	0.5	14.1	16.85	35.3	5.05
Calculated analysis of gas as produced	26.04	2.31	0.43	14.15	16.9	35.4	4.77

Calories per liter.

Calorific value of the gas as obtained ---------- 3,115
Calorific value of the gas as produced ---------- 3,125

A sample of coal from *Cebu* gave the following results:

Proximate analysis of the coal.

Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Total sulphur.	Calculated calories—		$\frac{100 \text{ V. C.}}{\text{V. C.} + \text{F. C.}}$	Fuel ratio.
					Of coal.	Of combustible.		
12.12	43.70	41.24	2.94	0.04	5,917	6,965	51.45	0.944

Production of gas (in liters).

Weight of coal in grams.	Yield of gas.	Air in gas.	Actual yield of gas.	Actual yield of gas per kilo of coal.
47.406	15.217	[29] 0.757	14.460	305.020

Analysis of gas.

	Carbon dioxide (CO_2).	Heavy hydrocarbons (C_nH_{2n}).	Oxygen (O_2).	Carbon monoxide (CO).	Methane (CH_4).	Hydrogen (H_2).	Nitrogen (N_2).
Analysis of gas as obtained (per cent)	13.3	5.2	1.75	9.3	24.2	39.2	7.05
Calculated analysis of gas as produced	14.4	5.48	0.7	9.8	25.46	41.3	2.86

	Calories per liter.
Calorific value of the gas as obtained	4,082
Calorific value of the gas as produced	4,295

A sample of coal from *Polillo* gave the following results:

Proximate analysis of the coal.

Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Total sulphur.	Calculated calories— Of coal.	Calculated calories— Of combustible.	$\frac{100\ V.C.}{V.C.+F.C.}$	Fuel ratio.
5.58	40.99	47.04	6.39	----------	5,925	6,735	46.6	1.174

Production of gas (in liters).

Weight of coal in grams.	Yield of gas.	Air in gas.	Actual yield of gas.	Actual yield of gas per kilo of coal.
44.690	14.338	0.008	14.330	320.648

[29] During this experiment the apparatus leaked so that the number of cubic centimeters of air has been assumed to be that given and is nearly equal to the quantity of air originally exhausted from the apparatus.

Analysis of gas.

	Carbon dioxide (CO_2).	Heavy hydrocarbons (C_nH_{2n}).	Oxygen (O_2).	Carbon monoxide (CO).	Methane (CH_4).	Hydrogen (H_2).	Nitrogen (N_2).
Analysis of gas as obtained (per cent)	8.4	8.1	0.7	8.95	32.7	40.5	0.65
Calculated analysis of gas as produced	8.4	8.1	0.7	8.95	32.7	40.5	0.65

Calorific value of the gas, 5,254 calories per liter.

A sample of coal from *Negros* gave the following results:

Proximate analysis of the coal.

Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Total sulphur.	Calculated calories— Of coal.	Calculated calories— Of combustible.	$\frac{100\ V.C.}{V.C.+F.C.}$	Fuel ratio.
18.95	32.39	31.07	17.59	0.0	4,402	6,935	51.1	0.960

Production of gas (in liters).

Weight of coal in grams.	Yield of gas.	Air in gas.	Actual yield of gas.	Actual yield of gas per kilo of coal.
49.706	13.400	0.100	13.300	267.570

Analysis of gas.

	Carbon dioxide (CO_2).	Heavy hydrocarbons (C_nH_{2n}).	Oxygen (O_2).	Carbon monoxide (CO).	Methane (CH_4).	Hydrogen (H_2).	Nitrogen (N_2).
Analysis of gas as obtained (per cent)	17.3	3.2	0.2	7.1	34.15	34.2	3.85
Calculated analysis of gas as produced	17.44	3.21	0.05	7.15	34.43	34.43	3.24

	Calories per liter.
Calorific value of the gas as obtained	4,490
Calorific value of the gas as produced	5,427

A sample of coal from *Zamboanga* gave the following results:

Proximate analysis of the coal.

Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Total sulphur.	Calculated calories—		$\frac{100\ V.C.}{V.C.+F.C.}$	Fuel ratio.
					Of coal.	Of combustible.		
6.98	39.87	48.00	5.15	0.06	6,427	7,304	45.4	1.204

Production of gas (in liters).

Weight of coal in grams.	Yield of gas.	Air in gas.	Actual yield of gas.	Actual yield of gas per kilo of coal.
44.69	13.518	0.008	13.510	302.305

Analysis of gas.

	Carbon dioxide (CO_2).	Heavy hydrocarbons (C_nH_{2n}).	Oxygen (O_2).	Carbon monoxide (CO).	Methane (CH_4).	Hydrogen (H_2).	Nitrogen (N_2).
Analysis of gas as obtained (per cent)	10.1	6.2	0.65	9.5	35.5	36.4	1.65
Calculated analysis of gas as produced	10.1	6.2	0.65	9.5	35.5	36.4	1.65

Calories per liter.

Calorific value of the gas as obtained 5,135
Calorific value of the gas as produced 5,135

A sample of coal from *Australia* [30] gave the following results:

Proximate analysis of the coal.

Moisture.	Volatile combustible.	Fixed carbon.	Ash.	Total sulphur.	Calculated calories.	$\frac{100\ V.C.}{V.C.+F.C.}$	Fuel ratio.
2.28	35.31	50.25	12.16	0.09	6,550	41.26	1.423

[30] This was taken from the laboratory supply. It is a coking coal and was therefore analyzed according to the official method.

Production of gas (in liters).

Weight of coal in grams.	Yield of gas.	Air in gas.	Actual yield of gas.	Actual yield of gas per kilo of coal.
43.714	10.018	0.058	9.960	227.845

Analysis of gas.

	Carbon dioxide (CO_2).	Heavy hydrocarbons (C_nH_{2n}).	Oxygen (O_2).	Carbon monoxide (CO).	Methane (CH_4).	Hydrogen (H_2).	Nitrogen (N_2).
Analysis of gas as obtained (per cent)	6.2	6.3	0.85	5.0	41.8	37.1	2.65
Calculated analysis of gas as produced	6.24	6.34	0.73	5.03	42.05	37.34	2.17

Calories per liter.

Calorific value of the gas as obtained 5,583
Calorific value of the gas as produced 5,616

The gas which supplies the Bureau of Science is not made from coal, but from a mixture of equal parts of petroleum and crude oil. For some time a mixture of petroleum and "Cape Axle Oil" has been used for this purpose. Coconut oil in the place of "Cape Axle Oil" was formerly found satisfactory. The oil is gasified by dropping under considerable pressure into a retort heated to a bright cherry-red heat. The gas produced in this way burns with a long, smoky flame in spite of the fact that it is mixed with 30 per cent of air at the generator. This gas would make a splendid enricher for others which are deficient in illuminating power. An analysis of a sample taken from the tap on July 26, 1906, gave results showing a wide difference between it and coal gas as follows:

Analysis of laboratory supply.

Carbon dioxide, (CO_2).	Heavy hydrocarbons (C_nH_{2n}).	Oxygen (O_2).	Carbon monoxide (CO).	Methane (CH_4).	Hydrogen (H_2).	Nitrogen (N_2).
Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1.00	24.9	5.9	0.8	35.1	3.1	29.2

Calorific value of the gas, 7,705[31] calories per liter.

No calorimetric determinations of the gases could be made, but a table which shows their comparative heat values is given below. The combus-

[31] This number becomes 8,020 when the value used in the calculation of the heavy hydrocarbons is that given by Payne, H. L., *J. Anal. and App. Chem.* (1893), **7**, 233, when the "illuminants" are derived chiefly from the decomposition of mineral oil.

tion was effected in a Bunsen burner with a constant flow of air, regulated empirically by trial with Polillo gas, and a flow of gas regulated to deliver approximately 7 liters in five minutes. The apparatus used was an ordinary uninsulated copper bath protected from drafts and containing 1 liter of water. The amount of heat lost by radiation was of course very large, but by conducting the experiment in each case for exactly five minutes and raising the water over the same range of temperature, viz, from 30° to about 50°, the results are thought to show the relative calorific value of the gases. The heat value of the water bath, as determined, is 160 calories for each increase of 1° in temperature. It was also calculated [32] from the weight and specific heat of the materials of which it is constructed and a very concordant result obtained.

TABLE VIII.—*Comparative heat value of the gases obtained.*

Name of gas.	Volume of gas burned in liters at 760 mm. pressure.	Increase in temperature of the apparatus in degrees C.	Heat imparted to the water in calories.	Heat imparted to the apparatus in calories.	Total heat absorbed in calories.	Heat absorbed for each liter of gas burned in calories.	Calculated calorific value of the gas.	Heat lost by radiation in calories.
Batan Island coal	7.21	15.0	15,000	2,400	17,400	2,414	3,115	701
Cebu coal	7.30	17.5	17,500	2,800	20,300	2,780	4,082	1,302
Polillo coal	7.28	24.0	24,000	3,840	27,840	3,824	5,254	1,430
Negros coal	6.88	18.0	18,000	2,880	20,880	3,037	4,490	1,453
Zamboanga coal	6.98	22.5	22,500	3,640	26,100	3,740	5,135	1,395
Australian coal	5.78	21.0	21,000	3,360	24,360	4,210	5,583	1,373
Laboratory oil	6.35	30.5	30,500	4,880	35,580	5,570	7,705	2,135

It would have been better to have regulated the flow of air so that, in each case, the combustion of the gas would have been as nearly complete as possible. The gas generated from Batan Island coal contained a less amount of combustible matter than that derived from the other sources and, with the fixed supply of air, a more perfect combustion was obtained. On the other hand, the gas generated from oil for laboratory use contained a very large percentage of heavy hydrocarbons, and in this case the fixed supply of air was insufficient to effect total combustion. Discrepancies from both of these sources have been included in the last column representing the heat lost by radiation. Nevertheless, the third from the last column of the table represents fairly well the general relation which the calorific values of the gases bear to each other.

Perhaps the relations above determined can better be appreciated if placed together and expressed in a more comparative way, as follows:

[32] Ostwald-Luther: *Physiko-Chemische Messungen* (1902), 191.

TABLE IX.

Name of gas.	Actual yield of gas per kilo of coal.		Actual yield of gas per kilo of combustible.		Actual yield of gas per kilo of volatile combustible.		Calories per liter.
	In liters.	In cubic feet.	In liters.	In cubic feet.	In liters.	In cubic feet.	
Batan coal	365.955	12.922	452.255	15.97	854.380	30.89	3,125
Cebu coal	305.020	10.770	359.100	12.67	697.986	24.65	4,295
Polillo coal	320.648	11.322	364.245	12.88	782.260	27.60	5,254
Negros coal	267.570	9.448	359.350	12.69	826.088	29.14	4,527
Zamboanga coal	302.305	10.674	344.035	12.15	758.227	26.77	5,135
Australian coal	227.845	8.045	264.820	9.39	645.270	22.22	5,616

The quantity of carbon dioxide in each of the gases is sufficient to render it non-luminous. This inert body can easily be removed or diminished in quantity in practical work by slaked lime, but no attempt was made to do this as it would give a distorted idea of the actual conditions. As this is the chief noxious body in the gases, perhaps a better idea of the relation existing between them can be obtained when they are calculated as free from it.

TABLE X.—*Gas free from carbon dioxide.*

Source of coal.	Yield per kilo of coal.		Yield per kilo of combustible.		Content of desirable constituents.				Calories per liter.	Calorific value of gas produced per kilo of combustible in calories.
	In liters.	In cubic feet.	In liters.	In cubic feet.	C_nH_{2n}.	CO.	CH_4.	H_2.		
					P. ct.	*P. ct.*	*P. ct.*	*P. ct.*		
Batan Island	270.660	9.56	334.488	11.81	3.12	19.2	22.8	47.8	4,225	1,413,000
Cebu	261.097	9.22	307.390	10.84	6.4	11.45	29.8	48.2	5,020	1,542,000
Polillo	245.094	10.37	333.648	11.79	8.85	9.77	35.7	44.2	5,730	1,910,000
Negros	220.906	7.81	296.680	10.48	3.9	8.66	41.7	41.8	5,483	1,626,000
Zamboanga	271.772	9.60	309.287	10.92	6.9	10.6	39.5	40.5	5,710	1,768,000
Australia	215.627	7.56	248.825	8.46	6.7	5.4	44.7	39.7	5,970	1,485,000
Average of Philippine coals			316.299	11.17						

Perhaps the results of the last column of *Table X* become more intelligible when attention is called to a piece of research done in 1891 by Mahler.[33] Commentry coal [34] was distilled on a large scale by the Paris

[33] Mahler, Pierre: *Compt. rend. Acad. d. sc.*, Par. (1891), **113**, 862.

[34] An ultimate analysis published in *Handbuch der chemischen Technologie*, by O. Dammer, 4, 52, shows that Commentry gas coal is of a much better grade than the Philippine coals. The analysis of Batan Island coal has been calculated

Gas Works and the yield of gas per kilo of coal had a total calorific value of 1,898,870 calories. The other results of the table are comparable to the quantity and quality of the gas produced from American and English coals as shown in the following table:

TABLE XI.[35]—*Gas from American bituminous coal.*

Source of coal.	Yield per kilo of coal.		Yield per kilo of combustible.		Content of desirable constituents.			
	In liters.	In cubic feet	In liters.	In cubic feet.	C_nH_{2n}.	CO.	CH_4.	H_2.
					Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Westmoreland, Pa	382.0	10.82	406.0	11.50	4.5 to 7.5	2 to 14	31 to 43	38 to 48
Sterling, Ohio	377.5	10.70	400.0	11.33	4.5 to 7.5	2 to 14	31 to 43	38 to 48
Despard, W. Va	386.0	10.93	413.5	11.71	4.5 to 7.5	2 to 14	31 to 43	38 to 48
Darlington, Ohio		9.97	372.5	10.56	4.5 to 7.5	2 to 14	31 to 43	38 to 48
Petonia, W. Va	474.0	13.42	545.0	15.43	4.5 to 7.5	2 to 14	31 to 43	38 to 48
Grahamite, W. Va	535.0	15.25	551.5	15.56	4.5 to 7.5	2 to 14	31 to 43	38 to 48

TABLE XII.[36]—*Gas from English bituminous coals.*

Source of coal.	Yield per kilo of coal.		Yield per kilo of combustible.	
	In liters.	In cubic feet.	In liters.	In cubic feet.
Llantwit	279.5	9.87	294.0	10.39
Aberbeeg	256.2	9.04	268.2	9.46
Abercarn	350.3	12.49	372.6	13.18
Radstock	294.6	10.41	312.6	11.05
Caleford	273.6	9.66	296.3	10.48
Hartley	302.0	10.67	313.0	11.06
New Pelton	301.5	10.65	310.0	10.95
Hindley Field	309.0	10.91	325.7	11.51
Lydney	273.6	9.66	291.4	10.30
Throncliffe	302.0	10.67	313.3	11.07
Gasforth	288.2	10.19	305.0	10.78
Average of English coals			309.3	10.93

from the air-dried sample (see p. 885) to figures free from water and other impurities. The comparative analyses are as follows:

	Commentry gas coal (per cent).	Batan Island coal (per cent).
Carbon	82.92	73.08
Hydrogen	5.30	5.54
Oxygen and nitrogen	11.78	21.38

[35] Calculated from *Kent's Mechanical Engineer's Pocket-book* (1903), table on page 652.

[36] Calculated from *Phillips's Engineering Chemistry* (1902), table on page 323.

Since the Philippine coals used in this study were of the upper or outcropping beds, in which naturally the percentage of ash and especially of moisture, due to climatic conditions, is higher than the average, it is only fair in comparing the results with those of other lands, to do so on the basis of the yield of gas per unit of combustible matter. It will be seen from *Tables X, XI* and *XII* that the yield compares favorably with American gas coals and the average, by a small amount, exceeds the average yield from English coals.

The regions represented by this investigation include the largest coal fields of the Islands and show wide distribution. Since the character of the coal in the Philippines and the facts of the gas tests are so nearly the same, conclusions may also be drawn from these results regarding the other regions. Furthermore, it is probable that equally good or even better results could be obtained from a study of the other coals.

An investigation of the by-products of the distillation of these coals has not been made, but it can be stated that the yield of tar is comparatively small.

The producer-gas plant depends not only on the production and utilization of the ordinary coal gas but also on the partial combustion of the fixed carbon which, in an ordinary gas plant, is left behind. Carbon monoxide, the product of the partial combustion, is of comparatively low calorific value, much lower than that of the gas produced from the volatile combustible matter. This explains the results of the work of the United States Geological Survey which show, when viewed from the usual steaming standpoint, that the quality of the producer gas "improves as one descends in the scale of quality of a coal, the best results being obtained from brown lignite." The same tendency is noted in the gas-producing power of native coals, as shown below:

Source of the coal.	Heating power of the combustible in calories.	Calories per liter of gas.	Total heating power of gas produced per kilo of combustible in calories.
Zamboanga	7,305	5,710	1,768,000
Batan Island	7,015	4,225	1,413,000
Cebu	6,965	5,020	1,542,000
Negros	6 935	5,483	1,626,000
Polillo	6,735	5,730	1,910,000

↓ Decrease in calorific value of the coal.

↑ Increase in calorific value of the gas per unit volume.

↑ Increase in total calorific value of the total gas produced.

This fact is of importance to the Philippines as it suggests a method for the utilization of the low-grade fuels. The disposition of the outcrop coal, which must be mined in opening up the works, and the use of the slack is the question now to be considered and the problem which we must solve. My investigations have been made with outcrop coals of a low fuel ratio, with the particular object of determining their utility. The above results show that the coals tested have satisfactory gas-

producing power and could probably be used in a producer plant with excellent results.

Physically, the Philippine coals are ideal to handle in a producer furnace. They do not swell, they burn steadily, form no clinkers, and the ash would easily be removed automatically. Since the quantity of ash in a producer plant is of no material consequence, it seems probable that dirty coals could be used in this way to great advantage. It is also probable that the outcrop coals used in a producer-gas plant may become as valuable as the best grades of coal used in a steam plant.

With a satisfactory scheme for the utilization of the upper and poorer grade of coal, the mines can successfully be operated and the deeper coal can be used for steaming where a producer gas plant is impracticable. For the production of power, the utilization of our low-grade and outcrop coals for producer gas seems much more promising than any other scheme which has yet been devised for their use.

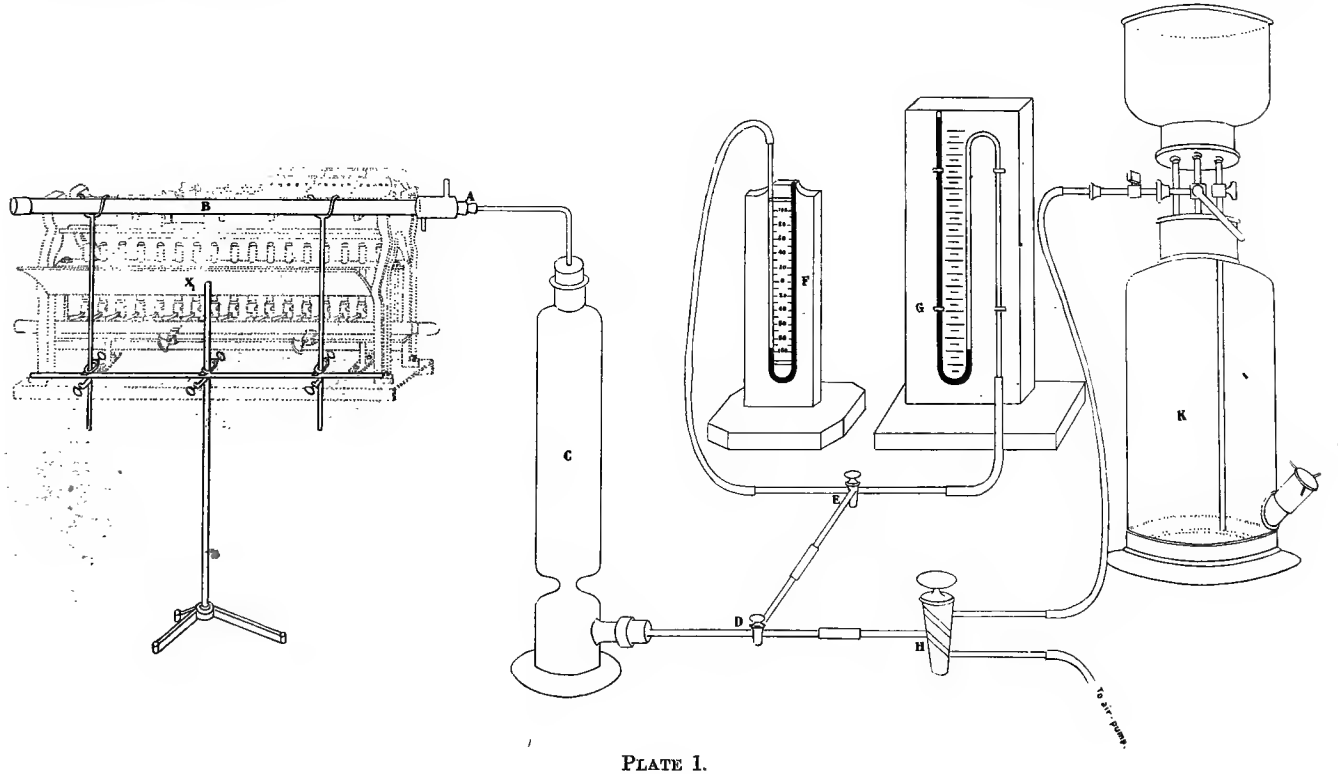

PLATE 1.

NOTES ON A COLLECTON OF BIRDS FROM PALAWAN ISLAND.

By RICHARD C. MCGREGOR.
(*From the zoölogical section, Biological Laboratory, Bureau of Science.*)

During the months of December, 1905, and January and February, 1906, Messrs. Celestino and Canton, assistant collectors in the Bureau of Science, collected birds at Puerto Princesa and Tinabog in the Island of Palawan. Tinabog is situated on the east coast, some 25 miles north or Puerto Princesa. The collection contains good series of the characteristic Palawan species and makes a very considerable addition to the number in the Bureau collection. One species obtained, namely, *Hypotænidia striata,* has not, it is believed, previously been recorded from Palawan.

LIST OF SPECIES COLLECTED IN PALAWAN.

Megapodius cumingi Dillw.

A young bird, 6 inches in length, collected December 19 at Puerto Princesa, has the secondaries, wing coverts, and scapulars barred with fulvous.

Treron nipalensis (Hodgs.).

Two males and a female from Puerto Princesa, December 14–19.

Osmotreron vernans (Linn.).

Eight specimens from Puerto Princesa.

Muscadivora ænea (Linn.).

Several specimens. The fruit pigeon of Palawan has been described by Blasius under the name *Carpophaga ænea palawanensis.*

Myristicivora bicolor (Scop.).

One specimen from Puerto Princesa.

Macropygia tenuirostris Bp.

A male from Tinabog.

Spilopelia tigrina (Temm. and Knip.).

Three adults and one immature bird from Puerto Princesa, December 5–9; one adult specimen from Tinabog, January 17. This species seems to be very scarce in the Palawan group and to occur in the winter months only.

Chalcophaps indica (Linn.).

Two specimens of this ground-frequenting dove from Puerto Princesa.

Hypotænidia striata (Linn.).

A female, taken at Puerto Princesa, January 2, seems to be the first specimen of this species recorded from Palawan.

Amaurornis phœnicura (Forster).

A fine male specimen was taken at Tinabog, January 17; the only previous record of this species for Palawan was made by Platen.

Ægialitis dubia (Scop.).

Tinabog, January 18, one female in badly worn plumage.

Actitis hypoleucus (Linn.).

One specimen from Tinabog, January 15.

Ardea sumatrana Raffe.

An adult male heron taken at Tinabog, January 23, agrees very well with the description of the great slaty heron given by Oates in his Birds of British Burmah, II, page 244. Total length of specimen in the flesh, 53 inches; wing, 19.25; tail, 6.75; tarsus, 6.50; culmen, 7.10.

Butastur indicus (Gm.).

A specimen taken at Puerto Princesa, December 9.

Syrnium whiteheadi Sharpe.

A female example of Whitehead's barred owl in fine plumage was taken at Puerto Princesa, December 16.

Cacatua hæmaturopygia (P. L. S. Müll.).

A female of the Philippine cockatoo from Puerto Princesa.

Prioniturus cyaneiceps Sharpe.

Twelve specimens of the blue-headed racket-tailed parrot were taken at Puerto Princesa in December and January. The females in this series have the feathers of the chin, and to a less extent of the throat and breast, matted with a resinous gum, which injuries their appearance as specimens; the males are practically clean and in smooth plumage.

Tanygnathus lucionensis (Linn.).

A female from Puerto Princesa.

Pelargopsis gouldi Sharpe.

Three specimens from Tinabog, Palawan, have been compared with a male from Mindoro and a female from Lubang. So far as I can determine these all belong to the species described as *P. gouldi.*

Alcedo bengalensis Briss.

One male from Tinabog.

Ceyx euerythra Sharpe.

An adult female from Tinabog, January 12; a pair of immature birds from the same locality, January 13.[1]

Gymnolæmus lemprieri Sharpe.

A male from Puerto Princesa.

Caprimulgus macrurus Horsf.

Six specimens of this goat sucker were killed in Palawan during January and February; three are from Puerto Princesa and three from Tinabog.

Caprimulgus jotaka Temm. and Schl.

Bourns and Worcester obtained a specimen of this species in Palawan and one was collected by me in Calayan; the present collection contains the third known Philipppine specimen, a female from Puerto Princesa, December 29. This specimen differs from the one from Calayan in having a greater number of bars on primaries and rectrices; the measurements of the two are equal.

[1] For full description of the various changes in plumage of this species see Bourns and Worcester, *Occ. Pap. Minn. Acad.* (1894), 1, No. 1, 45.

Salangana whiteheadi (Grant).

Three small swifts from Puerto Princesa, belong without doubt to this species.

Salangana troglodytes (Gray).

Two specimens of this small swift were taken at Tinabog.

Chætura gigantea (Temm.).

Specimens of this large swift were taken at Puerto Princesa, December 26, January 3, and February 3; at Tinabog specimens were taken January 22 and 24.

Surniculus lugubris (Horsf.).

A female from Puerto Princesa, December 20, and a male from Tinabog, January 18. Shelley[2] characterizes *S. velutinus* as "having the head, back, throat, and breast velvety black, with absolutely no trace of white on any of the tail coverts and a distinct, narrow, white, basal edging to the tail feathers." A male of *velutinus* from Balete, Mindoro, has the under tail coverts tipped with white, but not barred as in *lugubris;* on the other hand the two specimens of *S. lugubris* from Palawan have narrow, white, basal edgings to the tail feathers but these edgings are not distinct as they are in the Mindoro specimens of *S. velutinus* before me. The specimens from Palawan have each a white feather on the nape; this is absent in the specimens of *S. velutinus*. There seems to be very little difference in the size of these species. The greatest variation is in the gloss of the wings and tail and their coverts which in *S. velutinus* is bluish and in *S. lugubris* is greenish.

Cacomantis merulinus (Scop.).

Puerto Princesa.

Chalcococcyx xanthorhynchus (Horsf.).

Two males of the emerald cuckoo from Puerto Princesa. One taken December 26 is in adult plumage; the other taken three days earlier is in mixed plumage, the throat and upper breast with white and green barred feathers of the young and violet feathers of the adult about equally represented; a few feathers of the hind neck, barred with white and green. Primaries 1, 3, 5, 8 in one wing and 1, 3, 5, 6, 9 in the other wing are of the young plumage; nearly all secondaries and the greater secondary coverts are green and rufous. There seems some probability that the name *C. amethystinus* (Vigors) will have to be adopted for the Mindoro bird. The Palawan bird is certainly distinct from that from Mindoro and the latter should be recognized as a subspecies. Vigor's bird came from the "neighborhood of Manilla" and it is not unlikely that all the specimens from the Philippine Islands (excluding the Palawan group) belong to *C. amethystinus*. Tweeddale[3] recognizes Vigor's name, subject to revision on the basis of actual material to be compared.

Measurements of three male specimens of Chalcococcyx.

Locality.	Wing.	Tail.	Exposed culmen.
Mindoro	4.04	2.72	0.67
Palawan	3.56	2.55	.58
Do	3.60	2.54	.57

Centropus javanicus (Dumont).

A female from Tinabog, January 18, has the under parts buff, blotched with black; feathers of flanks and thighs, barred with black.

[2] *Cat. Bds.*, **19**, 230.

[3] *Trans. Zool. Soc.*, **9**, 160, 161.

Dryococcyx harringtoni Sharpe.

Five specimens of this curious coucal from Puerto Princesa.

Tiga everetti Tweedd.

A male from Tinabog, January 11; a pair from Puerto Princesa taken in December.

Chrysocolaptes erythrocephalus Sharpe.

A female from Puerto Princesa, December 20.

Mulleripicus pulverulentus (Temm.).

Two males and two females from Tinabog, January 22.

Pitta atricapilla Less.

Puerto Princesa.

Hemichelidon griseisticta (Swinh.).

One specimen from Puerto Princesa, December 18, 1905.

Cyornis lemprieri Sharpe.

Specimens obtained at Puerto Princesa and Tinabog, Palawan.

Hypothymis occipitalis Vig.

The black-naped flycatcher was obtained in Palawan.

Rhipidura nigritorquis Vig.

The black-necked, fantailed flycatcher was obtained in Palawan.

Zeocephus cyanescens Sharpe.

A series of nine specimens from Puerto Princesa and Tinabog.

Culicicapa helianthea (Wall.).

Two specimens taken at Puerto Princesa in December.

Artamides dificilis Hartert.

Two specimens from Puerto Princesa and one from Tinabog.

Pericrocotus igneus Blyth.

A male from Tinabog, January 11, 1906, differs from the description[4] in the following points: *Four* central tail feathers black, not "two;" "the broad vermilion sub-basal band which traverses the wing" is absent from the first four primaries, not from the first and second only. The inner web of each primary, except the short first, bears a yellow patch.

Lalage niger (Forster).

Puerto Princesa.

Ægithina viridis (Bp.).

Fifteen specimens from Puerto Princesa collected in December and January.

Chloropsis palawanensis Sharpe.

A fine series of this curiously colored species was obtained at Puerto Princesa and Tinabog.

Irena tweeddalii Sharpe.

Tweeddale's fairy bluebird was taken at Puerto Princesa and Tinabog.

Microtarsus melanocephalus (Gm.).

Nineteen specimens from Puerto Princesa taken in December, January, and February.

Criniger frater Sharpe.

Seven specimens of this bulbul were obtained in Palawan, December 11 to January 31. In this species the rectrices are clear-brown, without the greenish-yellow wash shown in the plate.[5]

[4] Sharpe: *Cat. Bds.*, 4, 78.

[5] *Ibid.*, 6, Pl. V.

Ciniger palawanensis Tweedd.

A male and a female of this smaller *Criniger* were taken at Tinabog, January 19.

Pycnonotus cinereifrons Tweedd.

A large series of specimens was obtained at Puerto Princesa.

Turdinus rufifrons (Tweedd.).

Four specimens from Tinabog, January 11 and 12, agree with Tweeddale's description and plate.

Anuropsis cinereiceps (Tweedd.).

This curious species is represented by two males from Puerto Princesa, December 14, and one male from Tinabog, January 12.

Mixornis woodi Sharpe.

Specimens from Tinabog and Puerto Princesa. In the description[6] of this species no mention is made of the numerous obsolete cross bars on the tail feathers.

Cittocincla nigra Sharpe.

A good series of specimens of this species from Puerto Princesa, December 5 to January 31; one specimen from Tinabog, January 12.

Acanthopneuste borealis (Blas.).

A specimen of the willow warbler from Tinabog.

Artamus leucorhynchus (Linn.).

One female from Puerto Princesa, December 13.

Otomela lucionensis (Linn.).

Three shrikes in more or less barred plumage were taken at Puerto Princesa in December and January.

Hyloterpe whiteheadi Sharpe.

Puerto Princesa and Tinabog.

Pardaliparus amabilis (Sharpe).

Specimens from Tinabog and Puerto Princesa.

Callisitta frontalis (Swains.).

Fourteen specimens of this nuthatch from Tinabog and Puerto Princesa are all in fine adult plumage. Probably this is *Sitta frontalis palawana* of Hartert.

Dicæum papuense (Gmel.).

Three specimens from Puerto Princesa.

Prionochilus johannæ Sharpe.

Specimens from Puerto Princesa and Tinabog.

Æthopyga shelleyi Sharpe.

This beautiful little sun-bird was found both at Puerto Princesa and Tinabog; a number of specimens in fine plumage were taken in December and January.

Cinnyris aurora Tweedd.

One specimen from Puerto Princesa.

Arachnothera dilutior Sharpe.

Eight specimens of Sharpe's spider-hunter from Puerto Princesa, taken in December and January.

Anthreptes malaccensis (Scop.).

A good series from Puerto Princesa and one male from Tinabog.

[6] Sharpe: *Ibid.*, 7, 577.

Budytes leucostriatus Hom.

Three specimens. It is possible that Philippine birds of this genus belong to the recently described *Budytes flavus alascensis* of Ridgway.[7]

Anthus rufulus (Vieill.).

One specimen of this common pipit from Puerto Princesa.

Anthus cervinus (Pall.).

Three specimens of the red-throated pipit were taken at Tinabog, Palawan, in January.

Anthus gustavi Swinh.

One specimen from Puerto Princesa, taken December 20.

Uroloncha everetti (Tweedd.).

A male and female from Puerto Princesa, December 29.

Oriolus chinensis Linn.

An immature female from Puerto Princesa.

Oriolus xanthonotus Horsf.

Twelve specimens obtained at Puerto Princesa and Tinabog, December 12 to January 23, are in fine plumage.

Chibia palawanensis (Tweedd.).

Three specimens of the Palawan drongo taken at Puerto Princesa in December are in perfect plumage.

Buchanga palawanensis Whitehead.

Two males from Tinabog and four specimens from Puerto Princesa; one of the last taken December 9, 1905, is immature, having acquired but few of the dark, slate-blue feathers of the adult. The old feathers are dark smoky-brown. Specimens from Culion and Paragua do not differ from each other.

Eulabes palawanensis Sharpe.

Ten specimens from Palawan; an immature female taken at Puerto Princesa, December 22, has the bill lighter and more yellowish than the adults.

Lamprococorax panayensis (Scop.).

Tinabog and Puerto Princesa.

Corvus pusillus Tweedd.

A female from Puerto Princesa.

[7] *Bull. 50*, U. S. Nat. Mus., Bds. N. and M. Am., pt. **3**, 8. "Winter specimens from the Philippine Islands apparently belong to this form (*alascensis*), but owing to the fact that no winter specimens undoubtedly belonging to this subspecies are available for comparison their identification is uncertain." Op. cit., p. 10.

PREVIOUS PUBLICATIONS OF THE BUREAU OF GOVERNMENT LABORATORIES—Concluded.

(Concluded from second page of cover.)

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1893.—Estudio Descriptivo de algunas manantiales minerales de Filipinas ejecutado por la comisión formada por D. Enrique Abella y Casariego, Inspector General de Minas, D. José de Vera y Gómez, Médico, y D. Anacieto del Rosario y Sales, Farmacéutico; precedido de un prólogo escrito por el Excmo. Sr. D. Angel de Avilés, Director General de Administración Civil.

1893.—Terremotos experimentados en la Isla de Luzón durante los meses de Marzo y Abril de 1892, especialmente desastrosos en Pangasinán, Unión y Benguet. Estudio ejecutado por D. Enrique Abella y Casariego, Inspector General de Minas del Archipiélago.

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1904.—Fifth Annual Report of the Mining Bureau. H. D. McCaskey.

1905.—Sixth Annual Report of the Chief of the Mining Bureau. H. D. McCaskey.

1905, Bulletin No. 4.—A Preliminary Reconnoissance of the Mancayan-Suyoc Mineral Region, Lepanto, P. I. A. J. Eveland, Geologist.

1905, Bulletin No. 5.—The Coal Deposits of Batan Island. Warren D. Smith, B. S., M. A., Geologist.

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[1] The first four bulletins in the ornithological series were published by The Ethnological Survey under the title "Bulletins of the Philippine Museum." The other ornithological publications of the Government appeared as publications of the Bureau of Government Laboratories.

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