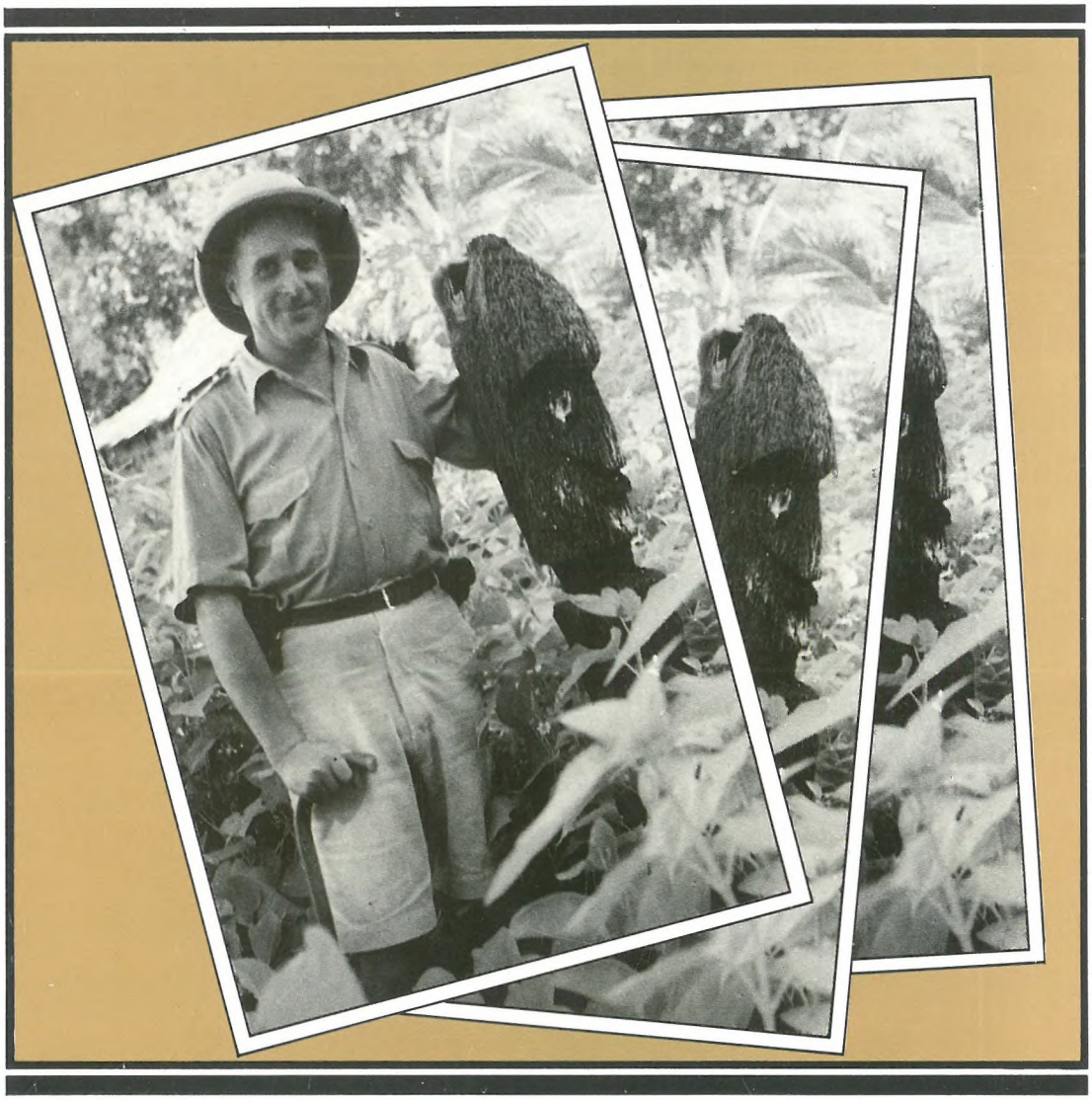
OCCASIONAL PAPERS IN ANTHROPOLOGY

ETHNOGRAPHICAL INSTITUTE OF THE HUNGARIAN ACADEMY OF SCIENCES



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J.HÁLA–G.VARGYAS /EDS./

H. VON BANDAT, A HUNGARIAN GEOLOGIST IN WESTERN NEW GUINEA

PACIFIC OCEAN

CERAM SEA

WAIGEO I.

TAMARU MTS.

SALAWATI I.

SORONG

DOBERAI PENINSULA (VOGELKOP)

MANOKWARI

NUMFOOR ISLAND

NUM ISLAND

SUPIORI

BIAK

Yapen Strait

YAPEN

WAAR ISLAND

ROON ISLAND

WANDAMMEN PENINSULA

Binfuni

Modai

Babo

BERAU BAY (Mac Cluer Gulf)

MAMBRIEMA

ARGUNI BAY

ONIN (FAKFAK) PENINSULA

FAKFAK

BOMBERAI PENINSULA

KAMRAU BAY

KUMAFA MTS.

ADI ISLAND

MOOR ISLANDS

CENDERAWASIH BAY (SARERA BAY)

NABIRE

VAN REES MOUNTAINS

Au[illegible]

MAOKE MOUNTAINS

SUDIRMAN MTS.

JAYAWIJAYA MTS.

NEW GUINEA

TIYO MTS.

Idenawa R.

Blumen R.

INDONESIA

ARU SEA

ARU ISLANDS

WOKAM

KOBROOR

TRANGAN

ARAFURA SEA

TAYANDU ISLANDS

KUR I.

KAI ISLANDS

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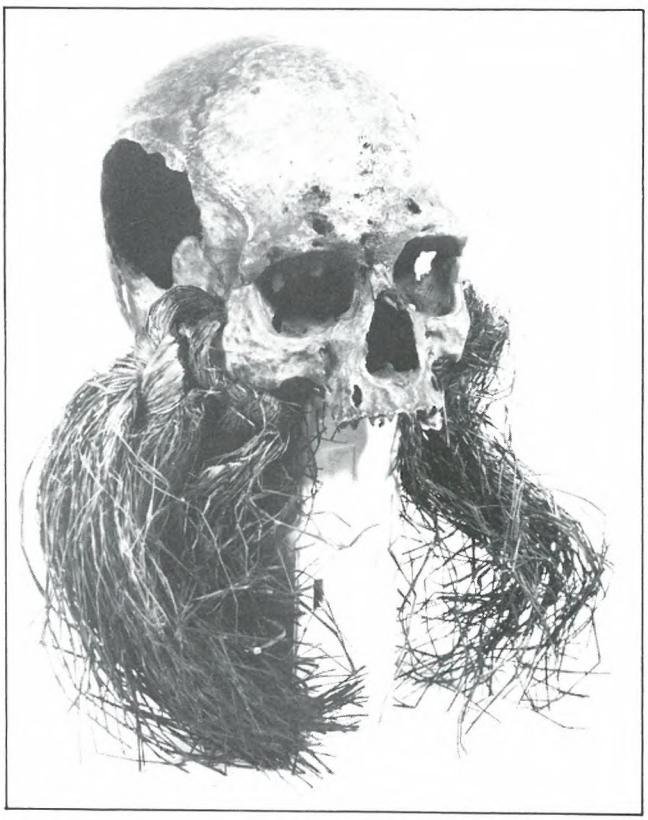
OCCASIONAL PAPERS IN ANTHROPOLOGY



OCCASIONAL PAPERS IN ANTHROPOLOGY

4.

HORST VON BANDAT, A HUNGARIAN GEOLOGIST IN WESTERN NEW GUINEA

Edited by

JÓZSEF HÁLA and GÁBOR VARGYAS

Ethnographical Institute of the Hungarian Academy of Sciences
and
Hungarian Geological Survey

1992

Budapest

OCCASIONAL PAPERS IN ANTHROPOLOGY

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Ez a szám a Magyar Állami Földtani Intézet, az „Etnológiai alapkutatások" és a „Kulturális változás és modernizáció a harmadik világban" című OTKA-programok anyagi támogatásával, az MTA Néprajzi Kutatóintézete és a Magyar Állami Földtani Intézet együttműködésében készült.

Cover Photo: HORST VON BANDAT with a ritual sculpture in North-Salawati Island

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FOREWORD

The fourth volume in our series is published jointly by the Ethnographical Institute of the Hungarian Academy of Sciences and the Hungarian Geological Survey. The cooperation is justified by the somewhat exceptional nature of the subject: in this issue we are publishing the memoirs of travel in West New Guinea in 1963—38 and the ethnographical collection of the geologist Horst von Bandat who, despite his German name, was Hungarian-born.

As the father of photogeology, von Bandat's name is known among petroleum geologists rather than among anthropologists. Nevertheless, his name means a great deal to those acquainted with the Oceanian collections of the Ethnographical Museum, Budapest: he has earned a place in the history of the museum as the sole donor of a South-west New Guinea collection. Although this collection may not be very large, it is of special interest because of the early date of the collection and the exceptional value of a few of the items. Strangely enough, the circumstances under which it came into being and, in general, von Bandat's travel and activity in West New Guinea remained obscure right up to the present. It was a source of great pleasure for us when József Hála approached us on behalf of the board of trustees of the Hungarian Geological Survey's "von Bandat Foundation" with the manuscript in the hope of a possible joint publication.

The date of origin of the mauscript has not been fully clarified. All we know is that it was written not long before von Bandat's death, that is, some 40 years after the expedition. However, this fact detracts nothing from its value. His description provides us with the first authentic and abundantly detailed eye-witness account of the BACOPA expedition wich played an important role in both the history of the discovery and colonization of South-west New Guinea and in the history of petroleum and photogeology, of the circumstances of this expedition and its sporadic contacts with the local population. In this respect, von Bandat's description in many ways resembles the subject of the first volume in our series and —mutatis mutandis— can also be regarded as its continuation.

However, as editor of the OPA, it seemed to me at least as important to compare the von Bandat photographic material which has now come to light with the collection of objects preserved in the Ethnographical Museum, Budapest, and to publish them together since the manuscript and the description of the attached photographs not only throw light *in general* on the circumstances under which the objects were acquired but in a number of cases also produce data of source value on the *individual* objects. All this confirms the importance of publishing von Bandat's complete material —the manuscript, photographs and the collection of objects— together in a single volume.

Nevertheless, the manuscript —which was presented to the "Horst von Bandat Foundation" of the Hungarian Geological Survey by Mrs. Jessie von Bandat, von Bandat's widow, and which is preserved in the Survey's Archives— required a certain amount of editing. Although von Bandat's work was written in the 1980s, its style, attitude and knowledge of ethnography in many respects reflects and recalls the time of the expedition, the 1930s. Moreover, the publication of the full travel journal would have exceeded the frame of our series and also departs from it in character. As a result, to our deep regret, we have been forced to leave out the greater part of the manuscript which runs to several hundred pages: all those sections in which the author presents the geography and history, flora and fauna, etc. of the islands visited in the course of the boat trip from Makassar to Sorong. We have also left out the similar chapters on New Guinea, including, for example, an amateur survey of the ethnographic conditions in West New Guinea and reflections on the subject of cannibalism. These latter chapters are now obviously outdated. However, we have retained all the passages of source value dealing with the BACOPA expedition, the geological exploration and, in this connection, the exploration of the islands, including of their ethnography.

All this represents largely the last few chapters of the manuscript. The division of the chapters for the most part follows the manuscript. However, we have given the chapter titles as well as the title of von Bandat's travel report. (The author did not give his manuscript a title.) We have also preserved von Bandat's original text for the photographs (with occasional deletions). For

the sake of the unity of the text, the place of the deletions has not been indicated.

We would like to take this opportunity to express our thanks to all the individuals and institutions who have contributed to the publication of this volume. Our special thanks are due to the Ethnographical Museum, Budapest, for the photographs of the objects and for authorizing their publication. The text was typed by Nóra Rozmaring, the word processing and preparation for printing was done by Ildikó Tiefenbacher and the typographical design of the volume is the work of János Romvári, who also designed the cover, as he has done for the other volumes in the series. The printing films were produced by Éva Kelemen. In the absence of the (ethnographic) editor, Mihály Sárkány took over the task of editing and also gave the editor valuable friendly advice. We extend our sincere gratitude to all of them.

GÁBOR VARGYAS
editor

CONTENTS

BIOGRAPHY AND GEOLOGICAL WORK OF HORST VON BANDAT

TIBOR CZAKÓ—JÓZSEF HÁLA

H. von Bandat, an outstanding petroleum geologist and a pioneer of photogeology lived and worked in Hungary and later the U.S.A. and also carried out geological exploration in many parts of the world. Like many other geologists in Hungary, he started with Tertiary stratigraphy, but it was not his main interest. His greatest results were achieved in the fields of hydrocarbon geology and photogeology. He was a scientist with great breadth of knowledge and a practical expert at the same time. Besides Hungarian, he spoke fluent English, German, Spanish, French, Dutch, and Malay. He was a member of the Hungarian Geological Society, the Hungarian Geographical Society, the American National Geographic Society, and an active member of the American Association of Petroleum Geologists.

Von Bandat, son of József von Bandat and Anna Eckhard, was born in Budapest, on 30 March, 1895. He studied and got his degree at the Faculty of Arts of the Budapest University of Sciences (later Pázmány Péter University) in 1918 and his PhD. on 20 April, 1921. His subjects were geology, mineralogy and chemistry. From 20 October, 1921 he worked as assistant of Prof. Dr. K. Papp. In this quality his name figures for the last time in the Yearbook of the University for the academic year 1937—1938. During his university years he carried out geological surveying work in Albania, Poland (Galicia) and Austria (Burgenland). His job as assistant can be considered only nominal from 1929 since from then until 1940 he regularly participated in the work of geological expeditions abroad.

In winter 1925—1926 he worked with Swiss geologist M. Mühlberg in Southern Albania for the Royal Dutch Shell Group. His results were published in the studies entitled "Die geologische Verhältnisse der Umgebung von Valona (Vlorë) in Albanien" and "Újharmadkori csigák Délalbániából". "With this work, together with F. Nopcsa he became one of those Hungarian geologists who carried out pioneering investigations of Albania's geology." (DANK, V. 1989). In 1926 he worked in Galicia, also for the Royal Dutch Shell Group. In summer 1927 he studied the geology of the Kőszeg—Rohonc Mountains in Burgenland and published his results in his "A Kőszeg—Rohonci hegység nyugati részének geológiai viszonyai" and "Die geologische Verhältnisse des Kőszeg—Rechnitzer Schiefergebirges". "Austrian geologists (e.g. Pahr, Tollmann), in spite of the half a century that has since elapsed, still use Bandat's geological results and the data collected from that region. Bandat's »A Kőszeg—Rohonci hegység nyugati részének geológiai viszonyai« is included in all the important Austrian geological bibliographies." (REICH, L. 1986).

In 1929 von Bandat joined the Shell Company and for a decade he worked in different parts of the world as field geologist, chief geologist and geologic adviser. During this period he worked mainly on the Greater Sunda Islands and in New Guinea, as well as in Germany and Cuba. It is worth mentioning that he was the fourth Hungarian geologist working on the Sunda Islands and in New Guinea. Previously T. Posewitz (Borneo, 1879—1884), L. Lóczy Jr. (Sumatra, 1920-1921; Timor, 1922; Celebes, 1928) and S. Papp (New Guinea and New Britain, 1928—1929) studied the geological conditions of that region.

Von Bandat took part in hydrocarbon exploration on Sumatra between 1929 and 1932 and then, returning to Europe, worked in Germany (Harz Mountains) in 1932.

In January 1933 he went to Celebes where he worked till November 1935 as an employee of the Bataafsche Petroleum Maatschappij. With geologist L. Willemse he carried out detailed geological investigations on the Western part of the island along the coast of the Makassar Channel from Kaap Mandar to Donggala in an area some 300 kms long and in places 60 kms wide. Here and there they investigated the island's still geologically unknown interior as well. He reported on this work in Hungarian journals ("Olajkutatás a celebeszi őserdőkben" and "A nyugatcelebeszi Lariang medence"). Later, in Budapest, he also published a book entitled "Olajat keresek Celebeszen". In the preface of the richly illustrated volume, among others, he wrote the following: "I attempt to describe objectively the modern process of petroleum exploration

in a relatively unknown, tropical region, and also to give an account of the flora and fauna of Celebes and the way of life of the native people. Besides, I also wish to report on the colourful daily events that so enrich life in the tropics. So the reader should not expect adventures but an objective account of a study tour on Celebes." His ethnological observations on Celebes and on the neighbouring islands are also described in his article "Indonéziai nyílmérgek".

His first aerial photointerpretation of Borneo was completed in 1936. In the same year he also interpreted photogeological result referring to certain territories of Mexico and Arkansas (U.S.A.). Still in the same year he travelled to Dutch New Guinea where he worked as an employee of the Netherlands New Guinea Petroleum Co./Shell Standard Pacific till 1938. The Dutch New Guinea expedition was the first to use interpretation of aerial photographs in a large coherent area. It was a great success, and von Bandat and his Dutch colleague, N. Weissbord, gained much distinction. They recognized many oil-bearing structures by analysis of the strike and dip measurements taken on aerial photographs. They completed the first manual of geologic photointerpretation in 1937 (that remained, however, unpublished). "It contained what was probably the first photogeological sample collection with detailed descriptions and transparent overlays of some 60 photo-pairs." (MEKEL, J. F. M., 1974). Their evaluation, manuscripts and sketches are still preserved, in part by the Dutch Institute for Aerial Survey and Earth Sciences.

Between 1938 and 1940, at the invitation of the Compania Petrolera Estrella di Cuba/Shell Standard of Jersey, von Bandat carried out hydrocarbon investigations in Cuba and also again in New Guinea and Java. He returned to Hungary in 1940.

Returning from Indonesia to Hungary as a dedicated expert of oil exploration, he joined the Royal Hungarian Geological Institute (Budapest), where he worked as chief consultant for oil and gas research and edited the Institute's German-language publications.

Meanwhile, World War II had broken out. Hungary, taking part on the German side, reannexed (among other areas) Transylvania, the eastern part of the former country (before 1920). Shortly after, a new gas and oil exploration program was started for which the use of aerial photographs was highly suited, because quick geologic reconnaissance mapping of a large coherent area was needed. Von Bandat and his Hungarian team proved the efficiency of photointerpretation. Between 1941 and 1943, three main folded zones were recognized in the northern part of Mezőség, and many of the anticlines were found to contain oil and gas. The field measurements were recorded on aerial photographs at a scale of 1:10,000 and the geologic maps were compiled and drawn by photogrammetric instruments (e.g. Orell stereoautograph), the most advanced methods and instruments of that time. Completion and publication of the maps and reports, however, were hindered by the war within Hungary. As a result, his studies "Jelentés a szilágysági Kraszna-medencében 1942-ben végzett földtani felvételekről" (written with L. REICH), "Az erdélyi Medence északi és keleti részének rétegtani és hegyszerkezeti viszonyai" and "Adatok Beszterce—Naszód és Románszentgyörgy környékének geológiájához" were not published until 1950.

Von Bandat was appointed head of the North Transylvanian Geological Exploration Team by L. Lóczy Jr., director of the Royal Hungarian Geological Institute who also strongly recommended the application of photogeological methods giving the following reasons: "Horst Bandat carried out petroleum exploration under extremely difficult conditions in New Guinea for two years. During this period he not only had the possibility to study the most up-to-date methods of photogeology but did pioneering work, and gained enormous experience." (LÓCZY JR., L. 1942, in BANDAT, H. 1942). In the course of the North-Transylvanian exploratory work the following geologists of the Royal Hungarian Geological Institute worked together with von Bandat: L. Bartkó, K. Méhes, L. Reich, T. Szalai, Gy. Wein, Gy. Hegedűs, T. Tuttenoy, K. Balogh, S. Jaskó, L. Majzon, F. Bartha and J. Meisel.

In 1942, von Bandat, using the colour- and symbol-legend system of the Bataafsche Petroleum Maatschappij, compiled the "A Magyar Királyi Földtani Intézet egységes színés jelkulcsa". At a meeting held at the Royal Hungarian Geological Institute on 16 April, 1942 he gave a lecture of great interest entitled "Légifényképek alkalmazása a geológiai kutatásban". Though many geologists had watched his new photogeological methods with suspicion, the majority (e.g. L. Lóczy Jr.,

Gy. Wein, T. Szalai, S. Papp, Z. Schréter) of the geologists commenting on the lecture accepted and acknowledged the application of the new method that was later justified by the results of the investigation in Northern Transylvania.

When fighting reached Hungary, in April 1944 the majority of the geologists of the Royal Hungarian Geological Institute, including von Bandat, moved to Balatonarács at the order of the Minister of Agriculture. On returning to Budapest in 1945, von Bandat also took part in restarting the Institute's work. He stayed at the Institute till 1 May, 1946.

In 1947, together with his wife, Jessie von Bandat, a U.S. citizen (whom he married in 1941) he emigrated to the United States and was naturalized in 1949. He joined the Gulf Oil Corporation and was named photogeologic staff adviser of the Gulf Oil Corporation; he worked on projects and did field work in Cuba, Kuwait, Saudi Arabia, Iraq, Tunisia, Libya, Italy, Yemen, British Honduras, Guatemala, Peru, Bolivia, and many parts of the United States.

He retired from the Gulf Oil Corporation in 1956, but he did not give up being a scientist. First, he compiled a photogeologic manual based on his worldwide experience which was published by Gulf Publishing Co. in Houston in 1962. This comprehensive book, "Aerogeology", is a handbook with examples covering the complete spectrum of geologic, climatic, petrographic, and tectonic conditions represented in different parts of the globe. In this period numerous handbooks were published on the geological interpretation of aerial photographs (e.g. LUEDER, D. R., the American Society of Photogrammetry's Manual, RAY, R. G., MILLER, V. C.—MILLER, C. F.). Of all these studies, von Bandat discusses the different rock types and their characteristic features on aerial photos in greatest detail. As examples, many excellent aerial photos illustrate his book from all parts of the world, including Indonesia and Transylvania. He also discussed problems of the fundamentals of photogrammetry, legends, and compilation of maps. (The legend he used was edited in the 1930s and was already used in 1942 in the "A Magyar Királyi Földtani Intézet egységes szín- és jelkulcsa".) The book describes in detail the water network and its photographic features, the form of appearance of the main rock types, the main sedimentary, volcanic and magmatic structures, and finally the main geological—geomorphological landforms. This is a book of lasting value since no work treating the subject in greater detail has ever been published.

His further scientific research included applications of photogeology using the images of the Mars surface in the 1950s, the Gemini space photographs in the 1960s, the radar imagery of the Darien Mountains in Panama and the Landsat and radar images of Celebes in the 1970s.

One of his favourite research areas was the island of Celebes. Based on fieldwork in the 1930s, and working from aerial photographs of the 1960s and Landsat and radar imagery of the 1970s, he identified four main fault zones in central Celebes and nine volcanic-tectonic alignments among which the "Sidole-North Lalabi-Waowa line" is an important compression feature of plate tectonics. Unfortunately, most of his work of the 1960s and 1970s and his planned revision of "Aerogeology" to include sections on geologic interpretation of radar imagery remained unpublished. The first Landsat image of Hungary shows the western border area including the Leutha Mountains, the Kőszeg—Rohonc Mountains, and the Graz basin. It is precisely the same area where von Bandat carried out geological investigations in 1927. He evaluated these Landsat photos, too, but no manuscript has been found referring to this work.

His evaluations in manuscript form are excellent examples of the past period when the evaluation of space images was carried out visually by using the monoscope method. As for the contents, these evaluations could compete with the data bases provided by any digital interpretation method. His work proved that the know-how is at least as important as the instrumentation itself. It is a reminder that thousands of aerial photographs and space images have not yet been evaluated. We have only to learn from him the "how" and then, by applying inexpensive methods, we can obtain an enourmous quantity of geological data. It is also a warning example for our age in which human inventiveness is neglected in the midst of the technical novelties, and the most important factor, observing and creative man, disappears. His scientific activity proved that he was a keen-sighted observer and was highly creative.

According to an American geologist, H. D. Hedberg, "von Bandat was an outstanding pioneering photogeologist, who, by his fine book, his keen observations, his worldwide experience, and his lifelong dedication and enthusiasm for his profession, leaves the science of photogeology forever indebted to him." (Personal letter written to Jessie von Bandat by H. D. Hedberg in 1983.)

Von Bandat died in Paramus, a small town outside New York City, on 9 December, 1982. In accordance with his will he was buried beside his mother in Tiszaroff (Hungary). Two years later his widow has his mortal remains removed to Paramus where they were placed in the family crypt in the George Washington Memorial Park.

In memory of her late husband, Jessie von Bandat set up a foundation of a value of 30,000 USD that was later increased to 60,000 USD, to assist young geologists working for the Hungarian Geological Institute. The purpose of the "Horst Bandat Foundation" is to promote their postgraduate professional training in the course of visits abroad that are financed from the annual interest of the Foundation. The results of the competition for this grant were first announced in a ceremony attended by Jessie von Bandat on 16 March, 1988. On the same day, the Hungarian Geological Institute and the Ethnographical Museum organized an exhibition on von Bandat's life and work and a memorial tablet on the wall of the headquarters of the Hungarian Geological Institute (today: Survey) was unveiled.

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The Langgaran Structure (South Sumatra). 10 p, 2 maps, 1 section. Pladjoe

1932:
Klawas (South Sumatra). 14 p, 3 maps, 1 section. Pladjoe

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RECOLLECTIONS OF MY NEW GUINEA TRIP

HORST VON BANDAT

Introduction

The rapidly expanding quest for oil in the nineteen thirties, escalated the organized search for petroleum in Southeast Asia. In the Sunda Archipelago and New Guinea, new yet unexplored areas came into focus of interest. The western part of New Guinea, the second largest island of the world, seemed prospective, because oil indications were reported from the western tip of the island.

There was a sharp competition between the British—Dutch Shell and the American Standard Oil Group (Socony and California) for the new prospects. In 1931 this competition ended by an agreement to explore the oil promising territory of West New Guinea together. The result was a joint combine, the Dutch New Guinea Petroleum Company (DNGPM), also named "BACOPA" after the abbreviated titles of the Bataafsche (Dutch Shell) Coloniale and Pacific Petroleum (Standard Oil of New York and California) oil companies. The inclusion of American capital was politically motivated because the expansionist policy of Japan.

The New Guinea Expedition of 1935—37 was a joint organisation of the two largest oil concerns of the world. The new concession stretched over 100,000 square kilometers and covered the oil prospective lowlands and hilly terrain of Dutch West and South Central New Guinea with the Vogelkop and Bomberai peninsulas. The area was a 99% rainforest-covered wilderness with extensive swamps, the largest in the world, and a very scarce population. The idea was to find petroleum in commercial quantities. Dutch military patrols which made systematic ingressions since 1907 along native paths and navigable streams, found oil indications in the West Vogelkop. In 1934 an exploration party of the Bataafsche Petroleum Company under Dr. Rothaan verified the indications, but the leader almost lost his life. His notes and maps were lost when he was carried out on a stretcher from the western Vogelkop to a small hospital on the Bomberai coast. His report which he had to write without notes started the joint Dutch-American expedition.

Conventional geologic survey and mapping in such circumstances would take decades by a large staff and therefore be prohibitively expensive. Considering this, the companies decided to use airplanes first time in exploration history, instead of the usual ground mapping and photo triangulation for charts. The contract area was covered by about 15,000 aerial photographs and the maps were made by aerocarthographic instruments in Holland.

The advantages of this method were enormous. To chart the area by conventional methods from the ground, a basic prerequisite for oil prospecting penetrable only along broad rivers would have cost nearly one hundred million dollars and about fifteen years of surveying. But the air photographic mapping method would only need about ten million dollars including airfields, planes and pilots. Furthermore the maps would be incomparably more accurate than the maps made by conventional field methods. The air photos taken from a height of 20,000 feet, were examined under a stereoscope and the effect was a tridimensional "plastic" image which could be interpreted in geologic terms, indicating the nature of the rock, like sandstone, limestone, clay, gravel and other material; the distribution of the rock types and the attitudes of the rock layers: flat, tilted or steep, which is the base of structural analysis to find the most favourable areas for drilling an oilwell. To construct a geologic map costs a huge sum of money even in accessible areas. In tropical forests this is even more difficult, time consuming and risky. But if the new method is used, it gives the field surveying geologist a very great help in narrowing down his prospecting to a small area. But even so, equipped with accurate maps and some geologic intelligence the geologist has to go into the field and check, control and investigate the area, collect rock samples and look for oil or natural gas seeps.

Even so, the problems were many and the costs high. Landing strips had to be constructed for WW1 vintage Havilland fighter

planes to take the photographs. Two airfields were made, one at the Island of Jefman, a coral terrace, the other at the headquarters of the expedition in Babo on a gravel terrace. Landbound planes were later replaced by Sikorsky amphibians, who could land on the sea, lakes and rivers also. In Babo on the Mc. Cluer Gulf, a little village with houses for the staff and personnel, offices, laboratories for processing photographs was built, shipping organized, wharfs constructed.

However, this new trend in geologic exploration had to be tested for practicability and reliableness before being used in a greater scale. Mapping rock types from the air to search for petroleum was an unheard of method to the men of science, and some even found it a new fangled phony method similar to the devining rod of the Medieval Age. Nevertheless, the sponsors of the enterprise, the big oil companies with millions of investment gave some credibility to the new approach.

In the Main Office of the Bataafsche Petroleum Maatschappij, in the Hague, Holland, preliminary studies were carried out. Scores of geologists were tested. Air photographs and a stereoscope were distributed to them but the locality, continent or country were not disclosed. The photos were made over places which were well mapped and geologically known. Comparing the results of the "blind" tests with existing maps, the most able were picked to work with the new science. I happened to be one of them.

Accepting the challenge, I got my ticket and boarded the Royal Dutch Airlines' DC 2 in Vienna for an eight days flight to Batavia, Java.

Boarding an interinsular steamer of the Royal Packet Navigation Company, I left Batavia (the Djakarta of today) for Makassar in August 1936.

From Makassar to Babo

The afternoon the ship cast anchor at a small island south of Waigeo. On the map it is called Camphuys Island, named after a Dutch sea captain who put it first on the sea charts. Commonly it is called Saonek Island, from the small miserable little fishing village on the shore opposite of Waigeo Island. Saonek is the residence of the administrator of the island of Waigeo and a more remote, dreary, forgotten place for a government official cannot be imagined.

The island, is a small flat rock with a single warehouse of a pearl fishing company. The divers are natives who dive also for large shells worn as ornaments by several Papuan tribes. This is the goldlip shell used as a nose ornament by tribes of the south coast and is alternate for money.

The next morning we wake up by the rattling of the anchor chain. This is the end of the line for us. We are in Sorong. The boat continues from here to Hollandia (now "Sukarnopura") along the north coast. Sorong is a small village on a small island, an outpost of the northwest New Guinea administration with a controlleur, a small police force and a *pasangrahan*, a well kept resthouse for officials or travellers. We are told by the agent of our company that the next day we will be flown from the island of Jef-Man to Babo, the expeditional headquarters 250 miles on the Berau or Mac Cluer Gulf. Jef-Man is a small coral island with an airstrip about ten nautical miles west from Sorong.

After a day at the resthouse and paying our respects to the Dutch controlleur we board an open outboard motor boat for the airstrip.

The boat trip of about an hour leads along Tsiof, the largest three miles long island of the Rombombo Group. The sea is a bit choppy, the waters are beautifully blue. We land at a jetty near the airstrip built by the Shell-Standard Expedition in 1935 on an elevated coral terrace, suitable for the small surplus British Havilland fighter planes, used for photo reconnaissance and mapping by air of the uncharted northwestern area of New Guinea. A second airstrip was built at Babo in the Mac Cluer Gulf for the Havillands, though the companies switched later to the amphibian Sikorsky's able to land on any open water also. The obsolete fighter planes

of post first World War vintage with a speed of one hundred miles per hour, were used to photograph the concession area of 100,000 square kilometers to aid the geological and geophysical research parties with maps assembled from continuous strips of air photographs. For mounting the cameras, the cabin was simply cut open. The slow speed was adequate for the automatic aerial cameras of the thirties. In those early days of photo flying, there were no automatic pilots, keeping the plane at an even level and at a straight direction. This was all up to the pilot to keep the rather unstable vehicle, not constructed to make photographs, in a proper even height and direction to obtain the photo strips in the right overlapping intervals. Overlapping was of essential importance; to construct maps and study the landforms, like hills, stream pattern, type of rocks and attitudes of the rock layers, three dimensional stereoscopic effect had to be obtained. To obtain the right photographic coverage, the pilot had to be a very good one, because of the rapidly changing cloud conditions in the wet tropics made a repetition of a flight time wasting and expensive. In the southern part of the concession there was an area impossible to photograph because it was just always cloudy.

The Sikorsky's were able to land on an airfield or descend on water along the coast on the broad rivers or on lakes. They were used for photo missions and for transport of personnel in emergencies. By 1936 only Sikorsky's were in use, because of the amphibious qualities. The aero service was maintained by the Royal Airlines Company (Koninglijke Luchtvaart Maatschappij — KLM) and proved excellent, reliable and safe in spite of the difficult circumstances of unusual climate, housing, communications and airport facilities. There was also a 1000 ton steamer, the "Sudu", for transportation of field parties and a radio network between the headquarters in Babo and the field groups.

Arriving in Jef-Man, we sat down in the shade with our luggage to wait for the Havilland to take us to Babo, some 200 miles on the Mac Cluer Gulf. The airstrip glaring in the tropical sun was of planed coral debris, just a few feet above sea level. It was out of use for a time and vegetation already started to encroach upon the short runway.

Finally the approaching roar of the two motored fighter plane became audible, an unusual sound in the wilderness, and with a sharp turn the plane came to a halt on the end of the runway, dangerously close to the shore. The pilot and Jan were both Royal Netherlands Airforce Reserve officers, and when I told them I came by KLM plane from Holland to Java, I gained a little status with the two professionals. We climed into the small plane, fastened our seatbelts and the luggage in the worn interior, and the small plane roared off into the blue yonder just a few feet short of the runway which was a bit hair raising, but nothing in comparison with what came later.

I did not feel so good, but tried to be nonchalant as one of the first passangers of the company who made the flight in 1932 with a small six passenger KLM Fokker airmail plane in ten days from Holland to Indonesia.

The plane headed for Babo which is on the southern shore of the bay opposite the Vogelkop, the large northwest peninsula of New Guinea. The northern part of the Vogelkop is a multiple mountainous chain with a row of dormant or extinct volcanoes. Only one is periodically active. This area is almost entirely unexplored and was crossed only at two points in 1910. The southern part is a densely wooded lowland with large rivers and a thirty to forty mile broad stretch of marshes. The swamp region is crossed by the meandering rivers which flow between high walls of trees before they join the sea. The entire area is covered by an uninterrupted high rain forest with an average tree height of one hundred feet. This green cover, with tree tops ranging from dark olive to yellowish green, some of the crowns with flowers or buds display an infinite range of green shades. The plane flew low, but it was too fast —one hundred miles an hour— to see details or observe all more closely. All of a sudden the pilot felt an itch to show us how a British fighter plane can be controlled, obviously in an urge to show off. So he buzzed the river, went down a dozen feet over the water and followed the dizzy meandering curves of the Kamundan. At a sharp bend he suddenly pulled up to tree level a few feet above the crowns and continued merrily his course towards Babo with one pale faced passenger. He had obviously a lot of fun in scaring his passangers who felt a little uncomfortable about such stunts. I suspect even Jantje did.

With some relief, we found ourselves now over the dark blue waters of the Gulf, and Babo came soon into sight. Babo was built on a large gravel terrace of the Kasuri River, a sluggish broad muddy stream bordered at the mouth by dark green high mangrove trees in swamps. From the air, a group of houses roofed with palm leaves, a short road and a jetty, a couple of large sheds and an airstrip appeared as the plane turned into the wind to prepare for a landing.

"That is Babo," said the pilot, "tighten your seatbelts, here we go." The next moment I was aware, the airstrip was vertical and then upside down. The pilot made a steep fighter swoop over the wing, an "Immelman", called after the German ace from World War I. All I could remember of this stunt was that I blacked out by a feeling like that of a thousand needles piercing my skull. When I came to, we had stopped on the field, but I did not know where my feet or head were. I staggered out of this infernal contraption dazed and stunned. I just did not appreciate this unnecessary stunt, though we became good friends with the pilot later.

This was my first contact and arrival at New Guinea where I had to spend two years of geologic exploration, sometimes miserable and sick, but always interesting, even fascinating in spite of hardships and deprivations, of field work in the most remote and wild parts of the globe.

Babo

Babo was a dreary place. It was surrounded by swamps built on a large gravel terrace and had a small airfield. The terrace was a savanna, with huge eucalyptus trees, shrubs, insecticide plants (nephentes), pandanus trees and stretches of grass. This was the estuary of the Kasuri River. The mangrove swamps was a fine breeding place for mosquitoes and those small phlebotoma flies which slip through the finest mosquito net if it is not sprayed with a repellent. There were frequent afternoon and night showers. Once we had 260 mm of rain (ten inches) in thirty-six hours. The heat was damp like all over the wet tropics and fabrics and leather soon become covered with mold. There was adequate electricity for light and refrigeration of the photo laboratories but no air conditioning. There also was a mess hall where the staff, the geologists, technicians and pilots dines. Some time after our arrival, our doctor discovered that one Papuan dishwasher infected the personnel with amoebal dysentery. He was a carrier and as a Papuan not clean in his habits like Malayans are. Fortunately for us there were emetin injections to stop the trouble, though the vomiting after every injection was far from pleasant. Later many of us ate at home because a well stocked store run by a concessionaire of the company had a good selection of every type of food and merchandise.

There was also a short wave radio station with communication to the government radio network, which could be used to keep in touch with the radios of the field parties. Always when I passed the station I felt a little embarrassed and guilty. Back in 1933 I introduced a short wave radio "ham" communication when I worked in Celebes. The seat of the Borneo branch of the Shell Company was across the Makassar Strait and with the telegraphist, Mr. Krygsman in Balikpapan we proved that contact can be practical to order drilling parts, food and other items with the two weekly visits of the company steamer. The company liked the idea because the different field parties could be kept under control. The geologists however did not like the idea. They resented the daily progress reports and the additional administrative work, spoiling their free wheeling life in the wilderness. Geologists, mostly rugged individuals including myself, deeply hate paper work, directed research and interference from above. In New Guinea however, the situation was different. The distances were great and in case of emergencies radio could be invaluable to help in case of sickness or hostility. Some geologists in Sumatra and Borneo refused simply to carry a transmitter with them into the field or the base camp. One of them, Dr. Wooley the individualist British to the bones, had none when he was wounded by a crocodile and had to be transported by motorboat to the hospital in Fakfak instead of by a hydroplane to Babo.

The hospital was a meeting place of the Babo people. There was usually little vacancy because when the field parties came back from the bush, they went to the doctor, who most often kept them in the sickbay. There was also an operating room: a small palmleaf roofed section with an "operating table", a straight wooden table with a sheet metal top. The doctor was a jovial but crude, loud individualist. Some of us said that he has a sadistic pleasure to give injections. But it was not advisable to oppose or heckle him because everybody sooner or later came under his care or knife. The feud between the chief geologist and the doctor was a classic case, because a conflict between a medical man and a boss of another faculty is bound to arise sooner or later. Fortunately the chief geologist was in best of health and he did not go into the field either for long trips. So he enjoyed the luxury of curbing the somewhat inflated ego of the medical man. But the doctor, too, had his problems. The island had a very bad reputation. There were schores of diseases besides the better known common types like malaria or dysentery which were not well known and could be found only in big volumes of books of tropical medicine. At this time no sulfa drugs or antibiotics were known. For malaria there was only quinine and atabrin which colored the skin yellow. For diagnosis was only the microscope and a little chemical test.

There were some dramatic cases also. One geologist got a tentatively diagnosed tic fever. He developed heart failure and the medic gave him up. But somehow he recovered and was evacuated, since his contract was only for a few more months. One assistant geologist who worked with me in Celebes for a time was killed by a crocodile. He was just measuring a dip on an outcrop along a small river, when he was swept into the water by the reptile and disappeared. After I left, another Dutch geologist I knew well from Balikpapan, Borneo, got an intestinal occlusion (ileus) and had to be operated on. He died also and was buried in the sad little cemetery with a few others who were victims of the strange climate and sicknesses. Everyone of us had the chance to join the mute assemblage with the crude wooden crosses at the corner of the airfield, which became larger and larger as the time went by.

The big expedition had an international character. The oil companies, Dutch, British and American brought administrators and technicians of several nations to New Guinea. Dutch were in the majority. There were also Swiss, Americans, British, a German, an Austro-Hungarian and even a White Russian, a phantastic character who got into an ugly quarrel with the chief geologist and was kicked out almost literally.

Because of the complete lack of maps and geologic data necessary for oil prospecting, a systematic coverage of the concession was the first step of the programme. This had multiple advantages. In the first place, it gave the field parties accurate maps for plotting the geologic observations into a frame of a drainage system like type of rocks (sandstone, shale, schist, limestone, eruptive or intrusive rocks), the attitudes or inclinations and the direction of it; the accurate places of gas emanations or oil seepings; the places where the samples were collected; the type of terraine — hilly, mountainous, dry, flat or swampy; communication possibilities delineating the broad river courses. Smaller rivers were overgrown by trees and did not show up on the photographs. But the ground surveys of the water courses could be properly connected with points on the base map. The most important advantage was the morphologic analysis of the landforms (hills, mountain slopes, drainage patterns and inclinations of hard resistant rock layers — dipslopes). With this system a selection could be made where the chance of petroleum was positive or negative. The whole itinerary of the field groups could be planned. An additional item was the intelligence about the population. Villages and cultures can be seen clearly on the photos, and since the attitude of the natives was unknown or unpredictable, caution and planned approach became a rule. There were two incidents involving natives: the attack on a camp on the Blumen River and the stalking by the Mention Papuas of Dr. Bremmer's party because of a killed pig. Both were bloodless.

The maps were planimetric, they were not constructed with contours, though contour maps could be constructed if necessary. Photogrammetric work was done in Holland and after completion sent down to Babo for use by the field parties. The analysis of the landforms was made by us geomorphologists in Babo, who were sent to the field to look at what they had done — if they were right or wrong. Photogeology as it was named was in its infancy and very much was guess work in the beginning.

Photogeology uses stereoscopes, tri-dimensional 3D pictures like in grandma's time in the stereopticons. In spite of the thick vegetation cover, forms as slopes, ledges, scarps, sink holes and other larger surface forms can be distinguished of the forest underground.

The actual aerial photography was the base of the enterprise. It was no easy problem to make over 15,000 overlapping stereophotographs with automatic cameras from an even height on a clear sunny day. Clouds and haze were the main obstacles. Altimeters were primitive, the weather was seldom clear and markers to make parallel and sidewise overlapping "runs" few and widely scattered in the uninterrupted forest cover. There were mountain areas where the sky was all the time cloudy and could never be photographed. Maintenance of planes, motors, the photo and processing equipment in the damp climate was difficult and costly. The personnel of the KLM made a very fine job, and deserve for their flying skill and faultless performance the highest credit. There were no plane accidents, and the task in spite of the primitive crafts was well accomplished.

Now after so many years, it is a sad fact that this expensive enterprise had little practical results. World War II cut all activities, but after the war only three small oil fields came into production. A fourth, Wasian was closed because of poor showings. The fields of Klamogen, Jef Lio and Seleh in the western tip of the Vogelkop were connected with pipeline to the coast. Production amounted to about a million barrels per year which is not a profitable amount in view of the money invested. The take over of Dutch New Guinea by the Sukarno regime who named the territory "Irian" placed the western part of the island economically in a new stagnation with little outlook of further investments, development and exploration. Possibilities of finding more oil are good, though much capital will be needed to prospect the area between the western and southeastern hilly parts of the Vogelkop and Salawati.

Life in Babo was a tedium. Mail by boat came only once a month; in the club was but little life, the geologists and BACOPA people separated from the KLM personnel. There was even a grouping according to nationality — Dutch, Swiss and the "others" forming separate circles. Lunch was taken in the club at separate tables. The cooking was Indonesian Dutch, mostly canned food and occasionally fresh vegetables from a farm on Salawati. Dinner was taken at home in the little but well built and practical bungalows every one of us had, if he was not in the field or hospital. First I stayed in the "men's house", a longhouse with separated sections built on high piles. It was intended to house transitory personnel but as soon as separate bungalows were free, they were available. Being a radio buff, I had a short wave receiver and could hear the daily broadcasts from Java. To keep my colleagues informed I made some short notes of the news to be circulated in the office.

Working in the sticky hot office on the mirror stereoscope was no pleasure and according to temperament, nationality and character, aggravated by the climate and mosquitos, the smoke of the glowing insect repellent coils and the flit, provoked scientific discussions which often grew quite heated. There were also political differences. One Dutch geomorphologist, Dr. B., had very leftist leanings and his comments on the events of the Spanish Civil War were onesided. Once after a loyalist victory he became so enthused that he made quite a talk about organizing a new society, not realizing that the great majority was not a bit enthusiastic about it.

Geologists are outdoor people and hate office work. They like to stay in the field, explore, investigate and prospect. One British geologist, a splendid noncomformist, a very capable and excellent expert, developed field work as a hobby and became very touchy about interference with his work. He worked with a group of Borneo Dayaks who were devoted to him. He lived puritanically, travelled light and ate and bathed like the natives. One day standing in knee deep water taking a bath he was attacked by a big crocodile. He did not see the animal which approached him silently submerged. He was just scooping some water with a bowl when the reptile grabbed his arm, bowl and all and tried to pull him into the deeper water. But he had no luck with Dr. Wooley. When, loosing his balance and plunging forward, he thrust his free hand into the eyes of the crocodile who let loose in pain. In the meantime the Dayaks bathing nearby, jumped the animal and the *mandur* ran for the carabine. From eleven shots, seven hit the reptile, but Wooley's arm was badly lacerated and bleeding profusely. He was taken at once by boat to the nearest hospital in Fakfak

which was eighty-five miles away. When we saw him in Babo his right arm was deeply lacerated and part of the muscles pulled off the bones. He recovered quickly and went again back into the forest.

Dr. Wooley was an original. When he worked in the deep interior of Borneo, the chief geologist, who was not too popular and a "king geologist" from Holland, intended to visit Wooley's area, and Wooley did not like it. When they arrived by motorboat in his camp on the river he took them immediately out into the forest through rough chopped paths into the water of creeks, up and down, from morning till late into the night, without resting or giving them even a drop of water. The two were exhausted and wretched, tongue hanging out, drenched with sweat. After they returned into the camp they were dying with thirst, but the water was not filtered yet said Wooley. So they had to wait for cooking some. It was late when the dinner was served. But it was uneatable. It was so sharply peppered with that small vicious red paprika that they could not eat it. Of course there were some heated arguments and early departure next morning but Wooley got over his point. Never, but never was he visited again by snooping office geologists. He also could afford all this. He was an outstanding professional who loved his work and the life in the tropics.

The technique of routine fieldwork depends on a good organisation. The first step is usually an establishment of a base camp, which keeps in touch with the administration center by short wave radio. Secondary camps are set in places which can be reached by canoe or foot paths cut through the forest. Here a little shelter was built. Tents were used only on mobile treks for a short overnight stand. The native porters and helpers make in short time a sleeping shack from young tree trunks and branches, covering the frame with a tarpaulin. This is essential to be sheltered from the downpours which often come afternoon or in the night.

The staple food of the coolies was rice and a sort of small peas (*katjang idjo*) mixed into the polished vitamin arm rice to prevent beriberi. Our food was mainly canned meats, corned beef, vegetables or fruits and small Javanese potatoes, sometimes taro, yams or sweet potatoes. Water, available only from creeks or the river, had to be filtered and boiled. We mixed it with tea or a lemon juice preserve which came from Australia. Drinks were luke warm, but when you need three liters (a gallon) of fluid per day you get used to it. It tastes bitter because some plant chemicals cannot be filtered out of it. The forest itself does not yield any food to the untrained. Survival courses prove that. Bartering from the natives, if any around, can yield some *kladi* or sago, but this only in an emergency. Hunting some birds or a kangaroo was an exception. There was seldom time for that. New Guinea is poor in protein sources.

At sunrise, when the cacophony of the night changed to the sounds of the day, I crept out from my perspiration covered cot to start off, after a strong coffee and a long drink of tea, into the forest. To reach the area of the daily programme, capping of a path with the aid of the hand compass becomes a routine. Because of a thick layer of weathered rock which is often more than six feet, samples of fresh rocks can be collected only in small creeks or rivers where the weathered rubbish had been washed away and the waterlevel was low. Routes investigated and cut, were marked with numbers on trees to enable the topographic party to measure the distances and heights. Sample locations and attitude measurements were also numbered and noted. Back in the camp the routes, creek or river courses and outcrops were plotted on a map to construct anticlines or occurences of older beds to get an idea about the prospects of oil. When gas bubbles or brown fatty oil seeps were located on an anticline, excitement and satisfaction were great. This could mean an eventual promotion or a contract into a nice place or a country for reward. Employment policies of the Shell Group's BPM were fair, correct and humane. Pay was very good and there was a substantial pension fund and a generous retirement pay after fifty years of age in tropical service.

The geologists first maps were only the beginning of the exploration job. If an area became prospective, new geologic parties went in for more details. This was done by hand drillings or shallow wells, test pits and closer investigation of the samples for sequence and age. Geophysical methods, seismic and gravimetric followed or were made independently where geologic surface methods could not be used, for instance in swampy lowlands. The Seleh fields were discovered by geophysical methods,

the other fields by a combination of four methods.

Test drilling for oil production in the tropics is a very costly undertaking. Roads had to be built in the thirties or forties, though today helicopters can take over the transport of material and riggings to the locations.

After I arrived, I got the rather monotonous task of working on the aerial photos on the Salawati Island, and the Rombombo Group. Later, after my return from the Rombombo and Salawati exploration I got the horrid limestone region of Kumawa to work out where later Dr. Wooley was wounded by a crocodile. I asked them to send me to this area for a reconnaissance trip, but Dr. Wooley arranged it to go himself because he hated the office. So I got the island of Biak instead with the promise to go there and make the ground check. Biak was well populated and interesting and I was glad to go there. To my chagrin I got the lymphatic infection and had to be operated on, spending six weeks in the hospital, and a short time later was evacuated and transferred to Cuba as chief geologist.

Conquering the Carstensz Mountains

A mountain climbing expedition to reach the top of the 16,503 feet high Carstensz snow mountains at the headwaters of the Otakwa Stream, was conducted by members of the BACOPA. Dr. A. H. Colyn was at that time chief administrator of the enterprise in Babo for the Shell group in Holland. The two other members were Dr. Dozy, geologist and Mr. Wissel, a pilot. An able sportsman and mountaineer, Dr. Colyn was the son of the Prime Minister of the Netherlands. Without the tacit knowledge of the Hague Office he prepared for an assault of the snow mountains, sending out a party to cut a path into the Otakwa valley from the south coast. This work took three months and was plotted from aerial photos taken from the companies' planes. Areas for parachute drops of food, tents and outfits were plotted also.

Previously, two attempts were made to climb the peak. Goodfellow in 1910 and Wollaston in 1913 tried but could not reach the summit. Dr. Colyn with his two companions with a few Borneo Dayaks reached the top in two weeks and planted the "orange-blanje-bleu" flag of the Netherlands at the top of the glaciated snow field. The route was 55 km by motorboat from Aika at the coast till the prauw bivac and a 45 km climb to the "Alpine meadow" where supplies were dropped for the party by 25 kilogram parachute packages. The weather at the top was inclement, very cloudy with dense fog and snow which made the climb hazardous though alpinistically it was not too difficult. The peak is a slanting plateau covered with "firn", frozen compact snow. The temperature on the top was +1.40 C (34 F) at 5000 m, at the 4350 m camp at the Alpine meadow +5 C (41 F). The most interesting and important discovery was a broad band of copper, a malachite mineralisation, maybe one of the richest in the world at 3700 m. This green copper zone was observed about 100 km to the west also and seems to be continuous.

The party also met a small Kapauku mountain village at 1800 meters, and were enthusiastically welcomed by the natives. Here arose an interesting behavior problem. How would a group of humans, living in the neolithic period react if they would, by some miracle, come into the civilization of the twentieth century? How would all the technical achievements like ships, autos, airplanes, radio or TV impress them? The answer to this question came when a group of seven Papuan aborigines came for the first time into contact with modern times. The reaction was however somewhat unexpected.

Previous aerial reconnaissance showed a small settlement in the midst of the forest on a crest of two dozen huts in a height of about 5000 feet. Because of practicable footpaths, this spot could not be avoided by any means. The climbers had to pass just over this place. Nobody could tell what type of natives are living there — hostile, neutral or friendly. They certainly never had any contact with civilization, because the coastal tribes had none either. And contacts with Papuas there were usually on the unfriendly side. So it was decided to butter them up — to parachute gifts to them.

This strategy worked only too well. When the climbers reached the place, the small population received them as deities. In their animistic world, they obviously believed that they are spirits and this was all right with them. They did not understand each other. There was no interpreter. All the climbers learned from them was *nak-wa*, an affirmative word like fine, good, OK.

When the group and the Dayaks returned after the successful conquest of the highest snow summit, there was a new commotion and problem. The whole population was ready and decided to go with their new spirit friends. To leave their dreary fog bound mountain village and follow the spirits to the land of abundance of iron axes, food, tobacco and red cloth which fell to them from the sky.

This decision put the alpinists into another embarassing situation. After long palaver in sign language the number was reduced to six adults and a boy. So with all their earthly possessions, a small net bag with some bamboo boxes, and a rottang girdle, they marched with the new friends to the coast to go to Babo, the center of the expedition some three hundred miles away.

The seven Kapaukus were transported from the base camp on the Upper Otakwa by outboard motorboats to Aika where the motorship "Sudu" waited for the returned expedition. There was no special astonishment or emotion expressed by the group about the outboard motor, the ship or the electric lights on the boat. They accepted all those wonders of the civilization stoically as natural manifestations of the spirit world. Transferred from the ship to the airplane did not impress them either. They saw the big bird roaring in the sky, so what about that? It was *nak-wa*. All was *nak-wa*. They felt secure, protected, had full bellies, so everything was all right; *nak-wa*.I was in the hospital recuperating when they came to Babo. Dr. Hartogh, our doctor took the group to the hospital for anthropologic examination, as measuring the cranium, height, weight, tooth cavities, blood group and to make other tests. I helped him like a sort of assistant. They were of course not clean people. They had B.O. and were plain dirty. So I went to the water faucet to wash my hands and turned the faucet on. With that an unexpected thing happened. The group started to stare at the faucet with the running water. An exciting chatter and running to the wash basin interrupted the doctor's measurement of their skulls. Bedazzled, I closed the water faucet only to excite the people even more. When I opened the faucet again there were new cries of astonishment and excitement. Now one timidly tried it himself. It worked. Water ran. Turn it — water closed. Now everyone wanted to play with that magic. We could not continue with the gang. They thronged the wash basin to open-close, open-close indefinitely. Airplane, radio, electric light, ships, even flashlights were accepted as attributes of the spirit world they came into. But to turn a faucet on and off was magic.

The group returned to their village loaded with matches, flashlights, tools, cloth, though to their regret, they could not get a magic water faucet to bring home. There came rumors that they had difficulties with some other tribes who ambushed and robbed them but nothing positive was known about this. The directorate in Holland was not enthusiastic about the enterprise at the expense of the BACOPA, but in view of the national achievement closed their eyes and the three members got a decoration from the Queen and wrote a book about the "Eternal Snow of the Netherlands". Dr. Colyn was transferred to Batavia and died later in a Japanese concentration camp in Java.

The Salawati and Rombombo Expedition

With the beginning of 1937 I finally got my long expected opportunity to leave for the field. The assigned territory was at the northwestern tip of the Vogelkop, a group of small islands: the Rombombo Group with the islands Dom, Jefman, Matan and Tsiof. Also planned were the investigation of the eastern shore region of the largest island, Salawati and the island of Warir. I had previously worked on and mapped the area in the office from aerial photos and had a good idea what to expect.

The Rombombos were a cluster of small coral reef fringed islands built up by conglomerate sandstones of unknown age and were intruded by volcanic veins or igneous dikes. They were easily accessible by launch and the work on them was easy, interesting and pleasant. Salawati and Warir were greater. They measured about 25 x 35 miles and were separated from the mainland by the twelve miles broad Seleh Strait. The two islands seem to be shifted by a long ago tectonic process towards the west, because they were a perfect continuation of the mainland. Salawati is geologically the west continuation of the mainland with a range up to 3000 feet high along the north coast. The southern half is a twenty miles broad swampy stretch. There was plenty of evidence that the later discovered but already suspected Jef Lio and Klamogen oilfields on the mainland continue toward the Salawati hill zone. Airphoto analysis found also evidence of a continuation. The Seleh fields also later discovered in the swamp region of the mainland, may continue also towards the island, because a particular drainage pattern indicate the presence of an anticlinal uplift.

The Rombombo job was based on controversial opinions about the age of a certain conglomeratic (mixed-pebble-sandstone rock) formation called Asbakin Conglomerate. The idea was to look for limestone pebbles in this sequence because it was supposed that it was of Cretaceous age (about 100 million years old) but Drs. Stauffer and Todd believed it to be a younger formation of about one million years old and belong to the Plio-Pleistocene. This was important because oil bearing sands were found in older beds than the Pleistocene. By a streak of luck we found a limestone chunk in the conglomerates of Tsiof Island. The sample proved to be Miocene, from the small microscopic chalky foraminifera (bugs) in a thin section. Limestone pebbles are usually rare in the Asbakin formation because the rock is easily dissolved when exposed to weather. So the age was settled, and the proper color and classification of the beds could be put on the geologic map.

The trip to the Rombombos looked to be fascinating. It was an island hopping with a comfortable base at Jef-man in the abandoned buildings of the now seldom used airfield and a good jetty. A second base camp was built in Kelobo, a pile village on the narrow Lenna Strait between Warir and Salawati. Trips to the islands were made in a flat bottomed open boat with an outboard motor which were only a few nautical miles apart. Though we had sharp and clear aerial photographs of the small island, nothing could be concluded about the type of rocks they were composed of. We found there all belong to the Asbakin group with some volcanic rocks of even younger age, because the intrusive or lava veins broke through the settled gravel and sandstone beds. Volcanic activity along the northern coast of the Vogelkop is quite recent and the only active volcano of the island is in the Arfak Mountains of the Tamrau Ranges on the Geelvink Bay. This area is not explored yet. Nobody climbed the volcano or volcanoes and since oil and volcanism is not compatible, no air photos had been made in the mountains, which anyway are usually in clouds and fog.

The small motorship "Sudu" had about 1200 tons capacity and a rugged Dutch captain. He was in his thirties and a loud slender six footer. He did not like geologists and this was mutual. There was gossip about him, especially on the Queen's birthday when he appeared on the festivities with a decoration, so it was whispered he never could have been awarded. Well, who cares in New Guinea anyway. But the ship's captain was a good sailor and steered his boat over difficult and uncharted waters safely without mishap. Navigation in these waters along the shallow muddy shores never charted in detail is a risky business. Reefs, shoals, sandbanks and mudflats need a cautious operation. Tides, changing gravel and sandbanks at the estuaries are not calculable and hazardous. Geologic parties usually use waterways only for transport. Flat bottomed open launches with outboard motors are used which are little seaworthy. Therefore the captain tries to anchor so far as possible from the shore, but the field parties want to go as near as possible to gain time and run less risk. This starts controversies and public relations become sour. The reception I got from the captain was not the friendliest, but I did not care because I heard about his aversive reputation. I had only to spend two days on this bilgewater smelling ship with my men anyway. There was a good but hot passenger cabin near the engine where the temperature was up to 100 F. all the time.

We started in good weather one afternoon and after a hot night in the cabin arrived next afternoon at Konda, a small government post at

the Kamundan River. This waterway has a peculiar shape. It is only ten miles long and at its end at the headwaters which come from a swamp, a half mile broad. It seems that it is an abandoned old river mouth, fed only by extensive swamps. This extensive belt of swamps follows the entire southern part of the Berau Bay or the northern shores of the Mac Cluer Gulf. In those swamps millions of sago palms thrive, which is a staple food of the aborigines. Konda was base camp for several field parties who went into the interior of the Vogelkop. Later with the help of our Sikorsky amphibians the base was shifted to the Amaru Lakes about thirty miles inland. This was a big gain for the geologic parties to forage food and supplies.

Entering the Seleh Strait separating the mainland from Salawati with its countless reefs and small islands, we ran into a torrential thunderstorm with so poor visibility that the ship had to cut the engines to a crawl. In the evening we arrived in Sorong.

Sorong is the principal port of the northwest Vogelkop with an Assistant Resident, military barraks, police and a resthouse on the small island of Doom, a name nicely fitting this forlorn remote outpost. Ship frequency — once a month. The native village of Salawati is at the opposite shore on the mainland. To place outposts on islands is a wise precaution, the British practise in Hongkong, Singapore and Penang. There is better anchorage also.

After a night in the government resthouse, a sort of primitive hotel with food served by the Malay keeper, we left next morning in an open motorlaunch for the islands Tsiof and Jef-Man. My assistant went to Salawati for a stay in the not managed rest shack in Samate and to prepare with some of my Dayaks for a camp in Kelobo at the Lenna Strait. Samate is a small hamlet with a live "Radja" or sultan who is a nominal native regent of Salawati and Batanta. There are only a dozen small huts with a rather well kept and fenced street. The house of the radja, who stood aloof, was a larger thatched shack with a bamboo fenced court and a small cemetery with islamic type graves. A momento of bygone spice boom days, an old iron cannon lay near the fence, salvaged from a wreck of an unknown warship or a spice trader.

The eastern part of the Vogelkop and the islands as Batanta, Waigeo, Misoöl and Salawati-Warir did not yield spices because the soil was not volcanic as on Ambon, Banda and the Halmahera group, the home of the nutmeg and clove trees. The languages spoken along the coast are of the Melanesian group spoken in South Halmahera.

There was an early colonisation of the area in the Moluccas and West New Guinea, which developed from the fourteenth century coming from the Halmahera group. The realm was called "Radja Ampat" or the empire of the four radjas, which were Ternate, Tidore, Halmahera and the West Vogelkop till Biak and Japen. Sukarno's claim to "Irian" was based on the Indonesian colonisation and the slave and spice trade of the sixteenth and seventeenth centuries. The area is an entire different ethnic entity and the present situation is an outright colonial rule of a bankrupt and incompetent imperialistic regime without outlook for progress or improvement of the primitive subjugated population.

The Radjas of Tidore who had large families sent relatives who were out of grace to outposts as governors who founded subdynasties and assumed titles. The Radja of Salawati was a Mohamedan and the graves near his compound testified to it. There was even a small thatched mosque to emphasize his Islamic ties.

The island fo Jef Man is a twenty-four square kilometer large coral reef with an airfield and a conglomeratic ridge in the center. At that ridge in a small cave we found a few primitive raw cut wooden figurines or *korwar*s, the natives placed in honor to the spirit of their dead ancestors. The Papuan guide became worried when I showed intention to take them with me for my collection of Papuan ethnographica. Realizing this, I did not touch them so as not to hurt the feelings of the natives and respect the customs of the fishermen who visit the uninhabited island time to time. Later I purchased a similar korwar from a native in Tsiof because the figure developed a crack and the spirit departed from it. So the men had no qualms about the deal. The natives readily carve korwars on request. But those used for ceremonies are untouchable.

From Jef-man we visited the little 300 m large coral fringed island of Matan about 4 km away. It was with reluctance that the guide came with us. The natives believed that the waters around Matan were haunted by a giant

octopus, a *gorita*, a dangerous monster who has taken prauws into the depth and drowned and devored the victims. A fisherman, a woman and a Chinese trader were drowned by the attacking octopus. Our outboard motor made a prohibitive noise and we had a carabine ready just in case. Of course nothing happened and we landed safely on the rocky shore.

I was a bit sceptical about the tales, till looking for samples on the low hill, I ran into a peculiar contraption erected between the trees. It was a rough wooden platform with a carved native canoe on top. The natives offered the image of a prouw to placate the evil spirit of the octopus. Abandoned plantation with decaying huts and tabu signs indicated that the waters around Matan are infested by bad spirits and the island is visited only time to time. We met a native on the shore roasting a huge sea turtle for dinner. He confirmed the story of the giant polyp and the dangers to the land on the small island. After the observation of Miss Cheesman in Waigeo, the whole story seems to be quite real, though nothing can be said about the size of the octopus, only according to the natives it is "besar betul" (very big indeed).

From Jef-Man we transfered to Waiwo in Salawati, a "village" with a single inhabitant and a few abandoned and decayed huts. We had as coolies a dozen Dayaks, warriors. excellent bushmen and experienced hunters, who came from Long-Iram at the Mahakkam river in East Borneo and were employed by the oil companies as helpers and transporters of field parties. Every group had a *mandur* or headman who managed the group. They had already prepared a neat bush camp before our arrival.

Dayaks were chosen by the company because of their reliability and stamina. They were formerly headhunters as most protomalayan aborigines, but were since a half century or so "Christianized" though holding on to their old customs, habits and superstitions. They all wore their long sharp swords (war *parang*s). Some even brought their shields with them. They detested and loathed the Papuans and believed all natives of New Guinea to be deepley below them in culture. The difficulty was to keep them from making trouble with the natives and restraining them from doing so. Dayaks are very clean and neat —they bathed daily— so they looked at the natives as dirty unkept savages. Once on a trek through the Salawati forests we had two Papuan guides who led us on a path towards an abandoned *ladang*. The two were followed by one of my Dayaks who suddenly stopped and started to vomit. Following behind him I asked him if he felt sick. Leaning on a tree, he pointed to the two Papuans and said, "I am not sick, Tuan, but I can't stand those two. They stink."

This antagonism was a reliable guarantee that in case of real trouble the Dayaks would fight rather than switch. With exception to one case, when Dr. Bremmer's party was followed by Mondok Papuans at Mention till Misenda on the Upper Sebjar River, because a pig was shot by the Dayaks belonging to the clan, no direct hostility was encountered by the field parties.

My Dayaks came from Long Kajan, near Tarakan, East Borneo and were of the Loung Gadjo tribe. They were hard working loyal boys and the *mandur* a fine hunter. He was always with me, carrying my rifle or shotgun, to improve our somewhat monotonous diet. Treking through the forest and deciding to make camp, the place was cleared under the direction of the *mandur* in the shortest time from underbrush and small trees and a platform of saplings erected for the tent. Firewood, ratan, was collected, sleeping place for the Dayaks built, the rice cooking and the dried fish sizzling in coconut oil.

From Waiwo we investigated the northern hilly region of Salawati, an area covered by dense primeval forest and cut by countless small creeks and side tacks to be looked after. Geologic work is a search for "outcrops", bare rock, found only in creek beds. The soil cover in the tropics may be at some places six feet thick and the not weathered or not decomposed rocks are found often only at twenty or more feet in depth. Erosion takes care of washing away the waste, cutting deep into the rock layers. Hence geologic mapping in rainforests is a wading in creeks and rivulets for hours every day, using special shoes of canvas and leather where the water can come in or out. Because the heat drenches everybody in a few minutes, wet feet do not matter. "Creek running" as geologists call it, is a standard procedure and a daily routine.

From Waiwo on the coast we made some routine excursions into the interior, a steep hilly densely forested area cut by small creeks.

The coast bordered by broad coral terraces — fringing reefs— made approach even in a small outboard motor boat hazardous and cumbersome. Walking during low tide on the chalky mud covered coral platforms results often in sinking into muddy holes.

After several excursions along the coast and into the mountainous interior of the north coast, we set up a new camp at the narrow mangrove fringed Lenna Strait between Salawati and the island of Warir at the small village of Kelobo. A part of Kelobo is built on piles, another on the mud flat of the strait. All buildings are connected by a broad walk on piles which serve also as jetties for the outrigger canoes. One of the largest houses was abandoned and the entrance way blocked by long sticks and branches. We were told that recently the house had several cases of illness and death, caused by evil spirits. The tabu signs were set to drive away the bad influences. After a time the house can be used again, a common sense health rule. Not far from this house a large tree was decorated with a dozen giant sea turtle shells, indication of abundance of the big turtles, a welcome food for the natives and said to be very tasty. This display seems to be substitute for ancient head trophies.

The Kelobo tent camp was set to explore the Monaibi Ridge on Salawati and the island of Warir. Both had low strongly dissected hills of about 200 to 300 feet high surrounded by mangrove. On Salawati the population is very thin; only a sporadic shift cultivation in the hills with abandoned half rotten leaky huts; in the Waibu valley — here and there mark primitive *ladang*s. At its northern coast Warir has a fishing village like Kelobo, which is defended by a broad coral terrace with two inlets. The rest of the coast is fringed with dense mangrove. The only hilly feature of the island is a 200 feet high ridge which had to be investigated. Few excursions into the forests of this desolate lowland taught me a lesson about the creeping faunal inhabitants of New Guinea.

One day, not feeling too well, possibly by a latent malaria attack, I checked the Waidji creek in the low hills, where overcome by a weariness and fatigue I laid down on the ground to rest for a few minutes. Feeling better and returning to the Kelobo camp in the afternoon, I felt terribly itchy all over my body which became covered with scores of red spots from tiny mites, arachmids, preying on birds, busily drilling themselves into my skin to feed and lay eggs. Fortunately my medical chest had the right bottle — a good dose of kajuputty oil (extracted from Eucalyptus tree leaves) which I applied to the red spots taking care of the small intruders. The smell of the oil is a bit offensive, but helps to keep away the mosquitoes and land leeches also.

After the battle of the mites another episode happened a few days later. Also in Warir, where hundreds of five inch long and one inch thick centipedes, with over a hundred and twenty segments and 240 feet thrive. I thought they were harmless. Similar ones I found in Celebes seemed to be indifferent and curled up defensively when touched. I had fun seeing my Dayaks protesting vigorously when I picked up some of them. Very soon I learned otherwise. Examining one curled up specimen nearer I suddenly felt a horribly acrid spray hitting my face. It hit me fortunately only around my mouth and hand and not in the eyes. I desperately tried to wash away the sharp burning malodorous spray from my hands and face with water wich seemed to be obstinately clinging on my skin for hours after. The Dayaks did not find it funny and helped to smear black mud on the skin, which relieved the stench and burning. I returned to camp looking like a Papuan on warpath.

There were several excursions into the hilly areas along small creeks in search of rock outcrops. A topographic party surveyed the route taken. Salawati is very thinly populated because there is not much suitable ground to cultivate. The northern part of the island is mountainous, the larger southern part swampy and impenetrable. Millions of sago palms grow, collect sago to turn into fruits and die without being used for staple food. The natives are lazy because a single tree takes care of a family of six for a couple of months. Some hunting and collecting is done and a small *ladang* is enough to supply vegetables, as *kladi*, sweet potato roots, some red pepper and small tomatoes.

The natives of Salawati are Papuans of part Melanesian—Polynesian stock. Indonesian influence from Ternate, Ambon or Ceram is minimal. The type — negritic features and curly hair is predominant. We met only a few of them. The entire inland population of the area may not be more than a few dozen. There are no permanent villages save the

coastal fishing hamlets. A few empty delapidated huts on piles, some in bad decay stand on abandoned overgrown old ladangs.

Because of the hot tents, once or twice abandoned huts were used for shelter. Cots, mosquito nets, metal boxes for luggage were placed into the shaky contraptions with leaky thatched roofs. Next day in the morning, I wanted to take a dry shirt out of my tin box luggage when a strange humming noise came out of my box. Opening it, hundreds of big and small cockroaches swarmed out of the luggage where they crept in during the night. It took a time to unpack all the luggage to chase out the hiding hungry agressive insects which had lived and multiplied on the rotting refuse and sago rubbish under the hut. So we learned our lesson not to use old *ladang* huts. Papuans are not clean like Malayans. Indonesians like Japanese are rice cultivators and working in the muddy rice fields, bath daily and keep clean. Papuans too, work in the mud when they cut up a sago palm but this is only two or three times a year. The rain washes off the dirt and a scaly disease (ring worm) gives their appearance an even more dirty shaggy trend.

Pitching another day my tent at a small abandoned plantation, I was shaving in the morning when two naked Papuans with spears entered uninvited, silently curious but nonchalante, crouching on the ground observing me and my shaving with keen interest. They felt it is their right to investigate because we were on their territory. They were harmless good natured fellows and I hired them for the day as guides. We needed a short cut to the coast and the interpreter, though he could not speak their tongue, could somehow make them understand what I wanted. Interested in their habitation and to repay the visit, I asked to be led to their huts on the way to the coast. The two led the way but one suddenly disappeared. As we later found out, he took a short cut to their house to warn the women and children to hide in the bush. When we later came to their hut only a few men were present. They posed willingly and accepted some tobacco. They seem to be rather afraid of my Dayaks than of myself. Because of the bad odor and dirt I restrained my ethnographic curiosity and did not enter their habitation. Containing a fire place, some sleeping mats and other paraphernalia as nets, tools and cooking utensils, I saw from outside.

Later I passed some graves of this people. A broken hour glass shaped drum indicated that the Papuans of northeast Salawati may have come from the hour glass drum culture group which are living along the coast of central southern New Guinea. The grave had also two bird shaped leaf weavings, a nipa palm roof, Chinese cups, saucers and plates with food and an oar. Nearby an older grave had only some plates. It is likely that the funeral China is reused again after a time.

Before our return to Babo we made a deeper incursion into the interior. Camping in a rather new hut at Aibemkri, a runner coming from the radio station in Sorong brought me a telegram. My father in Budapest had died ten days earlier. A much decorated hero of World War I, Commander of the Austro-Hungarian Twenty-third Infantry Regiment, he visited me with my mother in Sumatra six years earlier. When I got the message coming from Sorong by sail prauw and by runner, my father, seventy-one, was a week ago buried with military honors in Budapest. Broken, laid motionless for hours in my cot staring at the thatched roof of the miserably little hut.

The MS "Sudu" with its controversial skipper picked up my party in Sorong and we returned to Babo as planned. It was decided that after working out the results at the base I would obtain the commission to take over the test drillings on the broad anticlinal structure we discovered on the air photos and make the crossing of Salawati. On arrival, there was the usual first walk to the hospital for a check up for malaria tripanosomes and amoebas for dysentery. The surprising discovery of sporadic specimens of all three types of malaria parasites — tertiana, quartana and tropica in my blood was stunning. It turned out that I was a carrier, immune to the sickness, because in spite of being infected with an assortment of micro organisms I had no malaria symptomes. As a matter of fact I never had malaria in Sumatra and Celebes where I spent six years in the remotest rain forests. At the end of the thirties we had only quinine and atebrine for medication. An atebrine cure turned the skin yellow and the patient got a bitter taste in the mouth for weeks which ended the hospitality to the tripanosomes. So they also turned yellow and left.

In Babo for a month I worked on the aerial photos, completed in the meantime the map of North Salawati, in preparation for a cross-

ing of the island from the north coast over the mountains to the anticlinal foothills in the swamp forests. The idea was to construct a geologic cross section of the mountain range to find out about the source rock of oil, rock formations to be crossed by the drills, porous and impermeable beds, favourable or not favourable for oil accumulation or reservoir rocks (porous sandstones). The photos showed that the Salawati Range was covered by high forest and cut by deep intricate valleys. There was also an area of rounded hills which had a strikingly different vegetation; instead of close canopied rainforest the area had a character of a park landscape with scattered tree growth, shrubs and herbs called a savanna, which is very rare in the mountains. This was an interesting problem suspected to have some relation with the soil or rock type, not favourable for tree growth. So this area was included into the itinerary, needing a considerable detour but an outlook to pin down the reason. To find the area by the use of air photos in the field was contemplated, which turned out to be a big flop. To locate a position in a dense forest covered mountains from air photos even if a stereoscope is used is hopeless, because there is no reference point like a broad river bend, a coast line or a land form one can identify on a photograph taken vertically from 20,000 feet height. Crossings through moutains where no paths are is a difficult task and it must be planned well not to end in disaster. Transportation on land and water, of food and equipment is the main problem of exploration. Good planning is half the success. After two months the maps constructed in Holland arrived and the preparation of the trip began. My Dayaks who travelled with me on the Rombombo expedition were sent to Biak (Schouten Islands) to another party but by some reason they did not like the idea of working there. When they heard of the new Salawati venture they asked to join my party again. To keep the Dayaks in good spirit, out of policy, the company agreed with their request and I got my fine Dayaks to our mutual satisfaction back again. Their intelligence, reliability, loyalty and experience helped us very much. After crossing the mountains we ran into the big swamp forest and found the twelve mile path they hacked without compass to meet us and to reach the new base camp in the hills.

One afternoon in April 1937 we left Babo on the MS "Sudu" for Salawati. Next afternoon we arrived at Konda at the mouth of the Kaibus River with provisions and mail for a party working in the inland. The sea is very shallow at the river deltas in the Mac Cluer Gulf and navigation is difficult. In these waters swarm the smallest fishes of the world, a half inch long transparent creature. To mark the shallows the company set some marker tree branches into the mud to guide the ship through the channel. This is good in daylight, but not sufficient in the night. But we had moonlight and the captain took the risk. Next day we entered into the Seleh Strait which is full of coral reefs and also hazardous to navigation at night. A big downpour slowed down the boat. Next morning at Waibu our old camp, material, tents, food and our Dayak coolies were landed. We proceeded from Waibu to Jef-Man where in the empty airfield buildings we spent a mosquito free night. In the morning we boarded a small motor launch, the "Bulian" to go to Samate, the ten hut capital and sultan residence of Salawati, but at our arrival, because of low tide, we ran into a shallow. It took us two hours waiting till the small motorboat could be floated again. Sea charts in this region are incomplete and at river estuaries the position of shallows and gravel banks change frequently. To reach the land, careful navigation and observation of tides is necessary, best with help of local native fishermen as guide.

Some additional investigation along the coast from Samate, which had quite a decent resthouse or *baruga*, had to be done. The Cape Majaslawa promised some interesting conclusions about the character and attitude of the rock formations. The peculiar shaped conglomerate rock of Bam was difficult to approach because of direct exposure to waves of the open north Pacific, but a big rock on the coast promised good identification and collecting samples. An interesting cluster of earth orchids growing between the herbs of the rock had the shape of a pineapple and called our attention. Later we visited an oil indication at Wai Fiavet near Samate seeping out from a sandstone in a small creek. It was surprisingly fluid and light in color, containing much gasoline components. Shallow test drills later found a very light crude oil at the Waibu anticline, which almost could be used in the outboard motors. But the quantity was so small that deeper tests were not made and an oilfield never was developed.

I purchased two tree kangeroos (*lauh*) from the natives who snared them. I did not want

them for their tasty meat, but to observe, photograph and release them later. To my chagrin, one died within an hour, the other two days later. The natives told me that they cannot be kept in enfenced captivity in spite of proper vegetarian food. They just refuse to eat and live any longer. They have a soft thick light brown pelt and are about four feet high.

The plan of the Salawati expedition worked out in the Babo office asked for an established base camp in the interior, about 15 km west of Kelobo at the Lenna Strait. Clearing the site about in the center crest of the anticline, the idea was to drill a cross section of shallow wells to determine the most prospective place to set out a deep well later. There was also a chance to find some shallow oil in the drillings.

To build a camp in the middle of the rain forest is a hard job, finding a dry level ground not involved by floods, cutting smaller trees, shrubs and collecting building material to construct shelters. Old *ladang*s are very useful for camp sites, but we had none in the area to be drilled. The region was swampy and just not favourable to establish a good camp. After several attempts to clear a camp site in the prospective area, we finally settled on a low gravel terrace along the headwaters of a west bound creek which had no name. We decided that during the preparation of the camp I would cut from the north over the mountains to the lowland in the south central part where the camp would be built.

According to the air map, the shortest route was from the Waijaar Bay between Cape Jupleket and Ajmuri in the Sagewin Strait between Salawati and the island of Batanta. The air distance was about 15 km of pathless mountain, hill and swamp forest and would amount to at least 30 km of cutting paths up and down. There was a trace of a foot path from Waijaar leading from this village to Samate, but only a partly overgrown section of 3 km could be used of this luxury. From there, only the air photo map and the compass had been all we could rely on.

We started from Samate with eight Dayaks, a native topographer with two Javanese helpers and my boy Abdul, a Celebese, on the motor launch, "Bulian", which towed an outrigger prauw with the Dayaks and the luggage, food, tents. The foreman of the Dayaks and a few men went in advance two days before to prepare shelter and hire porters and a guide form Waijaar, a small village in the bay surrounded by steep forest covered mountains.

In Waijaar lived a German couple who had there a solid plank house and a vegetable garden. They made their living by selling fresh vegetables to our company to Babo. I was also a private customer for fresh greenery as salads, radishes, cucumbers, tomatoes, carrots, potatoes and some native vegetables as *obi* and *kladi*. I met the man in Babo once and he invited me to stay in his place should I come to Waijaar. I never found out why he came to Salawati, one of the most remote uncharted, unexplored and lonely islands of the Pacific. He was sometime ago in Obi, another lonely island of the Eastern Moluccans. He made a strange impression on me and I later found out why.

We left Samate in the morning in fine weather and rounded the northeast Cape of Salawati through heavy swells coming from the open Pacific and entered the deep blue waters of the Sagewin Strait. Right and left the green steep rugged mountain chains of Salawati and Batanta bordered the strait, thickly covered by high trees and dense underbrush along the coast. The shore loomed forbiddingly, densely canopied and dark green. That was the mountain chain I had to cross and it was not a very encouraging sight. Petroleum geologists seldom work in mountains. Oil is mostly found in lowlands or hilly areas of basins. In Celebes, Sumatra and Borneo I had only rarely entered areas with a topography over more than 1000 feet. Those here were about 3000 to 4000 feet high and very steep. Maps do not help much, because orientation is near impossible in a dense forest where you can see only a few feet. The only way is to follow water courses.

All of a sudden a shout from my man interrupted my brooding, "Ikan besar!" thay cried pointing to two big ten feet white sharks circling the boats. They were not impressed by the motor noise when they rushed and circled nearer and nearer to the "Bulian". Sitting on starboard I drew my Police Colt and tried to take a potshot at the greyish spotted bodies of the fishes as soon as they whizzed a few feet from the rocking boat. I shot several rounds at them, but they seemed faster than the bullets and to our relief left us after a few more passes. I doubt that the shots wounded them or had they been chased away by the shooting.

In the afternoon we arrived in Waijaar and were received by the Malay teacher and his Papuan pupils who sang a song of welcome to us. The German couple also waited on the jetty. We went to their well built house with a thatched roof and palm leaf sidings and European furniture. Behind the house was a large vegetable garden. The seed of the temperate zone vegetables, which would not germinate freely in the warm humid climate, are acclimatized in mountain regions of Java and sold all over Indonesia. At a drilling project in Celebes I used also assorted vegetable seeds, mainly radishes, salads and tomatoes successfuly. In virgin soil the latter came up very well. One single fruit had a weight of two pounds. Radishes were eatable after three weeks; beans grow also rapidly. If there is no shift cultivation, the problem with vegetables is fertilizer. Since the purchase and transport from Java was too costly, this was solved by the couple by building a double outhouse and compelling the natives and school children to use it in exchange for free vegetables. Next morning when I realized this situation, I became somewhat disgusted and suspected that the amoebal dysentery may have come to the Babo mess hall and myself from insufficiently washed and disinfected salads. Fresh vegetables are essential in exploration work where food comes mainly out of cans. Canned stuff is void of C vitamins and constant replacement is necessary. The forest does not furnish eatables we are used to and therefore the canned diet alone weakens resistance of the body. The best C vitamin source is citrus fruits. So we had always a good amount of oranges and lime with us if available. In Waijaar were several fruit trees and we could purchase a quantity of lime, the traditional antidote to scorbut from the sailship days.

Passing through the inland forest in Warir, I found along a creek to my surprise a wild citrus tree with fruits. The leaves had the characteristic citrus smell and the fruit, green, but obviously ripe had a size of a small lemon. Cutting the fruit I found that the skin was almost an inch thick and the greenish fruit flesh of the size of a walnut, sour, bitter and uneatable because of many seeds. Too much seed with little flesh stands also for the wild banana. The small fruit is full of hard black seeds, the fruit flesh tasty and sweet but so thin that hundred fruits wuld be necessary to satisfy the hunger of the traveller.

That evening I was the house guest of the German couple who were glad to speak with me in their home tongue. But what they told me made me shudder. They complained of being bewitched by the native authorities in Obi. They had a trade post before and weird fear of *guna-guna*, the native witchcraft, came up in their tales. It seemed that the native administrative assistant in cahoot with the corrupt police chief, also an Ambonese, did their best to chase the couple out to take over their business. Intimidations, staged spooky appearances and feathered straw puppets pierced with needles were found in their house and shop. Letters of complaints to the Dutch Resident in Ceram never arrived because they were snatched from the post office. All harrassment and threats employed to make their life miserable. Finally they gave in, became nervous wrecks and left to try again in Salawati.

In 1940 when Germany invaded Holland, all German nationals were thrown into concentration camps in Java and Sumatra by the Dutch. One old Dutch ship carrying several hundred rounded up Germans and Austrians was torpedoed at Sumatra's west coast —a rumor said accidentally by a Dutch submarine— and hundreds of men, women and children drowned. In the war hysteria after the bombing of Rotterdam by the Luftwaffe, this sounded like a retaliation for the thousands of Dutch civilians killed in the air raid. When the Japanese occupied Indonesia, in turn all Dutch nationals were interned again and the Germans freed. The tribulation of the Dutch internees were terrible; many died in the camps and when the Allies came back to the islands, many responsible Japanese were tried and executed by the Hollanders. The aftermath of unlucky Indonesia came to a climax with the regime of Sukarno who threw the islands into an economic disaster, chaos, war and caused a blood bath in a striking contrast to the prosperous benign Dutch colonisation period, which established and organized the best tropical economy in the world; developed copra, tobacco, rubber, oil, tin and coal mining, built ports, railroads and modern transportation means, now all in decay and neglect because of a monomaniac power-hungry, vain soap-box orator and paranoid self styled hero.

Next morning my party started out for the crossing. We could only follow for a short distance the path to Samate, because our route I

had to follow went through valleys and ridges which promised to be geologically significant. We went by compass, cutting a path in the forest, wading the creeks or small rivers looking for rock outcrops and samples. The distance covered ranged from a half to one mile per hour. Towards the evening we came to the savanna I looked for, showing on the air photos. High patches of needle trees, grassy and shrub vegetation covered a rather flat hill. The rock was serpentine, a very hard greenish-grey rock of metamorph basic igneous origin, transformed by high temperature and pressure in the depths a million years ago. It formed the crest of the mountain range and we camped down at a grassy spot for the night. My Dayaks pitched the tent, built in no time a shelter and bedsteads under a tarpaulin, made fire to cook the rice and before the darkness set in everybody was under shelter when the torrential rain poured down. When the drumming of the rain on the tent stopped, the night concert of the forest began again. Insects and night birds went on with their mating and warning calls. Snakes, lizards, rodents went on hunting for prey. The grim never ending struggle for life and survival went on and on as usual, day and night like for many hundreds of millions years.

Next day we crossed the grassland with the scattered high needle trees which cannot be found in the rain forest. The special vegetation was caused by the hard inpenetrable massive bedrock, where soil cover was thin, infertile and stony. Trees could only root in zones of cracks where the decomposed, crushed rock gave place for the roots. Now we were able to fix our position on the map to cross the shortest trace through the forest towards the camp which was now under construction.

Trusting our maps, compasses and air photos, we confidently trudged ahead, wading creeks, climbing inclinations, following ridges not to loose height, cutting our way step after step through branches, thorny rottan, creepers and thickets, thorns and leeches, the heat, the humidity and the sweat with about a gallon of fluid per day. One Dayak cutting the path with his *parang* according to compass directions, carrying two bottles of tea, sample bags, map folders and other geologic paraphernalia hacking the way ahead. Rock outcrops on small tree branches are marked with a number for the topographic party that follows at the rear of the file. Ridges, often sharp with steep slopes, are welcome for cutting paths because no high differences must be overcome. In our case we could not use them because they run mostly east and west whereas we cut our way north to south. So we had to go down into the valleys and up again to the ridges.

After two days of trudging we came to a high ridge with steep slopes open to the south with several fallen trees, so we could get a look where we might be. In trying to get an orientation from the air photos to locate the spot on the map was impossible because of the hundreds of tree tops, the maze of valleys and ridges. So there was no place identification possible. So we zig-zagged, ascended, descended, cutting and cutting again till we reached the lowlands in a drenching shower at the fourth cap. The vegetation changed considerably; trees were lower, more entangled, the ground soggy, swampy. All there we had to do was to find the path the Dayaks from the base camp had cut to meet my party. So we sent out search parties to find the cuttings. There was loud shouting when two of my men returned and reported that they found the path about a mile from the camp cut perpendicularly —in an east-west direction— to cross our traverses. This trail was a raw cut race through the swamps. It went through a low flood forest with one to two feet deep standing water. Walking was rather a balancing from root to root. Since roots are slanting, slippery and the water brown and muddy, to proceed was a gymnastic torture, jumping, sliding, splashing, stumbling into the knee deep mire. At open water stretches, the Dayaks made sort of bridges by felling trees, slippery and thin and some of the load carrying Dayaks slipped and fell into the water. The procedure was so slow that we had to camp again and sent a message to meet the party.

Next day we entered into the new base camp. My hut was half finished, a short wave radio station with operator was already established. My mail, the luggage with provisions stacked in the roofed house. The feeling of safety and homelyness was here again and the building and arranging for a longer stay began. Practically surrounded by swamps and flooded forest, the air was extremely damp and moist. The low trees had dense canopies and cutting did not improve the situation.

The path to the coast had to be improved. Working details were busy to construct a transport path with tree trunk bridges through

the swamps to the place at the Waidjaar river from where boats could be used to reach the coast. This path followed low ridges and ended at a mangrove swamp surrounded jetty of a short navigable tide channel.

For a couple of weeks we systematically investigated the neighbourhood as the work in the camp permitted. The radio station took up contact with Babo. We had now a compact two way Phillips transmitter with a trained native telegraphist. There were daily reports to Babo about activity and progress with but little interference, because Dr. Stauffer, our chief geologist, was an efficient and practical man who had understanding with the people working under adverse conditions in the forest, based on his long experience in many parts of the world. At most he was a warm human friendly person popular with his colleagues, even with the Dutch ones who usually stood aloof from the Swiss.

The activities in the camp became less and less vigorous, Dayaks and other personnel became ill. There were a lot of sick coolies shivering under blankets. Medication did not help much. Medical advise from Babo came by radio though it was obvious that the usual medication, taking quinine, did not work to stop the epidemy. One day I myself was laid off with high fever. Aspirin, quinine, atebrine did nothing. It was evident it was no malaria but a sort of dengue or swamp fever caused by a virus. Almost everybody in the camp was now sick. Work stopped. Then we got the evacuation order by radio. The MS Sudu would arrive to take the entire party back to Babo. Some of us were so sick we could hardly walk. So was I. Weakened by six days of intermittent high fever, I was unable to reach the coast walking. So they had to use a stretcher and transport me to the boat. The embarkation had to be made at about ten o'clock in the morning because of the tide. Because of the wretched conditions we all were in, we reached the boat only an hour later. The captain, shouting and cussing berated me in a rude manner because his ship could be stuck in the mud, caught in the low tide. I was so weak that I did not say a word to the rude boor, ignoring his ranting. I crept to my cabin and the boat left without trouble to Babo, because the captain kept ample distance anyway from the mudbank

As it has always been usual, I was taken into the hospital for observation. In a few days I recuperated so much that I could report for work again. So Dr. Stauffer assigned me to write a report on the crossing and to start the aerogeologic analysis of the island of Biak in the Japen Strait of the central north.This rather well populated island is today the crossroad jet airport of Mokmer, where converging air routes from southeast Asia to Australia and Japan meet. Biak and Supiori form the Schouten Islands, a group of a dozen islands discovered by a Dutch navigator of the Le Maire expedition in the seventeenth century. The name Schouten comes from the discoverer of the island. The islands have a peculiar outline. They seem broken off along a straight line and the northwest part, Supiori, seems just shifted eight miles to the southwest by a seismic process. The larger Biak is flat, with some 2400 feet high coastal ranges which reach in Supiori 3400 feet in the central part of this island shifting the tilted crest for about eighteen mile. The Schouten project was therefore an interesting problem though the outlook for petroleum was bleak, being a sunken section of the northern ranges. It has a great resemblance to the shifted central Ranges of West New Guinea from the Arafak chains where a similar crest shift, here of about 150 miles, took place along a parallel line like on the Schoutens. Since the company was not much interested in large geotectonic problems, we had to stick to the oil prospects though there were quite lively discussions in the office, interrupted only by intermittent use of the flit pump to chase away the bloodsuckers, *nyamuk*s, *agasse*s et al.

After recuperating from the dengue I attracted in Salawati, I fell ill again with an infection. It started with a small dark red spot on the thigh, caused by some bite of an insect or tick. The lymphatic glands on the groin became inflamed and swelled up frightfully so that the doctor decided to operate. So I went to the hospital again and was laid out on the wooden sheet iron covered operating table. Laying on the table I could see the thatched roof of the operating room and had some shaky ideas about asepsis of the place. The doctor used an anaesthetic, (Sodium penthotal) rather new at that time, which caused an instantaneous unconsciousness. An amazing amount of pus was drained from the cut and I had to stay for six weeks in the hospital in company of two other geologists who came back from the field with different ailments.

The hospital was well equipped and the Dutch doctors accredited surgeons. They had not an easy job. New Guinea with its unknown or unstudied ailments had a high rate of mortality, which cannot be attributed to the doctors or the hospital. There was no penicillin and the sulfa drugs were just coming out in injection form. A young Dutch geologist died of ileus, an intestinal obstruction after an operation, possibly due to poor facilities available for such a septic operation. Another geologist, as already mentioned, Dr. Schmidt, became infected but survived and later his illness was diagnosed as a rare tick fever described by Japanese doctors as Tsutsukumana sickness in a compendium of tropical medicine.

The remaining months of my two year contract was spent in Babo and because of my health, without field control work. So special projects as an analysis of the Kumawa Peninsula, a part of the south coast. Before my departure, Dr. Norman Weissbord, a good friend of mine and I got a commission to write a report on aerogeologic photo interpretation for beginners. This report, a sort of short textbook for geologists of the Shell and Standard group, had stereoscopic illustrations of the most characteristic features we found in New Guinea. To my chagrin I could not go to Biak anymore to do field research and control of the results I found by air photographs. That island was rather well cultivated, accessible and moderately populated by Australasians, Proto Malay and Papuan elements.

I was glad not to visit Kumawa. What Dr. Wooley, who was so badly mangled by a crocodil when he went to Kumawa, told us was certainly not attractive about this most miserable spot on earth. The Kumawa Peninsula is a huge old uplifted coral terrace plateau, criss crossed by mile long cracks and fissures with steep hummocks dissolved to a million sink holes of shapes and sizes, crags and sharp ridges. Uninhabited because of being impenetrable, it is covered by a forest of calcophil trees which are lower and more intertangled than those of the regular tropical rain forest. The humus is washed away into hollows and cracks and the vegetation can only survive on a thin soil accumulation. The frequent rain dissolves the limestone rock and razorsharp edges and points cover the blocks. Small sinkholes or potholes are overgrown and are virtual traps to fall or stumble into. Penetration into this hellish region may amount to half a mile a day only. Australian geologists called this type of ground "broken bottle country" because of the sharp cutting edges of the dissolved rock surface. To stumble into potholes or fall against the sharp rilled surfaces can cause serious cut injuries similar to those I got in Central Celebes. I can still see the scars on my hand writing these lines.

Because of chances to find some good prospect for oil in this region and therefore being impractical and too costly to penetrate into the region for a field control of the photo interpretation, the project was abandoned. Dr. Wooley and his party of ten Dayaks made later a coursory examination of the coast without intruding into the interior. An identical region at the western end of the Bomberai Peninsula was also written off from the prospective areas of the concession, because of too costly and difficult field control.

Epilogue

My two years contract with BACOPA came to an end. The aerogeologic report we wrote with Dr. Weissbord was ready, and he had the task to complete the details after my departure. There were over sixty stereo photos with captions of the most outstanding types of surface forms to instruct about types of rock, as conglomerates, sandstone, limestone shale, gravel or coral terraces, attitudes of rock layers as flat, inclined, dipping moderately or steeply, tectonical features as anticlines, synclines and faulting cracks. Also types of vegetation, erosion patterns and shoreline types for safer navigation. It was a satisfactory work, based on observations of a dozen photo geologist interpreters who worked in Babo for three years. I had no notion or premonition that thirty years later my textbook on aerogeology would contain several photos of this report which the Bataafsche Petroleum Company generously left to my disposition.

The monthly boat arrived on schedule. It was the same which took me to the island two years before. Also I got a little farewell party as everybody did in the messhall and on the

jetty before boarding the launch. Most of the boys were there. I felt I left friends behind. The French have a saying, "Partir c'est mourir un peu." (Leaving is a little dying.) I did not feel that parting feeling at all. I was glad to leave alive and not resting under those wooden crosses at the end of the airfield. The others would leave, too, anyway.

The captain had been replaced. He got another boat and was glad to have it. The new captain was also a nice fellow and we did not have to wait two hours till he gave the sign for the dinner. The return trip followed about the same route as the incoming. We had a member of the German Frobenius Expedition with us who investigated Ceram and collected specimens from the aborigines —Proto Malays— of the interior. He was very depressed that hundreds of photos he made were mostly fogged and could not explain the reason. He did not know, being for the first time in the tropics, that a fungus intrudes into and between the lens elements and causes the fogging. There was no help for that. The lenses had to be cleared in Batavia (Djakarta) which was weeks away. Photographic equipment as cameras, films and chemicals must be kept in perfect dry containers with dehydrated hygroscopic tablets of silicons or calcium chloride to prevent molding. We old timers had to pay for the lesson with fogged lenses and poor negatives in the tropics.

The ship touched again Makassar in Celebes and headed for Bali where I spent a few days for the third time sightseeing at Den Pasar, Bekasi, Klunkung and Buleleng. Then I proceeded with another steamer to Surabaya and by train to Batavia.

The return by plane to Holland was without events. The DC 3 planes made the return in six days with overnight stops along the route. In Holland, after a two months vacation in Europe, the company assigned me to the Cuba project as Chief Geologist, a very fine position after New Guinea. The fleshpots of Havana were in a sharp contrast with the swamp lands of New Guinea. In 1939 at the beginning of the World War, the BPM sent me again to New Guinea. Shortly after my arrival to Java, Holland was occupied by the Germans. Operations closed and I returned in 1940, December, over Siberia to Budapest.

HORST VON BANDAT'S COLLECTION FROM WESTERN NEW GUINEA IN THE ETHNOGRAPHICAL MUSEUM, BUDAPEST

JUDIT ANTONI

This collection, containing altogether 158 pieces, was donated to the Hungarian Ethnographical Museum by the geologist Dr. Horst von Bandat on several occasions in 1940.[1]

The time and circumstances of collection are described in the manuscript and a January 19. 1967 letter written to the then authorities of the Museum by Horst von Bandat. Asmat (upper reaches of the Blumen river) objects which make up the bulk of this collection, were gathered during a fortunate "punitive expedition" in 1936, following the pacification of the native inhabitants.

"Planes were used frequently by our expedition to provision the field parties. Once planes saved a party being attacked by a whole tribe, maybe two hundred warriors on the South Coast. The party camped upstream along the Blumen River which had an ill repute of hostile villages with warbound Papuas. The party was of one white and a dozen militant Borneo Dayaks. There was only one carabine and little ammunition. The Dayaks had their *parang*s but that was all. Fortunately they had a radio transmitter. The second day of camping two Papuas came to the camp, but did not accept tobacco or cloth. They just looked around and left sulky. The next day they came again in their canoe and left on the shore a little bamboo stick with blood and feathers on it. This is a *por* or an official declaration of war. In this case it meant get out or else! The leader of the party immediately made contact with Babo by radio, reported it and asked for help. Next morning two hydroplanes zoomed up from Babo, the headquarter of our expedition, with police and just in case, some dynamite sticks for bombs were loaded, too. Another police detachment left the same night from Aika by motorboat to go upstream. In the morning the hastily fortified camp on a river bend saw a row of war canoes with twenty to thirty men each coming down the river. The men standing in rows in the dugouts rowed furiously. But the same time the Sikorsky hydroplanes came in. Roaring from behind, they buzzed the startled warriors. The Papuans became so panicky that all jumped into the water in terror and fled into the forests. The upcoming police from Aika found only empty floating boats. The tribe was not punished. Nobody was arrested, all vanished into the swamps. A massacre had been bloodlessly averted with the help of airplanes and radio. A short time later this warlike tribe was pacified and a shipload of ethnographicas, like shields, arrows, stone axes, head trophies and wood carvings were bartered with knives, nails, axes and red cloth. The collection went to museums in Switzerland and Holland. The duplicates were distributed as souvenirs to anyone of the staff who was interested. A collection from this not yet studied part of the south coast, in former possession of the author is now at the Hungarian National Ethnographic Museum in Budapest." (Horst von Bandat: "Recollections of my New Guinea trip").

Thus, as the manuscript clearly indicates, the objects owned by the author were distributed as duplicates. However, this fact diminishes neither their individual value nor the important fact that this is one of the first collections from this territory.

This relatively early time of collection is one reason why these objects should be presented to the professional public as well.

The other part of the collection comes from two regions in Western New Guinea. The bark clothes were made in the group of larger, partially Christianized villages (Mambriema) located along the nortwestern coastline of Arguni Bay (Bomberai Peninsula). The *korwar* figurines and some other artifacts originate from the Bintuni Isthmus (Modan). Given this distribution, Asmat materials (from southwestern New Guinea) and stylistically different objects from northwestern New Guinea are presented here as separate units.

I. Southwestern New Guinea — Asmat

Although the western part of New Guinea had been under Dutch control since 1828, the scientific discovery of this area progressed relatively slowly. As recently as the 1920's, only the most exposed parts such as the region around Geelvink Bay and the southwestern coastal areas were, more-or-less, known to researchers.

This situation holds particularly true for the Asmat territory which was difficult to reach due to its isolation and the hostile tradition of its inhabitants. This region developed closer links with western civilization only during the 1950's. Although a few expeditons had previously reached the southwestern coast, their primary goal was the study of Mimika groups who lived near the Asmat. The "Zuidwest Nieuw Guinea Expeditie" organized by the Koninklijk Nederlandsch Aardrijkskundig Genootschap in 1904—1905 aimed in this direction as well. This expedition, similarly to subsequent exploratory trips on the same trail, directed attention to the formerly almost unknown Asmat.

The 1935—1936 expedition led by Lord Moyne made it to the area of the Eilanden and Blumen Rivers and collected Asmat objects as well.[2]

Only following the Second World War did systematic research begin. For the most part it was only Catholic missionaries and state administrators who reached this territory. These included Fathers F. Meuwese, J. Verschueren, J. Boelaars and G. Zegwaard who spent considerable lengths of time among the peoples living in this area and, thus, had opportunities to develop deeper familiarity with their culture and life.

In 1953, the Asmat territory became an independent administrative unit with Achatsj as a regional center. This development further accelerated the pace of research and enhanced the penetration of western civilization. Two major projects, one by S. Kooijman in 1953—1954 and another by A. A. Gerbrands in 1960—1961 were important milestones in this research.

Recently, several expeditions traveled into this area and the Asmat objects soon captured the attention of the European and American art loving public. The collection discussed in this paper was taken to Hungary as part of this trend.

Numerous descriptions detail the life of the Asmat people. Many of their authors carried out field work with the Asmat themselves. It is therefore not necessary to increase the number of such studies by a new summary.[3] During the description of objects, when their use and function are discussed, certain phenomena may occur which perhaps need some explanation. Namely, it is almost entirely impossible to discuss Asmat artwork and religious objects separately. Head hunting and cannibalism had a central place in Asmat social and religious life and almost all artistic manifestations are related to these topics. The mythological hero Fumeri-ipitsj carved the ancestors of Asmat out of wood thereby establishing the kinship between trees and people. Men, more exactly head hunters, are related to the praying mantis (Mantis religiosa, called *wènèt* in the Asmat language) on the basis of some degree of formal similarity. Other such mythic relations include the hornbill (*fofojir*=Buceros rhinoceros) and the black king cockatoo (*ufir*=Probosciger aterrimus). These three animals are head hunter symbols portrayed on all artifacts used in religious rituals.

Unfortunately, the collection under discussion here shows only little of Asmat everyday life. Artifactual evidence of social and religious life is much better represented than mundane objects. This fact shows the one-sided, selective approach of earlier collectors.

The quality of craftmanship dates the artifacts discussed in this paper to the years directly preceding their collection. As far as the mode of manufacturing is concerned, Horst von Bandat notes that these carvings were made either by "fire hardened bamboo knives", "stone (flint) knives" or "stone implements".[4]

Tools

STONE AXE

The cylindrical handle carved out of dark brown wood is broken at the grip section; the blade, made of a greyish stone, was inserted into a hole carved into the head segment.

Measurements: handle length=49 cm, blade width=10 cm, blade length=28 cm
Inventory number: 136747 (Fig.50.)

STONE AXE

The club-like, thick handle is carved from a dark brown hard wood. A flat blade made of silicified sandstone is inserted in it.

Measurements: handle length=73 cm, blade length=16.5 cm, blade width=7 cm,
Inventory number: 75.5.2 (Fig. 52.)

As far as stone axes are concerned, on the photograph showing a skull trophy Horst von Bandat notes that such axes were used as weapons in intertribal warfare. The reports of many authors contradicts to this note: the axes were never or rarely used as weapons. According to GERBRANDS 1967; KOOIJMAN, 1961, or ZEGWAARD, 1959; the stone axes played an important role only after the head-hunting raid. In the course of the initiation ritual the axes were used to make a fracture in the temple of the skull in order to remove the brains from the freshly-cleaned skull of a headhunted enemy.

The hafting method of these two axes are described by CROSBY, E.: 1977, p. 87 and Fig. 4.: under "manufacturing tradition: T3".

STONE AXE BLADES

Four, so-called, "Walzenbeil" type blades ground from greyish-green stone. According to GERBRANDS (1962b), due to the lack of raw materials, such blades (which functioned as money as well) were acquired by exchange from peoples of the mountainous areas. A type similar to No. 136.749 is known from Borneo (HEINE-GELDERN, 1932: Taf. III., Abb. 14/a). A Tanimbar parallel to blade No. 136.750 was published by HEINE-GELDERN (1932: Taf. III., Abb. 14/b); similar pieces were published from New Guinea (HEEKEREN, 1957: Pl. 43/A) and Celebes (HEEKEREN, 1957: Pl. 43/B and C).

Measurements: length=16.6 cm, width=5.7 cm
Inventory number: 136748/a (Fig. 49.)

Measurements: length=14.9 cm, width=7.5 cm
Inventory number: 136748/b

Measurements: length=15 cm, width=8 cm
Inventory number: 136749

Measurements: length=19.5 cm, width=6.7 cm
Inventory number: 136750 (Fig. 51.)

Fishing

HARPOON

Thirteen brownish, thin wooden pegs, sharpened at one end, tied together by inner tree bark in the middle. The haft is missing.

Measurement: length=27 cm
Inventory number: 136777

HARPOON

Five iron points inserted into a reed handle, fastened by string.

Measurement: total length=211 cm
Inventory number: 136848

SPEAR

Double pointed spear with a cylindrical handle carved out of a single piece of hard wood. The inner side of each point has two barbs. The broadening central section is perforated by a carving with stylized praying mantis motives. The same motif is shown e.g. on the drawing by GERBRANDS (1962a: p. 39 Fig. 3 and Plate VI. Fig. 1; or GERBRANDS, 1967, p. 256/A [MR 147]) published from the Asmat territory. A similar double pointed type is shown on a photo by GERBRANDS, (1967, p. 252/B [UN 22]) from Undir River, probably Jufri village.

Measurement: length=223 cm
Inventory number: 136851 (Fig. 53.)

Hunting

ARROWS

Thirty-eight specimens composed of two parts. The shafts are made from reed while the points are carved out of reddish brown or

blackish hard wood with incised barbs. The hafted points were fastened using woven inner tree bark. They are decorated by pairs of incisions around the upper part of the hafting and the tip of the point respectively.

Measurements: total lengths=82—159 cm, point lengths=14—33 cm
Inventory numbers: 136803 to 136817, 136819 to 136837, 51.11.5 (Fig. 54.) to 51.11.9 (Fig. 55.) and 51.11.11

ARROW

Artifact made of three parts: a hard wood reinforcement is fitted into the incision at the end of the reed hafting. A bamboo point is attached to this hardwood bit. All fittings have been reinforced with fiber twine.

Measurements: total length=130.5 cm, length of the bamboo point=50 cm
Inventory number: 51.11.4 (Fig. 56.)

ARROW

Artifact made of three parts: a hard wood reinforcement is fitted into the incision at the end of the reed hafting. The point, made of a piece of split bone is attached to the hardwood bit using whitish straps of inner tree bark. Incised motives may be seen on the upper part of the reed hafting.

Measurements: total length=157.2 cm, point length=46 cm
Inventory number: 51.11.10 (Fig. 57.)

BOW

Weapon carved out of relatively hard wood with jutting out ends for bow string attachment.

Measurement: length=168 cm
Inventory number: 136817

BOW

Weapon made from a dark brown hard wood with a rattan bow string. A feather is stuck in the string's loop at one end.

Measurement: length=190 cm
Inventory number: 51.11.12

BOW

Weapon made of wood with a convex cross-section. Rings of fiber serve as bow string attachments at its two end.

Measurement: length=180 cm
Inventory number: 136.818

SPEARS

Two pieces carved out of hard wood. They are cylindrical near the lower end and flattened toward the top. One of them is pointed at one end (a), while in the case of the other (b), both ends have been carved into points with barb-like incisions.

Measurement: length=226.5 cm
Inventory number: 136.850 (Fig. 58.)

Measurement: length=222 cm
Inventory number: 136852

SPEARS

Altogether six specimens each made up of two pieces. The reed hafting is equipped with a wooden point incised in a barb-like fashion. The two pieces are tied together by fiber strings. A major portion of spear No. 136.839 is missing.

Measurements: total lengths=92—223.5 cm, point lengths=24—40 cm
Inventory numbers: 136838, 136839, 136842, 136844, 136846 and 51.11.2 (Fig. 59.)

SPEARS

Altogether five specimens each made up of three pieces with light brown reed hafts equipped with split bamboo points. In each case, the point is tied to a wooden bit with thin string and, thus, inserted into the reed shaft. This dual point is tied to the shaft with inner tree bark.

Measurements: total lengths=221—224 cm, point lengths=38—45 cm
Inventory numbers: 136840 (Fig. 60.), 136841, 136843, 136845, 51.11.3

BONE DAGGER

Dagger made of a cassowary tibiotarsus. The handle is provided by the bone's distal articular end. The diaphysis was split and sharpened

below the proximal end. According to Horst von Bandat, herring bone patterns carved onto the medial side indicate ownership. Twenty-five incisions on the lateral side represent the number of pigs killed with this weapon.

Measurements: length=35 cm, width=4 cm
Inventory number: 75.5.3 (Fig. 61.)

Transport

PADDLE

Carved from brownish hard wood (ironwood probably). The paddle was sawed in two parts (by Europeans) and therefore inventorised under two separate numbers. The lower part or the paddle blade has a rounded oblong shape while the upper half of the shaft is decorated by stylized bird heads. This decoration is enhanced by reddish braids of sago tree fibres tied into the carving as is done on festive occasions. The top of the upper part ends in a sharp point probably because this paddle is also used as a spear. (For similar pointed types see RENSELAAR, 1956; descriptions of photos 18a and 18b.)

Measurements: total length=223 cm, blade length=51 cm, body width=16 cm
Inventory number: 136849 (Fig. 62.)

Measurements: total length=182 cm, length of the carved part=37.5 cm
Inventory number: 136853 (Fig. 63.)

Total length of the paddle: 405 cm

TOP PART OF A PADDLE

Soft wood carving of a sitting human and a bird head. An almost identical piece was published by RENSELAAR (1956: Fig. 19—20).

Measurement: length=47 cm
Inventory number: 136895 (Fig. 64.)

CANOE PROW DECORATION

Fragment showing the upper torso of a human and a bird head decorated with white and red painting. The spiral-like ornament on the lower part represents a shell nose ornament called *bipané*. The openwork carving represents probably the roots of the banyan tree. For more details on similar piece see the explications by GERBRANDS, 1967, p. 262/B. Comment by Horst von Bandat on the photograph: "Painted wood carving for the men's house".

Measurement: length=66 cm
Inventory number: 136897 (Fig. 65.)

Published by BODROGI: 1959, Plates 9 and 10 (detail).

FRAGMENT OF A CANOE PROW DECORATION

The Asmat name of this object is *etsjopok* (RENSELAAR, 1956). It is carved from soft wood depicting a jaw in its lower section and a bird head on the top. The openwork carving represents probably the roots of the banyan tree and the spirals resembles a nose ornament. The engraved parts are red, while the rest was painted white. The piece was published by BODROGI: 1959, Plate 3 and 1981, Plate 89.

Measurement: length=105 cm
Inventory number: 136906 (Fig. 66.)

These canoe prow decorations usually symbolize an anonymous ancestor or the victim of enemy head hunters (whose death was to be retaliated for in raids using the canoe).

SATCHELS

The natives call this object *noki* (communication by Horst von Bandat). Both specimens in this collection were woven using strips of an unknown plant. They are of oblong shape with bark cloth strips used as handles running along the long sides. One of them (a) is decorated by blackish meanders woven into the yellowish background, while the other (b) has diagonal reddish bands forming a chessboard pattern over it.

Measurements: length=19 cm, width=18 cm
Inventory number: 136856 (Fig. 67.)

Measurements: length=35 cm, width=25 cm
Inventory number: 136896

NET-BAG

Two square specimens each with a long handle woven out of dark brown fibers. In the case of No. 136859, the pattern is produced by alternating tight and loose weaving.

Measurements: length=19.5 cm, width=20 cm
Inventory number: 136859 (Fig. 68.)

Measurements: length=16 cm, width=21 cm
Inventory number: 136860

SATCHEL

Tightly woven, elongated satchel with braided handle and a double row of white feather decorations on one side.

Measurements: length=29.5 cm, 25 cm
Inventory number: 136901

BASKET

Oblong shape basket folded from palm leaves. The two narrow sides are reinforced by thin sticks. One of the sides has a small handle attached to it.

Measurements: length=42 cm, width=33 cm, height=16 cm
Inventory number: 136855

Household

CHOPSTICKS (?)

Six thin wooden sticks of angular cross-section folded in half.

Measurement: length=24 cm
Inventory numbers: 136778/a to f

BROOM (?)

Blades of grass attached to a folded strip of palm leaf using a fiber string.

Measurement: length=23 cm
Inventory number: 136899

WOODEN PLATE

Flat, undecorated dish with a plum stone shape and with elongated, handle-like ends.

Measurements: length=43 cm, width=18 cm
Inventory number: 136779

WOODEN PLATE

Willow-leaf shaped dish with one end carved into a head-shape handle. The other end has been broken off and missing. This artifact has a greyish-red color.

Measurements: length=120 cm, width=15 cm
Inventory number: 136780

WOODEN PLATE

Reddish, willow-leaf shaped dish with one end carved into a human head shape. Incised decorations occur under this carving and on the bottom of the plate.

Measurements: length=78 cm, width=13 cm, height=6.8 cm
Inventory number: 136781

WOODEN PLATE

Reddish brown, oval dish slightly broadening in the middle. The two handles are carved into human shapes shown from the shoulder up, with hands clutched above their heads. The face and arms are indicated by incised lines painted red.

Measurements: length=49 cm, width=7 cm,
Inventory number: 136782 (Fig. 69.)

The native name of these plates is *jufai*. Similar pieces have been published by JANSEN (1960: p. 169, Fig. 5) and RENSELAAR (1956: Fig. 36). The simpler artifacts could have been manufactured by any of the village's inhabitants. Specialized craftspeople were available for the carving of more complicated pieces or objects with special functions. These people also had an insider's familiarity with the cults concerned (GERBRANDS, 1962a). Red paint —the color of blood— is mixed in special, boat-shaped bowls used only for this purpose. Of the wooden plates presented here, No. 136780 and No. 136782 might have served in the mixing of red paint. In addition to their characteristic shape, the decoration of these plates as well as the remains of pulverized red paint both on their insides and outsides indicate such a function. Slightly larger plates decorated with human head carvings or human figurines may also be seen as dance symbols in the inauguration ceremony of the men's club house (*jöai*) (JANSEN, 1960: p. 169).

Clothing, jewelry

SKIRT

This piece of clothing is made of thick bunches of grass blades strung on a twisted

band of fibres. It is decorated with painted red and black zig-zag patterns.

Measurements: length=36 cm, width=60 cm
Inventory number: 136857

SKIRT

The belt part of this piece of clothing is made of a twisted rope. Bands of inner tree bark painted red, black and yellow are looped and strung on this rope.

Measurements: length=43 cm, width=68 cm
Inventory number: 56.27.6

APRON

This piece is made of casuar feathers strung tightly on a fiber string.

Measurements: length=11 cm, width=14.5 cm
Inventory number: 136900

PENIS SHEATH (?)

Bamboo tube with an open top and a hole drilled at the bottom. A small branch may be seen at the lower end.

Measurements: length=26 cm, diameter=6.5 cm
Inventory number: 136898 (Fig. 70.)

BELT

Twisted braids of black hair strung on a broad, yellowish fiber string and decorated with white snail shells strung on some of the hairs.

Measurement: length=70 cm
Inventory number: 136858

ARM COVERS

Cylindrical objects narrowing at one end and woven using yellowish-brown fibres as well as flexible twigs.

Measurements: length=15 cm, diameter=9 cm
Inventory number: 136770

Measurements: length=13 cm, diameter=9 cm
Inventory number: 136771

Measurements: length=13.5 cm, diameter=9 cm
Inventory number: 136772

BRACELETS

Objects woven of straps of inner tree bark. Their insides are black while their outsides are yellowish.

Measurement: width=0.9 mm
Inventory number: 136798

Measurement: width=0.8 mm
Inventory number: 136799

BRACELETS

Two wild boar tusks attached by braided inner tree bark strings both at the tip (a) and the base (b).

Measurement: (a) diameter=10 cm
Inventory number: 136800

Measurement: (b) diameter=9 cm
Inventory number: 136801

INNER TREE BARK RING

Two thin, brownish, braided rings interwoven with each other.

Measurement: width=1.5 cm
Inventory number: 136.902

JEWELRY

Four brownish-white snail shells strung on a piece of textile, European in origin.

Inventory number: 136892

Smoking

PIPE

Pipe head carved from yellowish bamboo.

Measurements: length=8.1 cm, diameter=2.7 cm
Inventory number: 136905

Weapons

SPEAR

Cylindrical weapon carved from dark brown hard wood broadening into a triangular shape; this latter part is decorated by perforated carving (stylized praying mantis motives).

Measurements: total length=223 cm, length of the carved part=11.1 cm

Inventory number: 51.11.1 (Fig. 71.)

Published by BODROGI: 1959, Plate 2 and 1981, p. 94.

Similar pieces were published amongst others by RENSELAAR (1956: T. 42/c), KOOIJMAN (1956: Figs. 28 and 29) and GERBRANDS (1967: p. 258/A [MR 46] Omadesep village, Faretsj river) from the regions of the Lorentz and Oetomboewe Rivers.
These spears, decorated by characteristic symbols, were used predominantly in head hunting but served for the purposes of wild pig hunting as well. Spears made for head hunting were usually smaller with a solid, broadening section while larger pieces with perforated carving on their broadening spade-like end were used in wild pig hunting (GERBRANDS, 1962b, "Spears").

SHIELD

Flat, oblong shield with rounded ends carved out of light yellow soft wood (mangrove). The upper end slightly narrows and ends in a semicircle. A rhombus shaped opening is cut into this semi-circular part emphasized by incised lines. The surface of this shield is covered by stylized zoomorphic motives (flying fox; Asmat name: *tar* and wading bird; Asmat name: *worot*). The basic color is white with the protruding patterns painted red. A handle may be seen on the back side.

Measurements: length=132.5 cm, width=41.5 cm

Inventory number: 136783 (Fig. 72.)

Published by BODROGI: 1981, Plate 86.

SHIELD

Similar to the previous piece (to No. 136783). Its surface is decorated by stylized human shapes, flying fox and bird head motives. The flying fox above the stylized human figure is often identified as the male ancestor. The upper part is decorated by a reddish bunch of grass blades.

Measurements: length=153 cm, width=42 cm

Inventory number: 136784 (Fig.73.)

Published by BODROGI: 1959, Plates 4 and 5; 1981, Plate V.

SHIELD

This shield is of a symmetric triangular shape with rounded corners. A handle may be seen on its back side. The surface is decorated by open "V" motives painted red and linked by a line in the middle. The centers of these surfaces are ornamented by double rings. The point of the triangle is decorated by a human shape. A shield with similar decoration was published by DE HOOG (1963: p. 37).

Measurements: length=149 cm, width at the handle=50 cm

Inventory number: 136785 (Fig. 74.)

SHIELD

Elongated, oblong shape with a rounded upper end. A protruding ridge runs along the back side with a small opening cut for the hand in the center. The height of this ridge gradually decreases in the direction of the shield's ends. The front side is decorated by four arms bent into an "M" shape. The painting resembles that of the previously mentioned shields. A similar shield from the same area may be found in the collection of Lord Moyne (Blumen River) (BRAUNHOLTZ, 1936: Pl. H, Fig. 1/3.).

Measurements: length=137 cm, width=35 cm

Inventory number: 136786 (Fig. 75.)

Published by BODROGI, 1981, Plate 87 (detail).

SHIELD

Elongated roundish oblong shaped shield carved from soft wood (mangrove). A handle protrudes from the back surface while the front is decorated with a red painted, carved design on a white background: the main motif is formed by three flying foxes one under the other. The motif engraved on the top of this shield is the head of a rayfish (Asmat name: *piwur*).

Measurem ents: length=143 cm, width=41 cm

Inventory number: 75.5.1 (Fig. 76.)

SHIELD[5]

Elongated, oblong shaped shield carved from soft wood. The front side is decorated with relief carving similar to the motives on shield no. 136786 but in highly stylized form. On the top of the shield is a head of a rayfish prob-

ably. The engraved parts are red, the rest is white.

Measurements: length=137 cm, width=45 cm

Inventory number: 51.16.74 (Fig. 77.)

The Asmat name of shields in the Casuarin Coastal region is *jamès* (DE HOOG, 1963: p. 37). The shields were made for the death ceremonies of deceased male relatives. During the ceremony, the shield was named after the dead person. The shields were used during the head huntings organized to take revenge for the relative's death (GERBRANDS, 1962b: "Shields"). Because the shield is in fact a substitute for the deceased, the decorative motives correspond to this function. They represent the ancestors of the dead or the deceased person himself, often in the form of nothing but stylized arms and hands as may be seen on shield No. 136786. The "S" motives on shield No. 136785, symbolize snakes called *biepon* in the Asmat language (Casuarin Coast); (DE HOOG, 1963: p. 18) as do the best known head hunter symbols such as bird heads and the praying mantis which provide another important component of these shield decorations.

Ritual objects

STATUE

Standing female figurine carved from light soft wood. The arms are broken above the elbows. The eyes are engraved and the nose protrudes from the place of the face. Incised lines emphasized by red painting may be seen around the mouth. The umbilicus and sexual characters on the trunk as well as the joints on the shoulder and legs are marked by chiseled lines. The engraved lines and surfaces are painted red. The body must have been originally painted white as is shown by a few remaining flecks of paint.

Measurements: height=78 cm, width=9.8 cm

Inventory number: 51.11.15 (Fig. 79.)

One may assume that this statue also belongs to the set of objects prepared for the *jöai* celebration. During this ceremony, creation myths of the community houses and of the first humans are played (JEANNERET, 1964).

SKULL

Human skull without the jaw with a large fracture on the right temple. Reddish bunches of grass were tied through the zygomatic arch. According to a communication by Horst von Bandat in a letter (January 9, 1967) and on his photograph, this opening was broken by a stone axe. As he suggests on Picture 51 stone axe No. 75.5.2 fits perfectly into this fracture. This head was a trophy acquired in a head hunting raid. (See above.)

Inventory number: 56.27.2 (Fig. 80.)

Musical instruments

DANCE DRUM

The Asmat name of drums (Casuarin Coast) is *em* (DE HOOG, 1963: p. 37). Hour-glass shaped, with perforated carving on its handle: stylized bird heads as headhunting symbols. Three engraved geometric motives may be seen below the upper rim. Four small handles are located on the drum's body. The instrument cracked at one point and is held together by a bandage of rotang fibres. Remains of a blackish, tar-like material occur along the outer side of the crack.

Measurements: length=57.5 cm, upper diameter=48 cm, lower diameter=59 cm

Inventory number: 136744 (Fig. 81.)

DANCE DRUM

Similar to the previously discussed specimen with a large broken handle attached to one side which is decorated by perforated carving: probably bird heads. A pair of perforated additional small handles may be found on both sides. Reddish grass was inserted in one of them. A rim was engraved around the upper opening.

The dance drums were used during the previously mentioned death rituals (GERBRANDS, 1962a: p. 40).

Measurements: length=54.5 cm, upper diameter=45.5 cm, lower diameter=59 cm

Inventory number: 136745

TRITON SHELL

This instrument is made from the shell of Charonia tritonis, with one hole drilled into it.

Measurements: length=20.9 cm, width=9 cm
Inventory number: 136854

After ZEGWAARD, 1959, p. 437, the triton shell "... is a very precious and important ornament and is worn on the abdomen by the warlords whenever they are performing their duties."

BAMBOO HORN

The Asmat name of this instrument is *fu*. A yellowish-brown piece of bamboo drilled at its base. It ends in a triangular process and is open at its upper side. An engraving (spirals with "spirit's hands or fingers") filled with lime runs around the upper half. Similar types have been published by: FIRTH, 1936: p. 71 (Place of origin: Kampong river; from the collection of Lord Moyne) as well as GERBRANDS, 1967 p. 222/c.

Bamboo horns were used to frighten the enemy during head hunting while the same horns announced the success of such hunting raids to villagers (GERBRANDS, 1962b: "Horns").

Measurement: length=35.5 cm

Inventory number: 136802 (Figs. 78 and 82.)

II. Northwestern New Guinea

The northwestern coast of New Guinea has had long standing, close connections with the Indonesian Archipelago. This relationship may well be observed in the style of decoration: the chief elements of ornamentation are of western Indonesian origin. The western coastal areas of New Guinea may actually be looked upon as the periphery of the distribution range for the Celebes-Molucca style. This phenomenon is, to a large extent, due to the population groups which spread from the nearby island of Biak and came into contact with the Indonesian Archipelago during their migrations. Consequently, they adopted and distributed the wealth of motives from that area.

A. MAMBRIEMA — ARGUNI BAY, BOMBERAI PENINSULA

Clothes

BARK CLOTHES

Altogether nine such pieces are included in this collection. They are whitish and have an oblong shape. One or both of the narrow sides are chopped into the form of fringes.

One side of these clothes is decorated by brownish or blackish painted motives.

Measurements: lengths=60 to 90 cm; widths= 21.5 to 70 cm

Inventory numbers: 136762, 136763 (Fig. 85.), 136764, 136765, 136766, 136767 (Fig. 83.), 136768, 136769 (Fig. 84/A and B.) and 56.27.5 (Figs. 86 and 87.). This latter piece was published by BODROGI: 1959, Plate 7 and 1981, p. 72 (detail).

Tapa were worn as loin clothes (dance aprons, according to Horst von Bandat). The decorative motives seen on them may be recognized on *tapa* from eastern Indonesia. Parallels to the decorative patterns on No. 136767 and 136769 are known from Celebes (KAUDERN, 1944: Figs. 128 and 129). Similar bark-cloth garments with similar motifs were published by KOOIJMAN 1963, too, on Plate XXXII, from the same area. Patterns similar to those on No. 136763 are known from Ondae, Central Celebes (Ibid. Fig. 130). Horst von Bandat made the following comment on individual pieces shown on his photographs: No. 136766 — the cruciform motives indicate conversion to Christianity. The fish (No. 136764) and centipede (No. 136762) are tribal symbols.

B. THE BINTUNI GULF REGION

Fishing

BOAT MODEL

Boat carved from wood with high sides and inner tree bark roof. The outrigger is missing.

It is painted white with yellow and black meandering motives on the side.

Measurement: length=103 cm
Inventory number: 136861

FRAGMENT OF A CANOE PROW DECORATION

This piece is carved from dark brown wood. It is flat, decorated with a human head and a casuar feather tuft.

An identical piece was published by UHLE (1886: Taf. II/5) from the area of Geelvink Bay.

Measurements: length=38 cm, width=11 cm
Inventory number: 136894 (Fig. 88.)

FLOAT

This artifact is a flat, oval piece of wood with a round hole in the middle. It is decorated by engraved meandering patterns. The object was used in turtle-hunting.

A specimen with similar decoration was presented by WIRZ (1923: Fig. 12) from Doreh Bay and by UHLE (1886: Taf. VII/9) from the area of Geelvink Bay.

Measurement: length=22 cm
Inventory number: 136746 (Fig. 89.)

PADDLES

Two blackish paddles carved from hard wood. Their handles are cruciform with an almond leaf-shaped body.

A paddle carved in a similar style was published by KAUDERN (1944: Fig. 75, p. 107) from Banggakoro, Central Celebes.

Measurements: total length=124.5 cm, body length=55 cm
Inventory number: 51.11.13 (Fig. 90.)

Measurements: total length=127 cm, body length=60 cm
Inventory number: 51.11.14

Household

SPOON

Dark brown, undecorated spoon made of rather hard wood. It has a cylindrical handle with the lower section broadening into a spade shape. This end is cut straight.

Originally, the head was made of a half coconut shell. Thus, this artifact may rather be defined as a scoop.

Measurements: length=42 cm, width=4.2 cm
Inventory number: 136752

STIRRING SPOON

This spoon is carved out of reddish brown wood decorated by meandering motives. The handle has a square cross-section. The lower part broadens into a spade shape. This end is cut straight.

Measurements: length=40.2 cm, width=5.1 cm
Inventory number: 136753

STIRRING SPOON

This piece is similar to the previously described artifact. The handle is decorated by incised lines and circles.

Measurements: length=24.5 cm, width=2.8 cm
Inventory number: 136754

STIRRING SPOON

The handle of this instrument is decorated by outward bending carving. The lower part broadens into a spade shape. This end is cut straight.

Measurements: length=32 cm, width=5 cm
Inventory number: 135755

STIRRING SPOON

This spoon is carved from dark brown wood. The upper section is angular while the lower part broadens into a spade shape. This end is cut straight. The rough working of this artifact as well as the lightly incised indication of handle decoration (human face) show that this spoon had not yet been finished.

Measurements: length=30.3 cm, width=4.4 cm
Inventory number: 136756

STIRRING SPOON

The finished, perfected version of the previously described spoon. The handle is decorated by a sitting *korwar* motif.

Measurements: length=37.8 cm, width=4.3 cm
Inventory number: 136757 (Fig. 91.)

STIRRING SPOON

Spade-shaped wooden spoon with an angular upper section. The handle is decorated with an incised "Z" ornament.

Measurements: length=34.5 cm, width=4.4. cm
Inventory number: 136758

STIRRING SPOON

This spoon is carved from dark brown wood. The handle is attached to the spade-shaped head in a slightly broken arch.

Measurements: length=38.5 cm, width=4.3 cm
Inventory number: 136759

STIRRING SPOON

This artifact belongs to the type described under No. 136755.

Measurements: length=29.5 cm, width=4.2 cm
Inventory number: 136760

STIRRING SPOON

The handle of this spoon is cylindrical and decorated with a *korwar* motif. Its handle ends in an oval shaped hole which is broken. A similar piece was described by DE CLERCQ and SCHMELTZ (1893: Pl. XVII/15) from Rasjé (northwestern New Guinea, Wandamen) as a tool used in sago chopping. Another specimen is known from Ansoes on the southern coast of Japen (Ibid.: Pl. XVII/24).

Measurements: length=42.5 cm, width=4.5 cm

Inventory number: 136761 (Fig. 92.)

STIRRING SPOONS

Hard wood objects which have a square cross-section on top and broaden into a spade shape at the bottom. The handles are decorated by engraved geometric motives. A hole was drilled into the handle of No. 56.27.4.

Measurements: length=29.5 cm, width=5.2 cm
Inventory number: 56.27.3 (Fig. 93.)

Measurements: length=38 cm, width=4.2 cm
Inventory number: 56.27.4

CLUB (MALLET)

Cylindrical object carved from light brown wood. The handle was painted black with its end carved into a mushroom shape.

Measurements: length=40.5 cm, width=3.6 cm
Inventory number: 136751

STRAINER

This oblong shaped artifact is made from thin wooden sticks tied together at seven points using fiber lines. One of its ends is cut straight, while the sticks are tied into a bunch at the other end. It was used in sago cleaning.

A similar piece was published by DE CLERCQ and SCHMELTZ (1893: Pl. XVI/11) from Oesba on the island of Waigeo near the northern coastline of New Guinea.

Measurements: length=26.5 cm, width=11 cm
Inventory number: 136862

BAMBOO KNIFE

Knife made from split bamboo with one half painted black.

A similar piece, a "Krabber" (scraper) was published by DE CLERCQ and SCHMELTZ (1893: Pl. II/10).

Measurement: length=25 cm
Inventory number: 136797

Furniture

HEADREST

This artifact is carved from light brown, light wood. Its pedestal is straight, while the top plate is arched. Perforated carving (broken) with meandering motives decorated the parts in between. The pedestal is black while the meandering pattern is painted white.

See also DE CLERCQ and SCHMELTZ (1893: Pl. XVIII/11) from Mar located near the mouth of the river Wéwé on the northwestern coastline of New Guinea.

Measurements: length of the upper plate=30.5 cm, width=10 cm
Inventory number: 136796

Smoking

TOBACCO CONTAINERS

Altogether seven bamboo tubes open at one end. With the exception of No. 136776, all of them are decorated with groups of incised motives running around the tube's body. These incisions are emphasized by dark painting. The previously mentioned undecorated specimen is closed by a bunch of inner tree bark at one end. For parallels to these motives: UHLE, 1886, Taf.V/4 and Taf.V/4a: Geelvink Bay.

Measurements: lengths=15.5 to 26 cm, diameters=3.2 to 5.2 cm
Inventory numbers: 136773 (Fig. 94.), 136774 (Fig. 95.), 136775 (Fig. 96.), 136776, 136787, 136788 (Fig. 97.), 136904

CIGAR HOLDER

Yellow bamboo tube with incised decorative motives on the surface. One of its ends is closed while the other is open. An opening with a wooden plug may be found on its lower third above the closed end. This conical "plug" is made from brown wood. It is drilled through and is decorated by circular carving.

Measurements: length=40.5 cm, diameter=4 cm
Inventory number: 56.28.2 (Figs. 98 and 99.)

Ritual objects

DANCE MASK

Cylindrical mask carved from light, soft wood. It is open at the top and bottom and has a slight ridge at the nose. Holes may be found around the upper opening. The holes on top of the head originally contained cassowary feathers (communication by Horst von Bandat in a letter dated to January 9, 1967, see also his photograph, Fig. 101.). According to him, this mask from Modan (Bintuni Gulf) was used by the Weror tribe. It shows the ghost of a deceased ancestor and was carved by a local craftsman (Fig. 100.). On the facial part, the nose and eyebrows are carved into a protruding line while the eyes and the mouth perforate the material. A bone needle was originally inserted into the nose. The ears are carved in a naturalistic manner. Black painting may be found around the mouth and the eyes while the hair and beard are colored black as well. The face is decorated by black geometric motives.

Measurements: length=34.5 cm, width=20.5 cm
Inventory number: 56.27.1 (Fig. 101.)

Published by BODROGI, 1959, Plate 6 and 1981, Plate 29.

KORWARS

Korwar figures from the Bintuni Gulf region (Modan) represent a part of this collection which is clearly separable both in stylistic and geographical terms. In the previously mentioned letter, Horst von Bandat defined the origin of the Modan figures as "having been carved by an old Papua in Babo." In his manuscript, Horst von Bandat also described how he attempted to take away a korwar figure from a small cave on the island of Jefman (Rombombo Group). That statue was placed there in honor of the spirit of the inhabitants' dead ancestor. However, he decided to leave this figure behind due to protestations by the Papuan guide. Instead of this specimen, he acquired another similar *korwar*, on the island of Tsiof which was cracked. As such, the figure lost its value as a ritual object since the spirit had left it. He writes that the local inhabitants carve *korwar* figures on request as well, however, the specimens used in rituals are untouchable. Four of the eight figures in this assemblage are standing while four were depicted in a sitting and squatting position respectively. All of them were made from light, soft wood which was easy to carve.

SITTING KORWARS

1) Sexless figure sitting on a round pedestal painted black. The cubic head is supported by its hands resting on the pulled up knees. Two columnar objects of square cross-section stand in front of the feet and extend up to the hands. The hair is indicated by black painting, while the carved face is marked by reddish coloring.

Measurement: height=18 cm
Inventory number: 136789 (Fig. 102.)

2) A figure similar to the previously described specimen. Its forms, however, are somewhat rounder and the arms are bent. Each hand holds a stick which reaches to the pedestal. The background color of the face is white,

while the nose, eyes and mouth are painted a reddish color. The hair is black.

Measurement: height=22.5 cm
Inventory number: 136790 (Fig. 103.)

3) The style of this figure is identical to that of the two previously presented specimens. A small, triangular piece of carving may be seen between the extended arms and the head on both sides. The hair and pedestal are black. The protruding facial features are painted white.

Measurement: height=18.5 cm
Inventory number: 136792 (Fig. 104.)

4) This object is slightly different from the other sitting *korwar* figures due to its arms suggesting more flexibility and its rounder head. The execution of the face differs as well. The arms rest on the knee and a stick is held between the hands and bottom of the feet.

Measurement: height=23.5 cm
Inventory number: 56.27.7 (Fig. 105.)

STANDING KORWARS

1) Sexless figure standing on a round pedestal. A "shield" is held by its extended arm. The hair is painted black, while the mouth, nose, eyebrows and ears are reddish. The "shield" was decorated by white, red and blue painting. The eyes are indicated by blue beads.

The piece was published by BODROGI, 1959, Plate 1, and BODROGI, 1981, Plate 30.

Measurement: height=23.5 cm
Inventory number: 136791 (Fig. 106.)

2) The angular, disproportionately large head is supported by the extended arms. A snake shape extends from each of the hands down to the feet. The pedestal and the head are black while the protruding facial features and the hand between the fingers are white.

Measurement: height=21.5 cm
Inventory number: 136793 (Fig. 107.)

3) Man standing on a round pedestal holding a "shield" in front of him with an extended arm. The "shield" shows the same motif like the No. 136791. The pedestal and the head are black while the facial features are marked by white. The eyes are made of white pieces of mussel shell.

Measurement: height=28.5 cm
Inventory number: 136794 (Fig. 108.)

4) The disproportionately large, angular head is supported by the hands which rest on two sticks (stylized snakes?) bent in the middle. The sketchy facial features are indicated by white paint. The hair and pedestal are blackish.

Measurement: height=25.5 cm
Inventory number: 136795 (Fig. 109.)

Musical instruments

DANCE DRUM

Hour-glass shaped, completely hollow, blackish blue drum carved from a single piece of wood. The original lizard-skin covering was preserved on one of its openings. Engraved geometric patterns and painted white-red-white bands decorate the upper and lower open ends.

Measurements: length=95.5 cm, upper diameter=49 cm, lower diameter=52 cm
Inventory number: 136743

Notes

1. The first part of the collection was briefly presented by BÉLA GUNDA, 1940.

2. See BRAUNHOLTZ, H. J.: 1936.

3. Some of the most important ones: GERBRANDS, 1962a, 1962b, 1967; KOOIJMAN, 1961; RENSELAAR, 1956; ZEGWAARD, 1959; etc.

4. See the descriptions of and explanations to the photos.

5. This shield was inventorised under the name of Dr. Ottó Polyánszky, but originally the object formed part of the collection of Horst von Bandat.

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around Saonek employ the natives of Waigeo, who live in the boats.

Fig. 26. Kapauku Papua from the Upper Otakwa River wearing a rattan belt and a sex gourd (penis sheat). They are mountain dwellers brought to Babo for a visit from the Carstensz Mountain slopes. Unimpressed by ships and planes, they were fascinated by a faucet in the hospital.

Fig. 27. Bow of a gaily painted prow from the Bintuni Papuas who visited Babo for the Queen's birthday festivals.

Fig. 28. Fisher prauw from the Mac Cluer Golf. The dug out tree is stabilized by the outriggers which make the craft seaworthy. There is primitive sail of Pandanus leaves rolled up, fish traps and at the bow two bamboo water containers.

Fig. 29. The Atawan Papuas live between the Kais and Kamundan rivers of the Central South Vogelkop. The man carries a steel ax and two boar teeth as ornament. The girl's beads are Japanese imports.

Fig. 30. South Coast Papuans from the river estuaries of the swampy sago rich coast of the Nassau-Explorateurs and Rumphius Ranges. The man carries a hourglas shaped drum and a stalk of bananas.

Fig. 31. Tribal tattoo from Waropen. The tattoo is applied by rubbing a concoction of plant extracts, oil and saliva into cuts and marks on the back for the maturity rites.

Fig. 32. Woman from Yohardia (Vogelkop) with nose plug. She wears a bast cloth. The big leaves at the right are from the Colocasia plant.

Fig. 33. Dogs are eaten and breast fed in Konda at the mouth of the Kaibus River. The woman carrying her dog and child is from the Budasu tribe.

Fig. 34. Two pregnant Wajuki woman wear grass masks and rattan girdles to evade evil spirits (Central South Coast).

Fig. 35. House of the native *radja* in Samate, Salawati Island. This area is originally a part of the realm of Ternate, and the *radja*s were underlings of the Sultan. The village has only a few dozen of huts. One Chinese shop or *toko*, was the only element of civilization. The radja was Mohamedan and absent when we were there.

Fig. 36. A small cave in Pliocene conglomerates, were the *korwar*s had been found. There are a few old wawe cut caves on the island of Jef Man, Northwest New Guinea. The author is in shorts because the scanty vegetation of the small island permitted to wear them. The hurling Papua guide told that the *korwar*s should not be removed in spite that nobody lives there now.

Fig. 37. Pile dwellings of Seleh at the southwestern Vogelkop at the entrance of the Seleh Strait east of Salawati. Roof and sidings of huts are made of *atap* by row of palm leaves. Oilfield has been developed in the swamps behind the cape.

Fig. 38. A small prauw is offered to the giant octopus in the forest of the small island of Matam. To appease the animal, which had drawn native fishermen to their death, a substitute had been erected on a platform. The nicely carved boat model is similar to those used in Waigeo and Batanta and seems to represent an older type of craft.

Fig. 39. Dayak chief from Kenja, Borneo. Earlobes are extended with heavy ornaments from metal or Buceros bird beak carvings. The elaborate sword hilt carvings are protected by wrappings.

Fig. 40. Dayak coolies, from North Melak, Borneo, sitting on a volcanic block. Dayaks were used by the joint oil companies in exploration work of West New Guinea.

Fig. 41. Tabu (*pemali*) sign on an abandoned plantation on Jef Man. We were told, it is against trespassers and thieves. A root of a plant on a plate, with magic powers, a sharp bamboo stick prevents the intrusion. Alang grass has already disregarded the contraption, we respected.

Fig. 42. Pile dwellings in the Strait Lenna between Salawati and Warir. The houses are on piles or stilts of mangrove trees which are rot resistant. The piles are driven into the mudflat of the tidal zone. The walkway are of sago palm planks.

Fig. 43. House in Kelobo Peleh provided with evil spirit protection. The house built on stilts

on a tidal flat is surrounded by a row of bambu sticks and four tabu (*pemali*) trunks before the entrance. For some time nobody lives there because of illness and death of a family member.

Fig. 44. Papua grave at Cape Kapatlap in Salawati. Hour glas shaped drum and Chinese porcelain plates containing food for the deceased are on the grave.

Fig. 45. Curious Papuans visit the author's tent. Unperturbed, they squatted on the floor and watched the writer washing, shawing and dressing. They were friendly and acted as guides to their huts. They are hunters, collectors and plant some *kladi* (Colocasia) and taro. Staple food is sago, plenty in the marshes of the coast.

Fig. 46. Native of Salawati. The man here wears a loin cloth and his inseparable shoulder bag with items as *sirih*, fire sticks, some sagotablets. The box, left, is made of Pandanus leaves and comes from Ceram.

Fig. 47. Natives of Salawati. The four men lead the party of the author to their village (on a detour path) in order to warn the woman and children in time to hide in the forest. There were only four huts. The name of the place could not be obtained since nobody could speak with them. It was south of the Monaibil Ridge.

Fig. 48. Abandoned native plantation at Aibemkri, Waibu River in North Salawati. The cleared *ladang* is already overgrown with shrubs.

Fig. 49. Stone axe blade, inventory number: 136748/a

Fig. 50. Stone axe: 136747

Fig. 51. Stone axe blade: 136750

Fig. 52. Stone axe: 75.5.2

Fig. 53. Spear: 136851

Fig. 54. Arrow: 51.11.5

Fig. 55. Arrow: 51.11.9

Fig. 56. Arrow: 51.11.4

Fig. 57. Arrow: 51.11.10

Fig. 58. Spear: 136850

Fig. 59. Spear: 51.11.2

Fig. 60. Spear: 136840

Fig. 61. Bone dagger: 75.5.3

Fig. 62. Paddle: 136849

Fig. 63. Paddle: 136853

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Fig. 66. Fragment of a canoe prow decoration: 136906

Fig. 67. Satchel: 136856

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Fig. 69. Wooden plate: 136782

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Fig. 71. Spear: 51.11.1

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Fig. 79. Statue: 51.11.15

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Fig. 97. Tobacco container: 136788

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Fig. 100. Native craftsman from Modan, an island in the Bay of Bintuni, who carved the dance mask (No. 56.27.1).

Fig. 101. Dance mask: 56.27.1

Fig. 102. Sitting korwar: 136789

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Fig. 109. Standing korwar: 136795

Fig. 110. Horst von Bandat's memorial tablet on the wall of the Hungarian Geological Survey.

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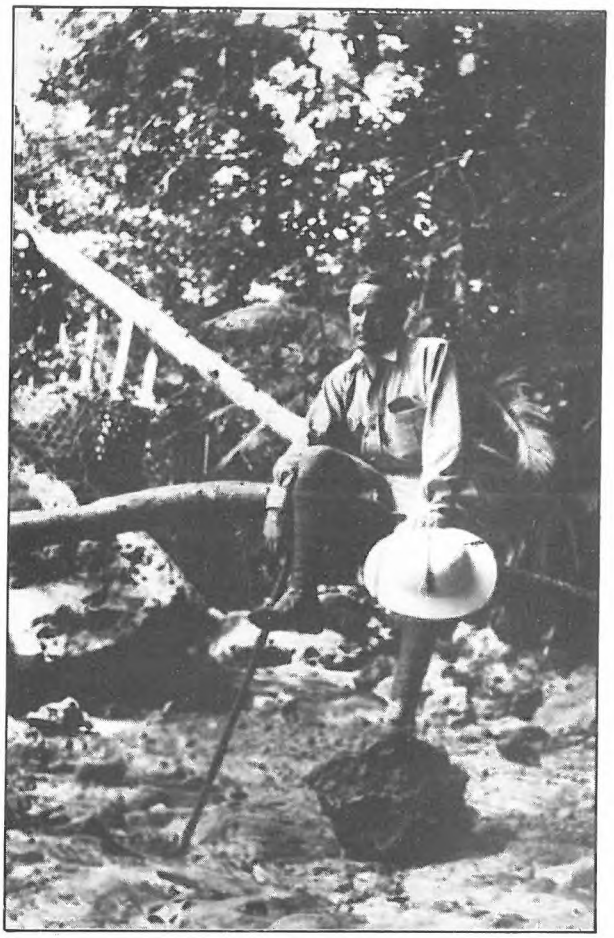

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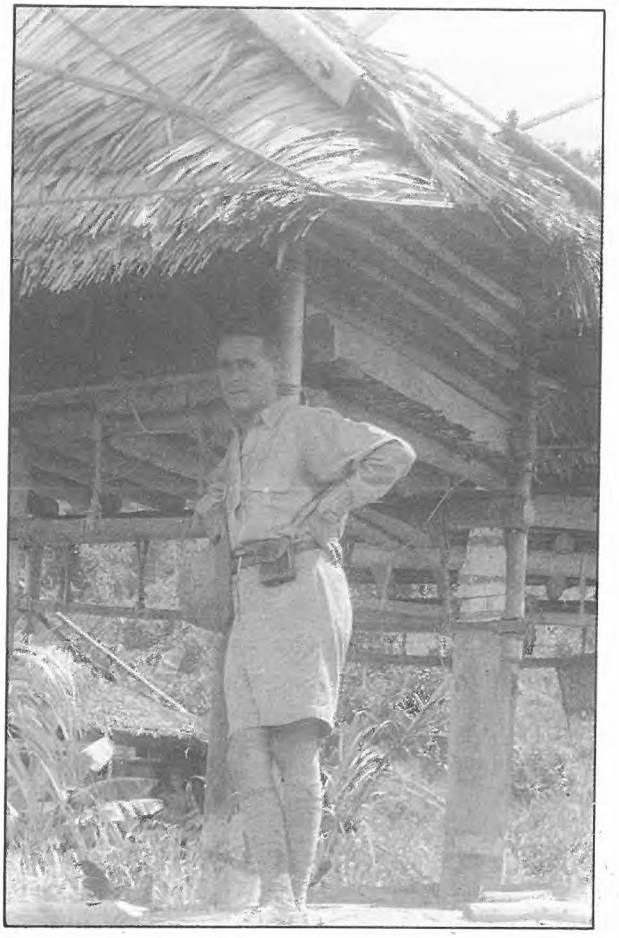

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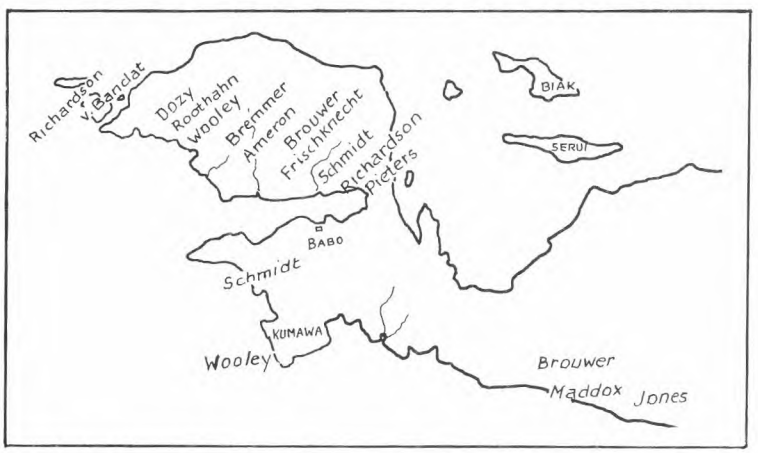
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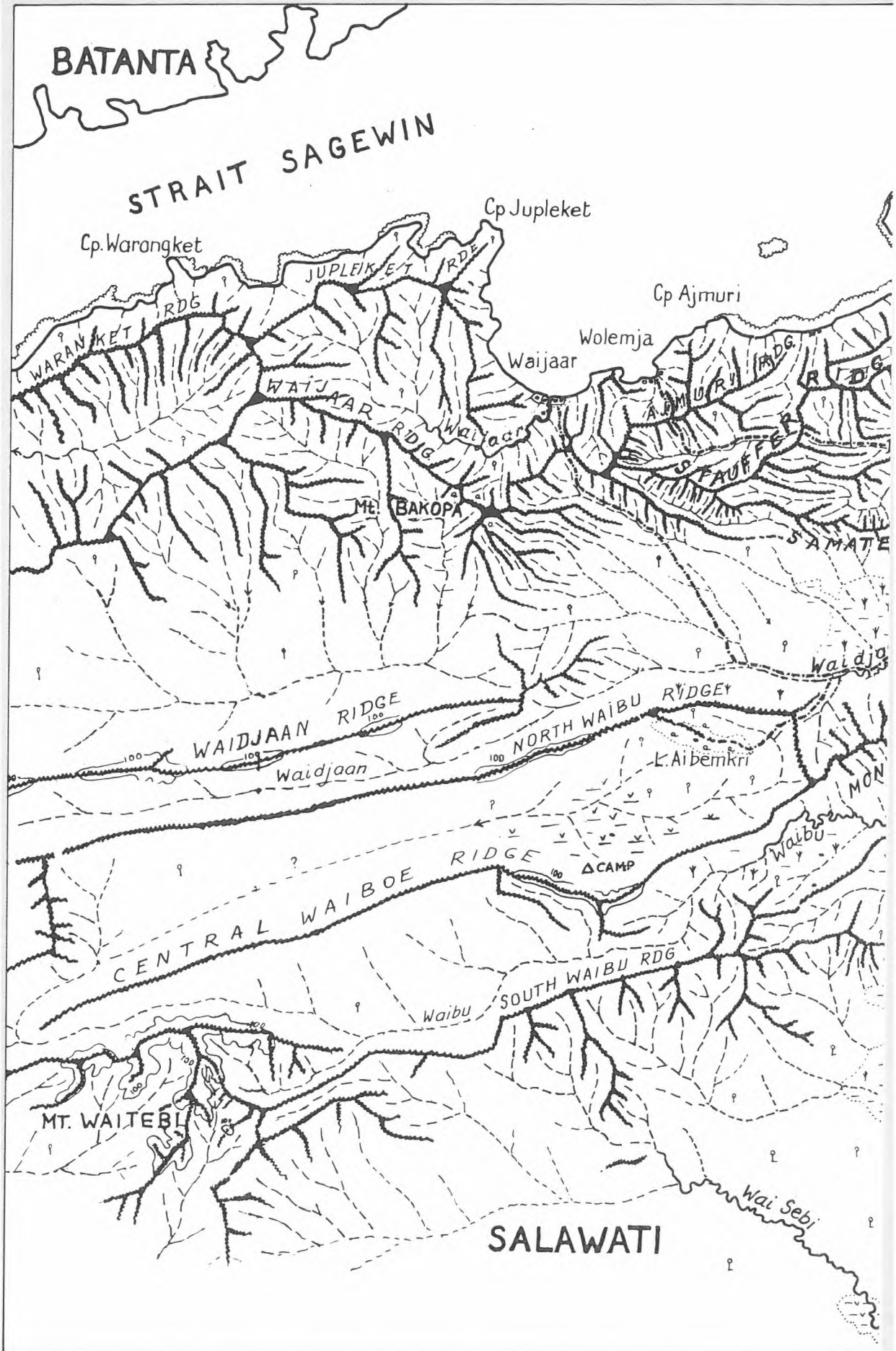
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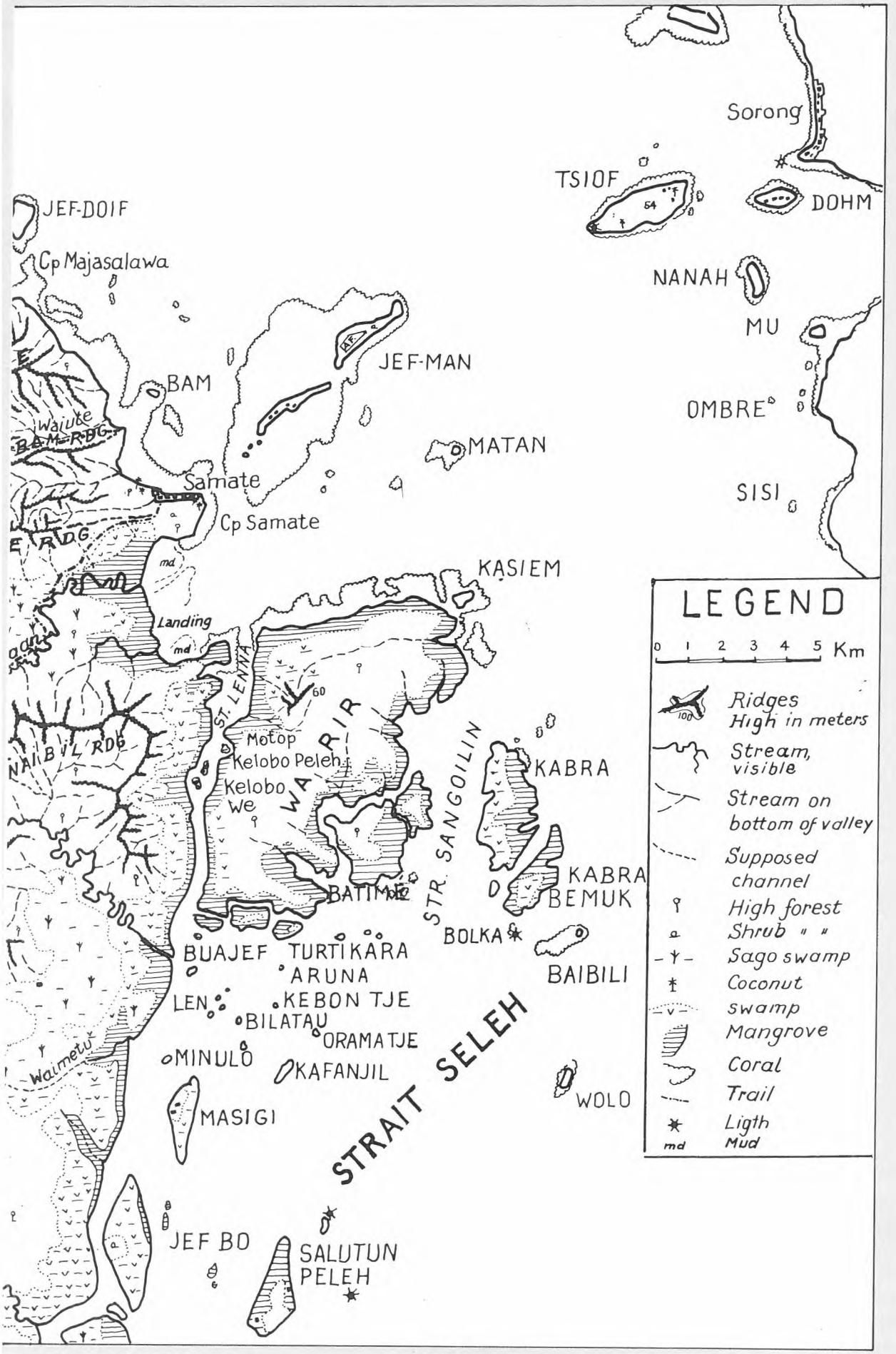
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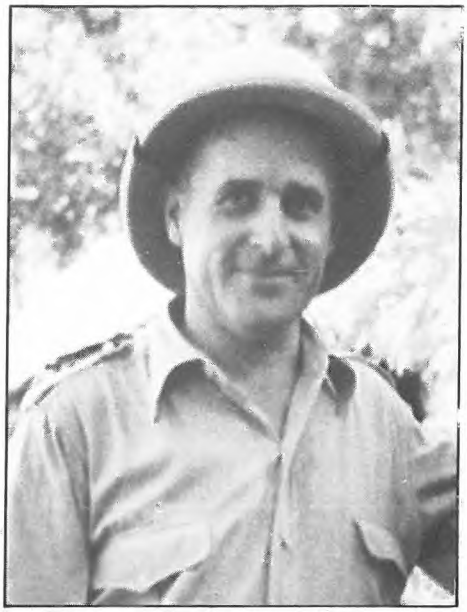

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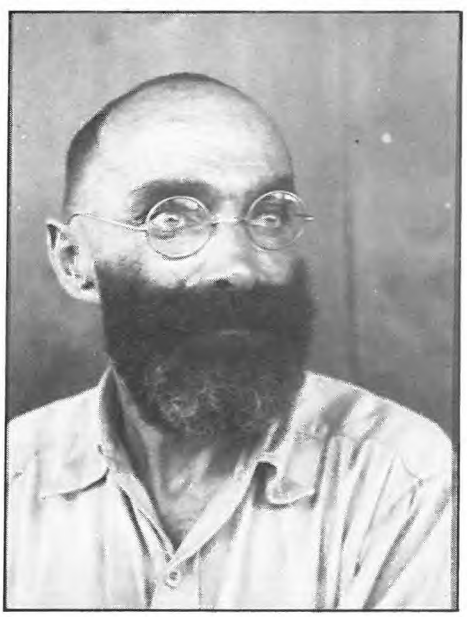

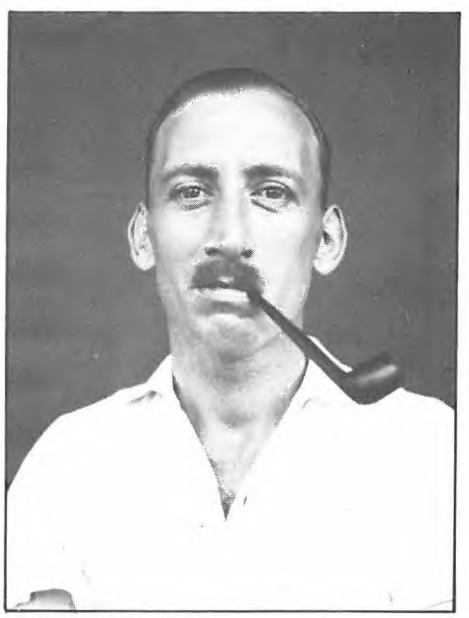

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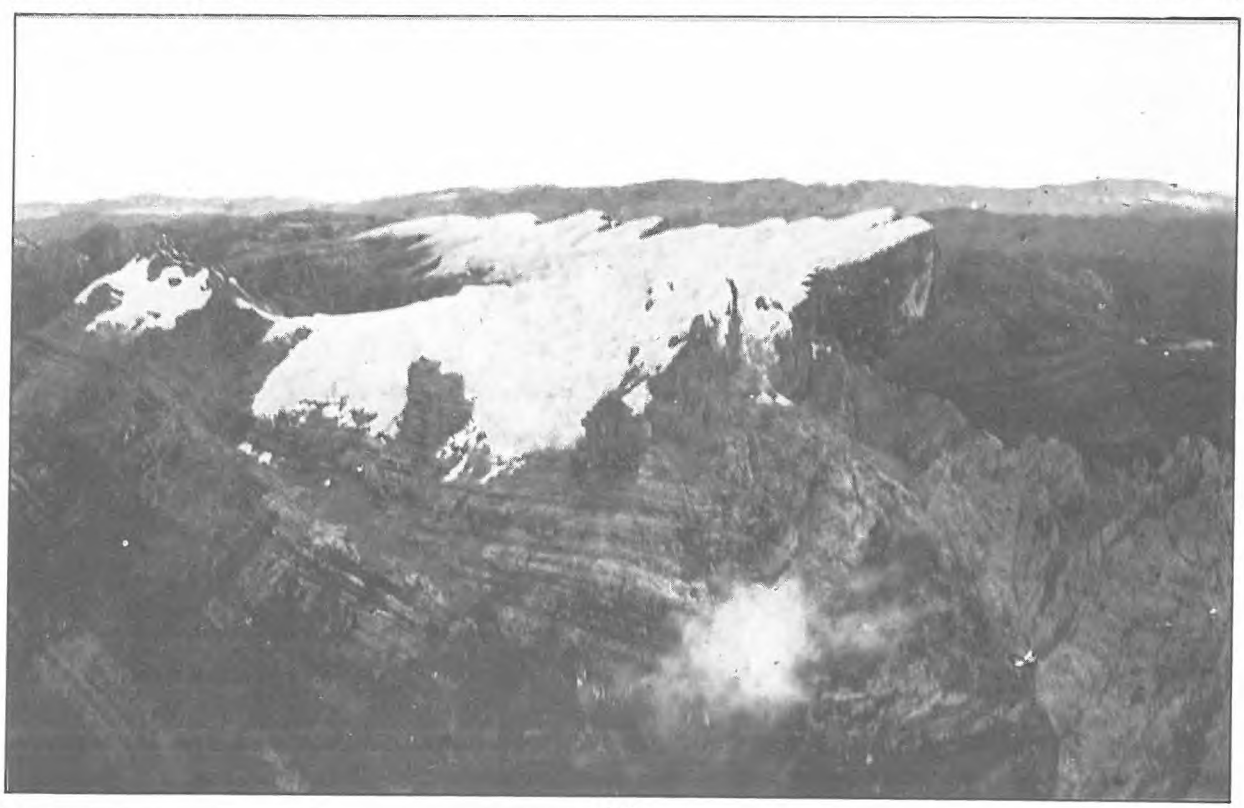

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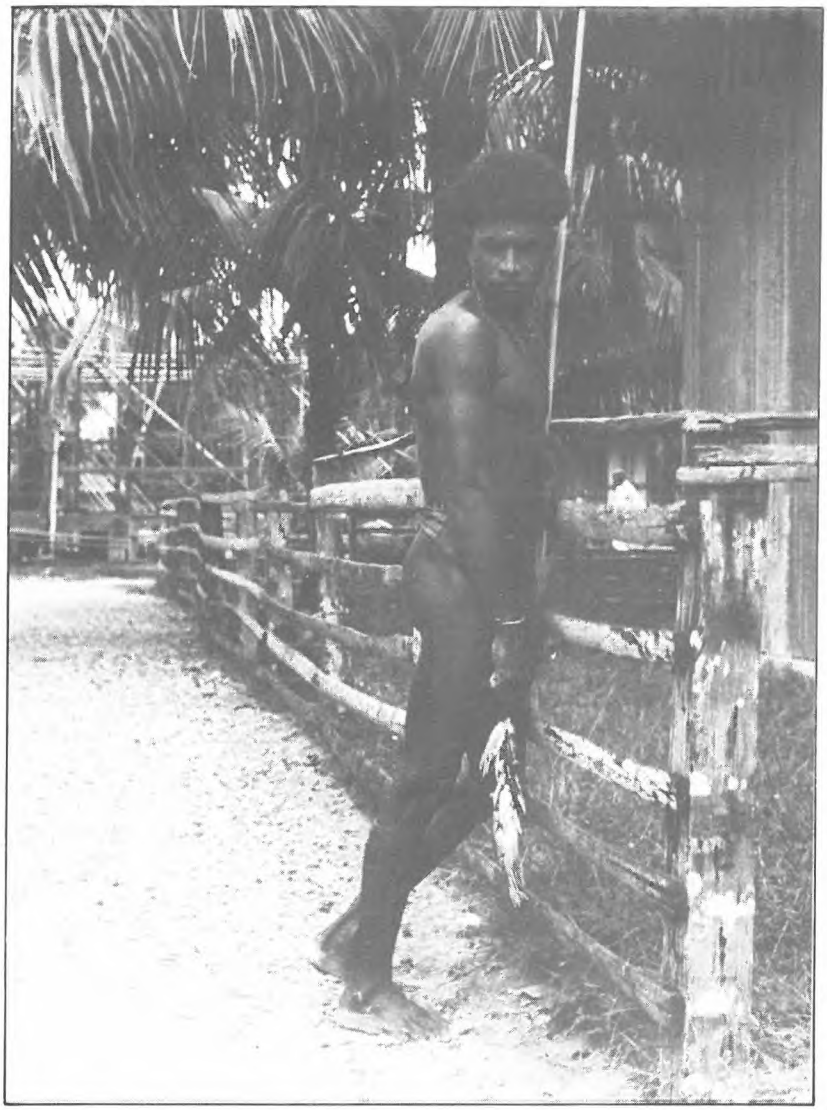

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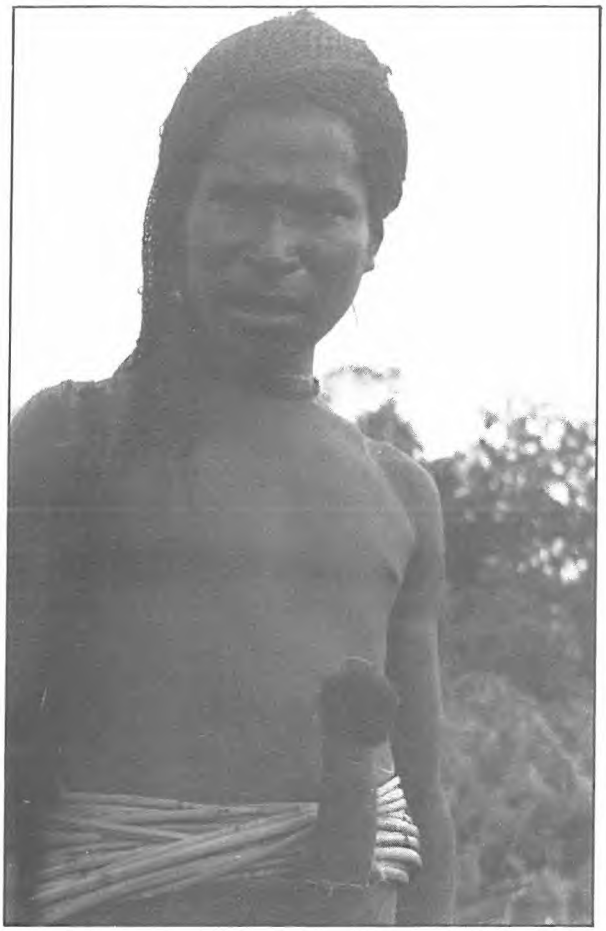

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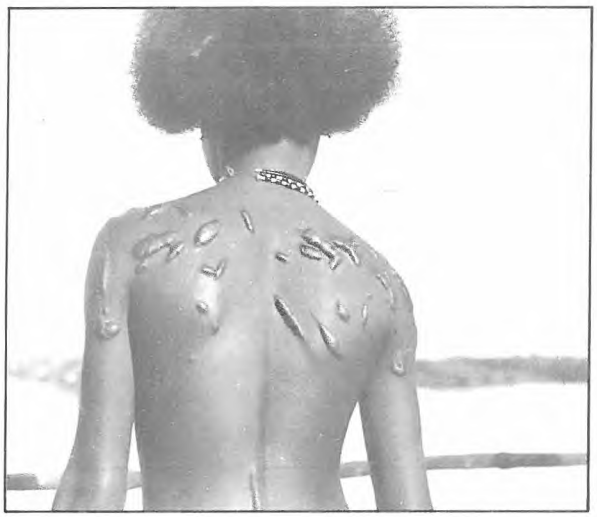

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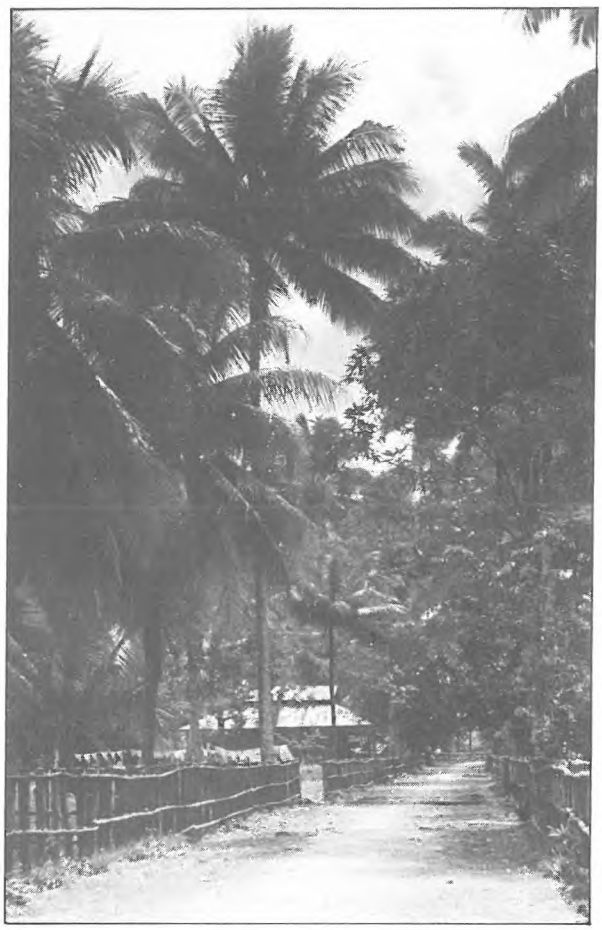

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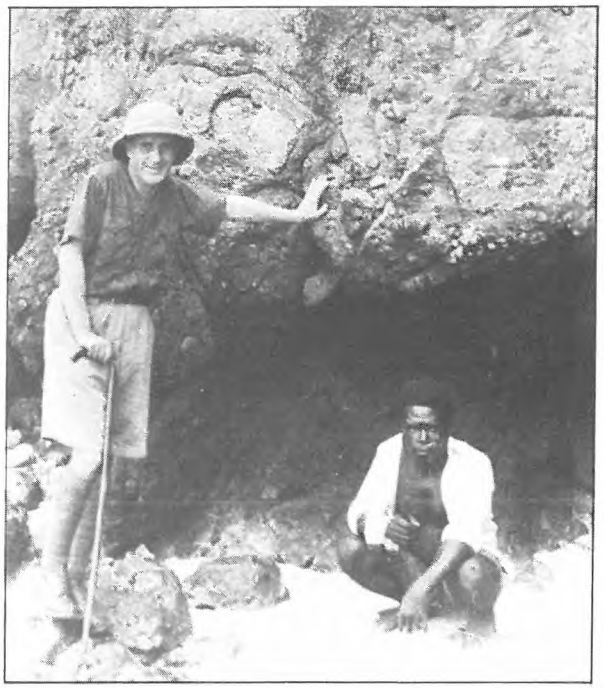

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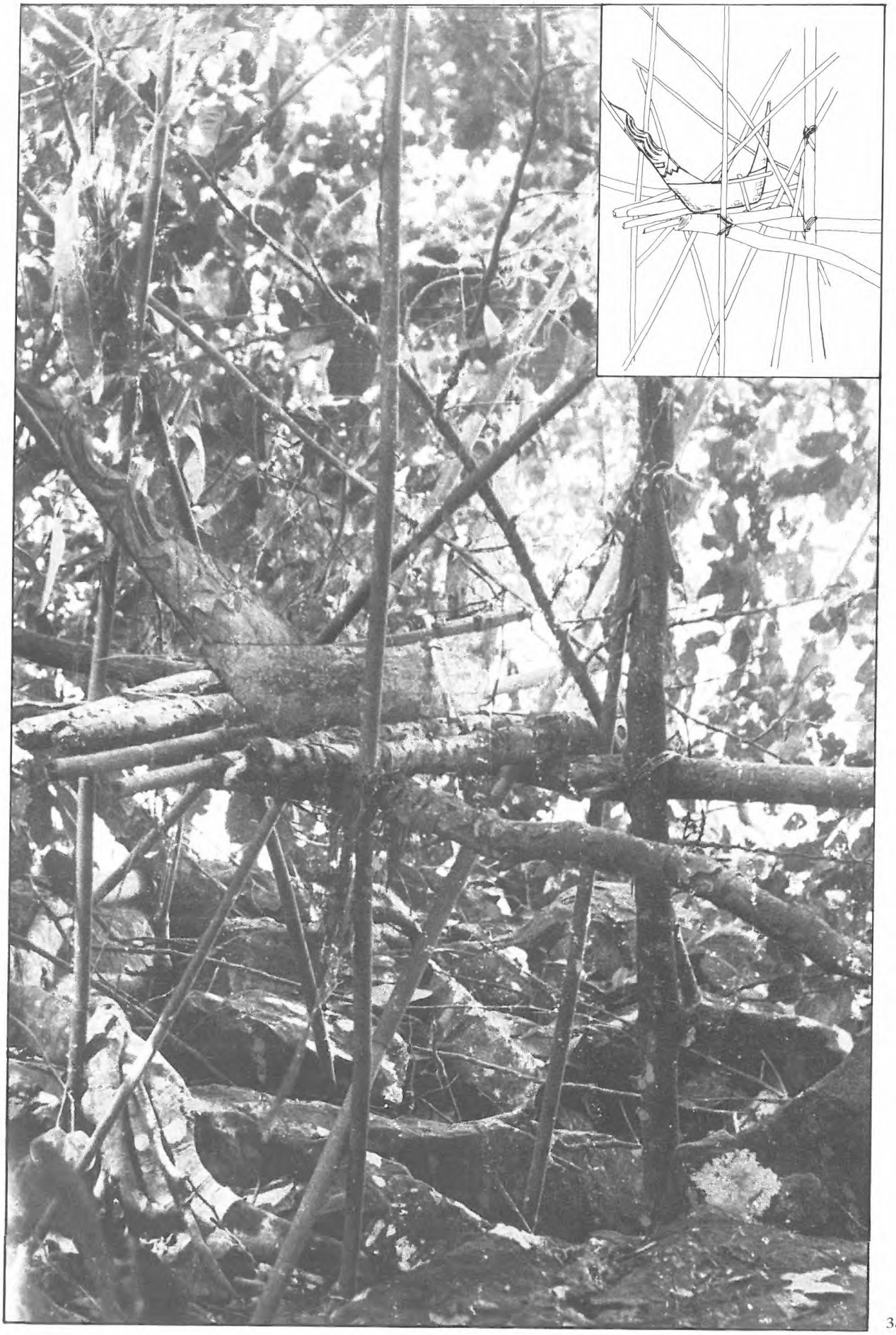

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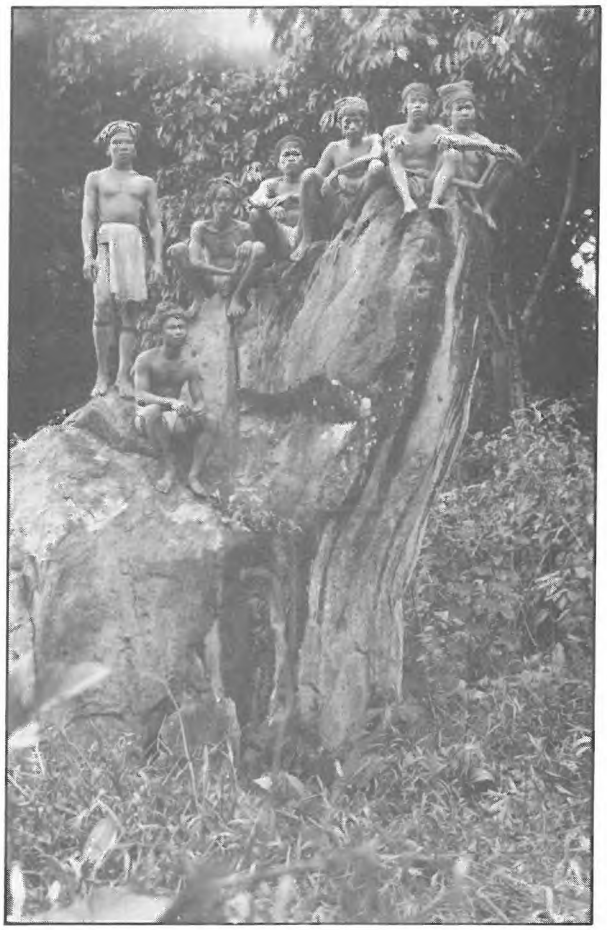

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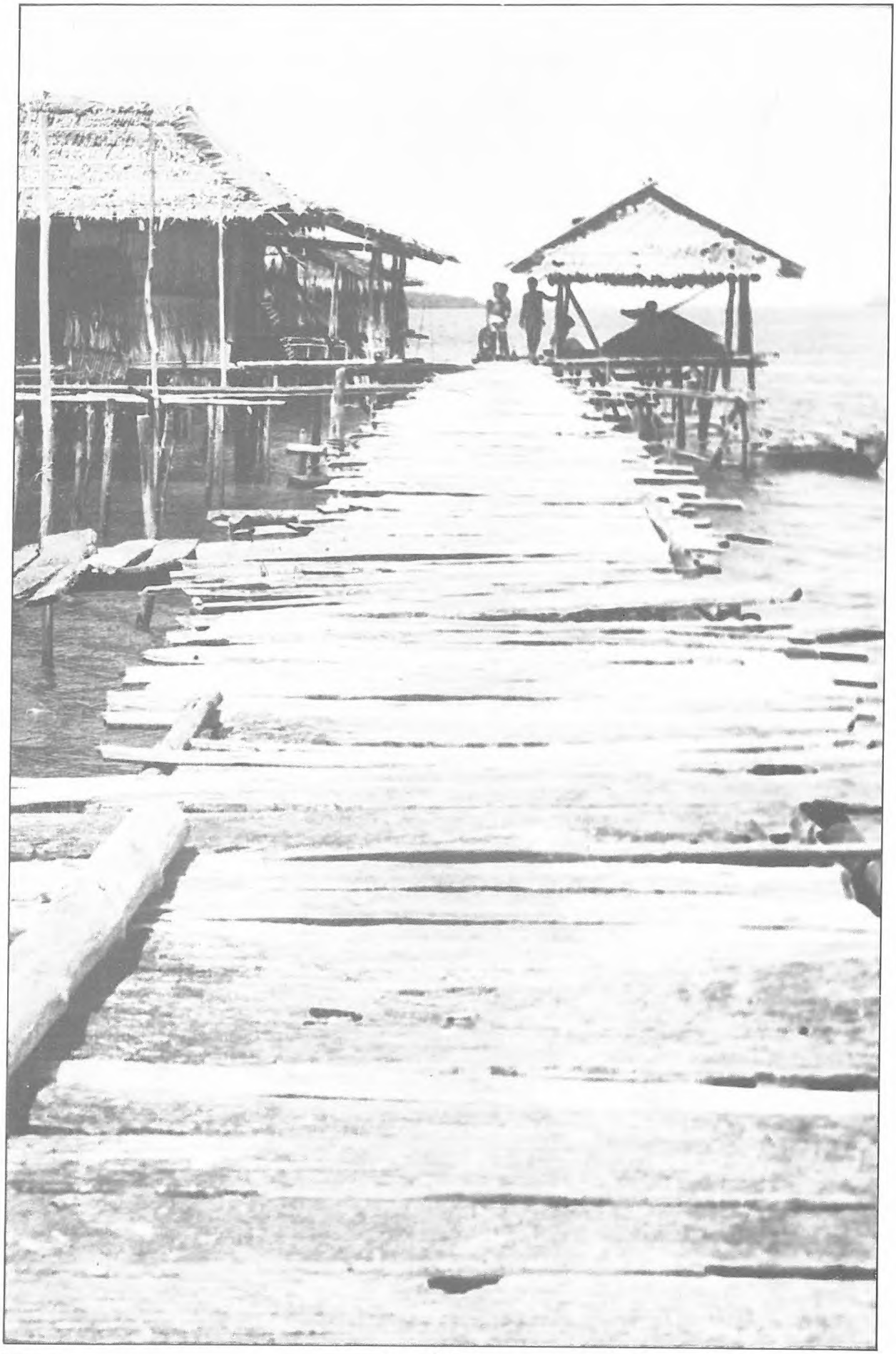

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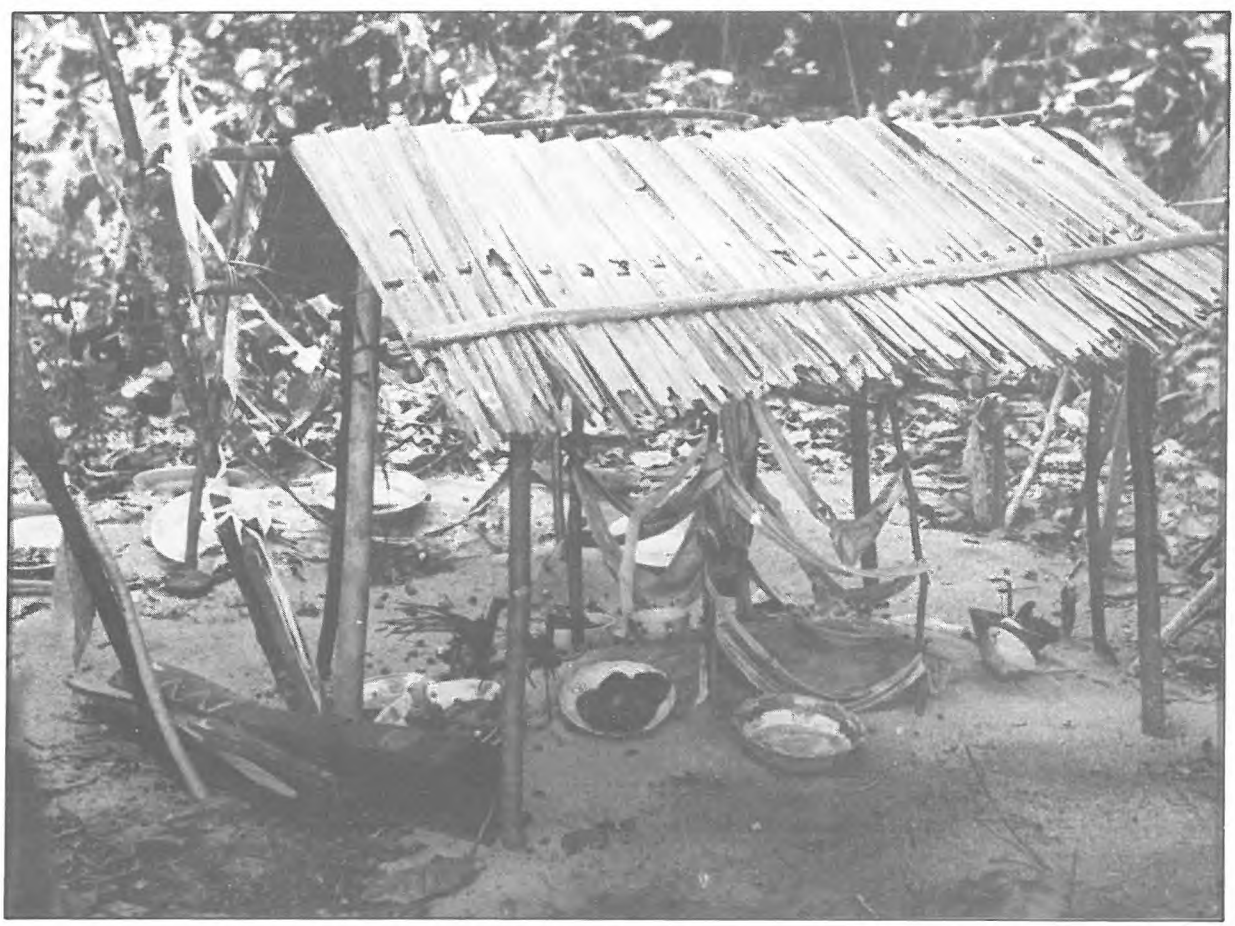

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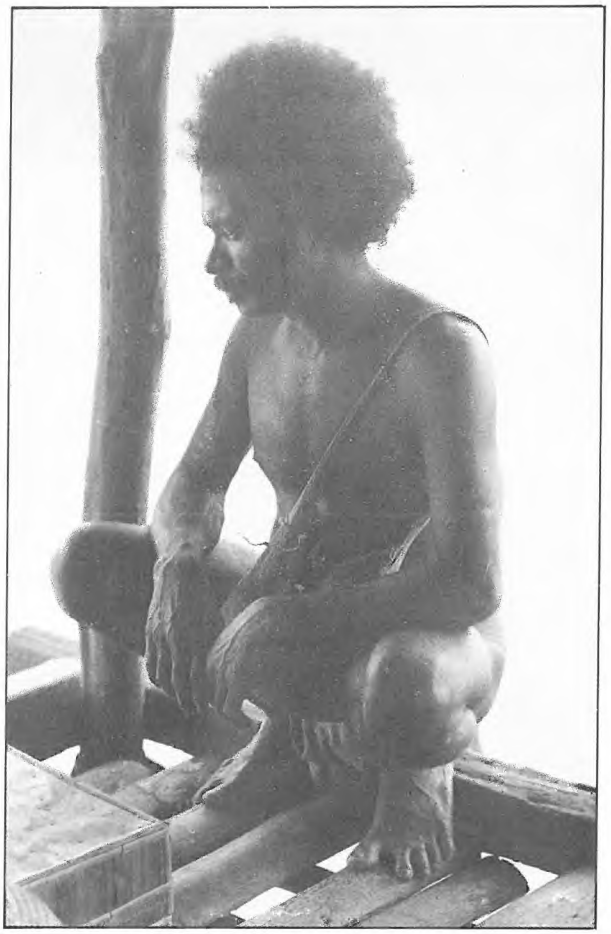

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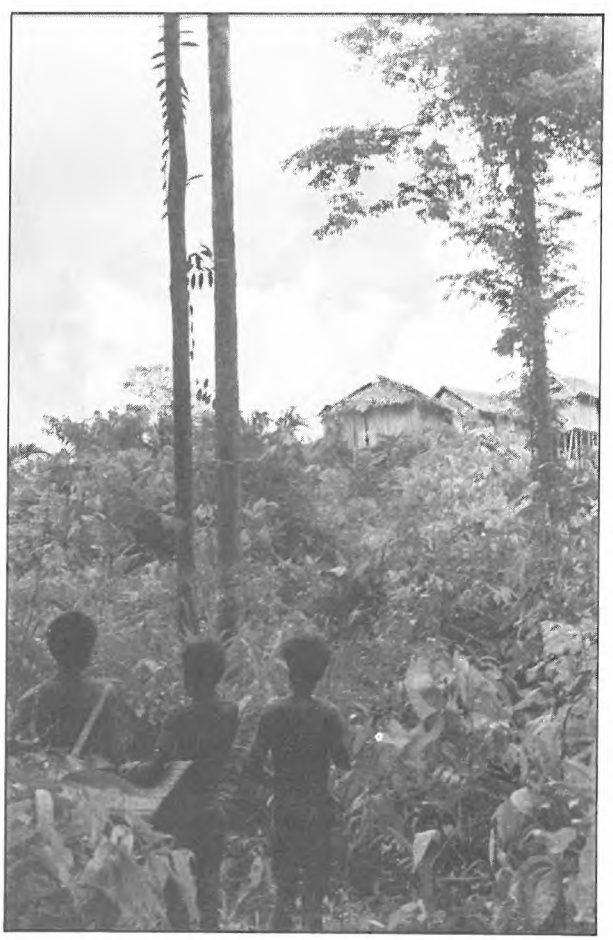

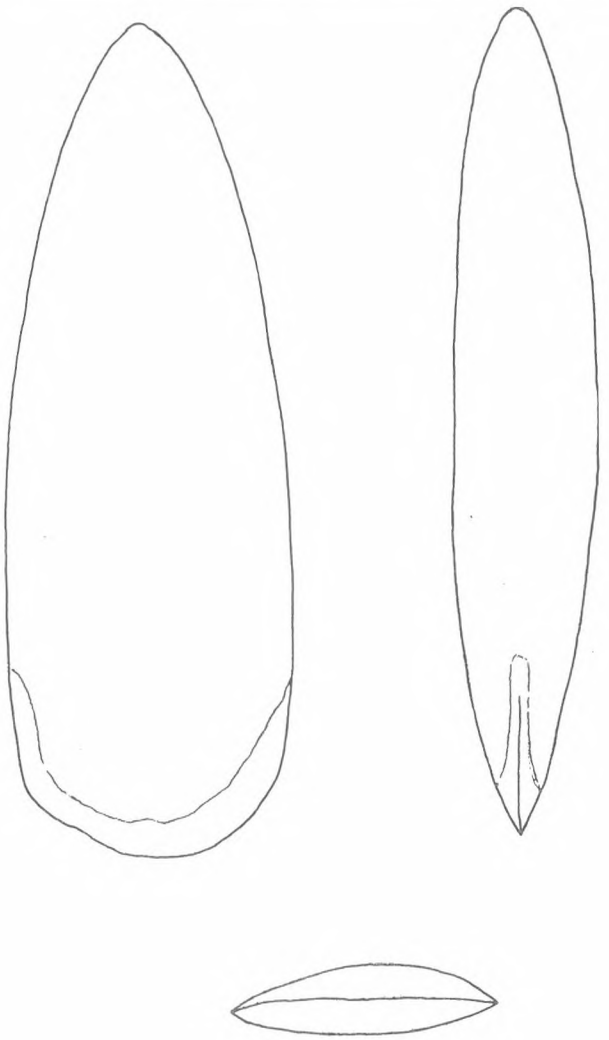

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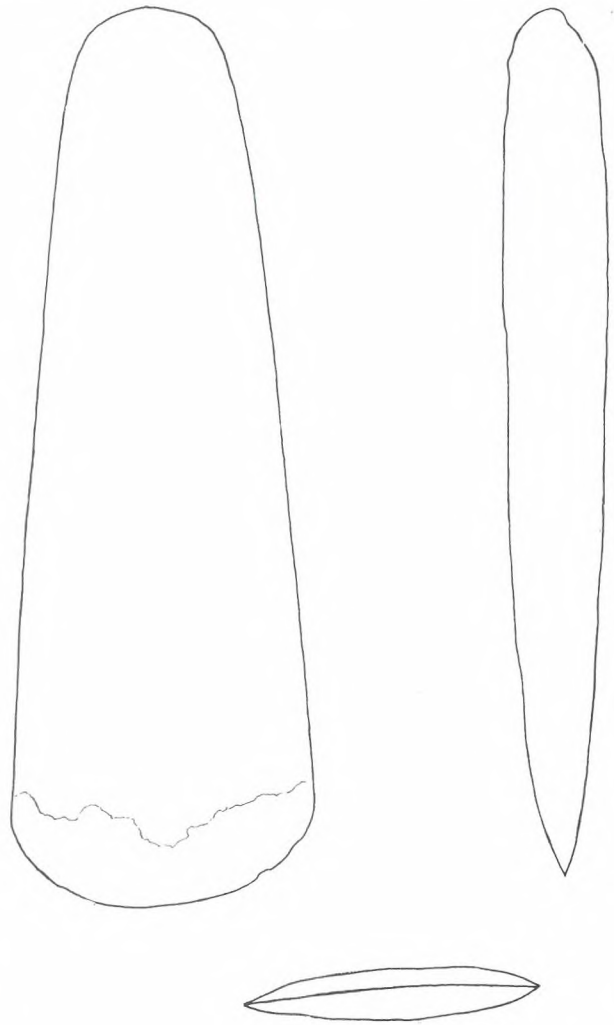

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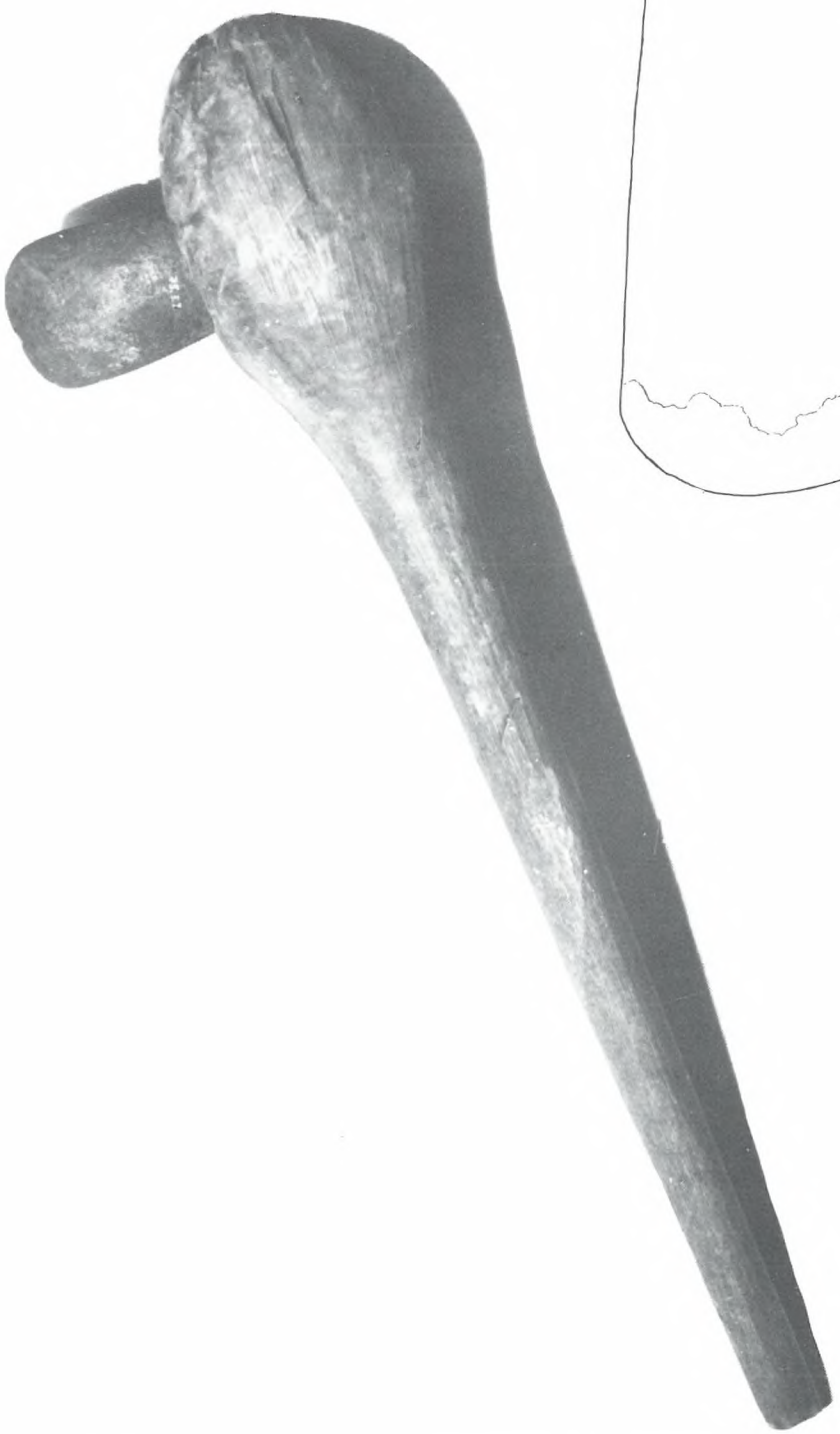

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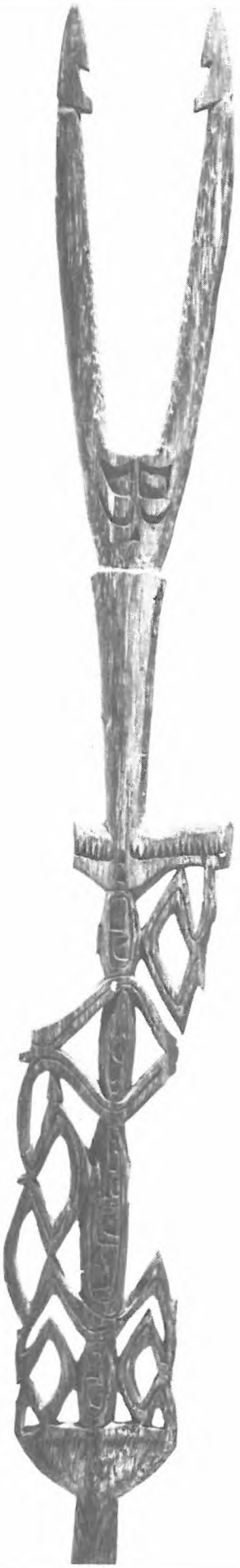

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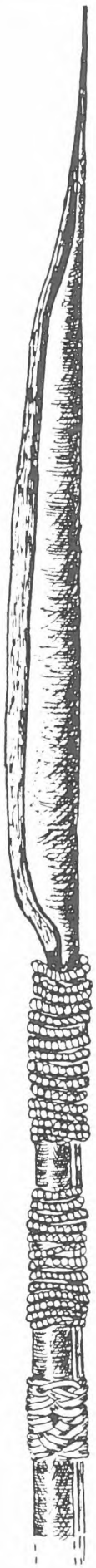

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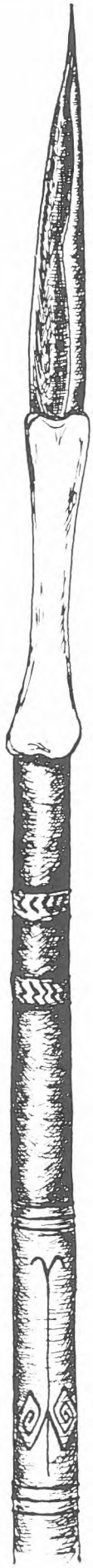

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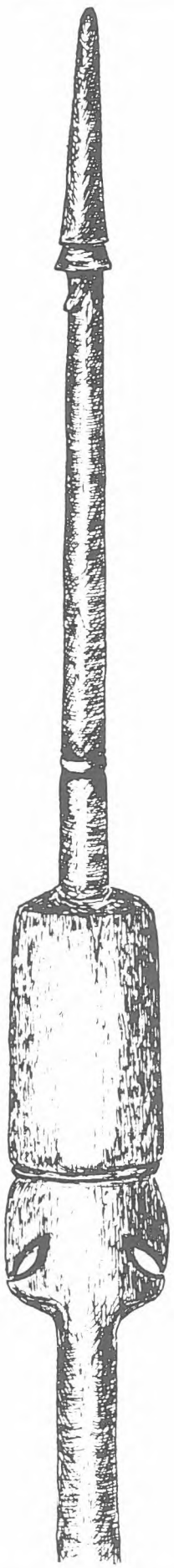

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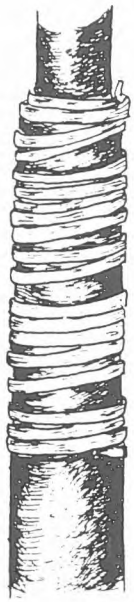

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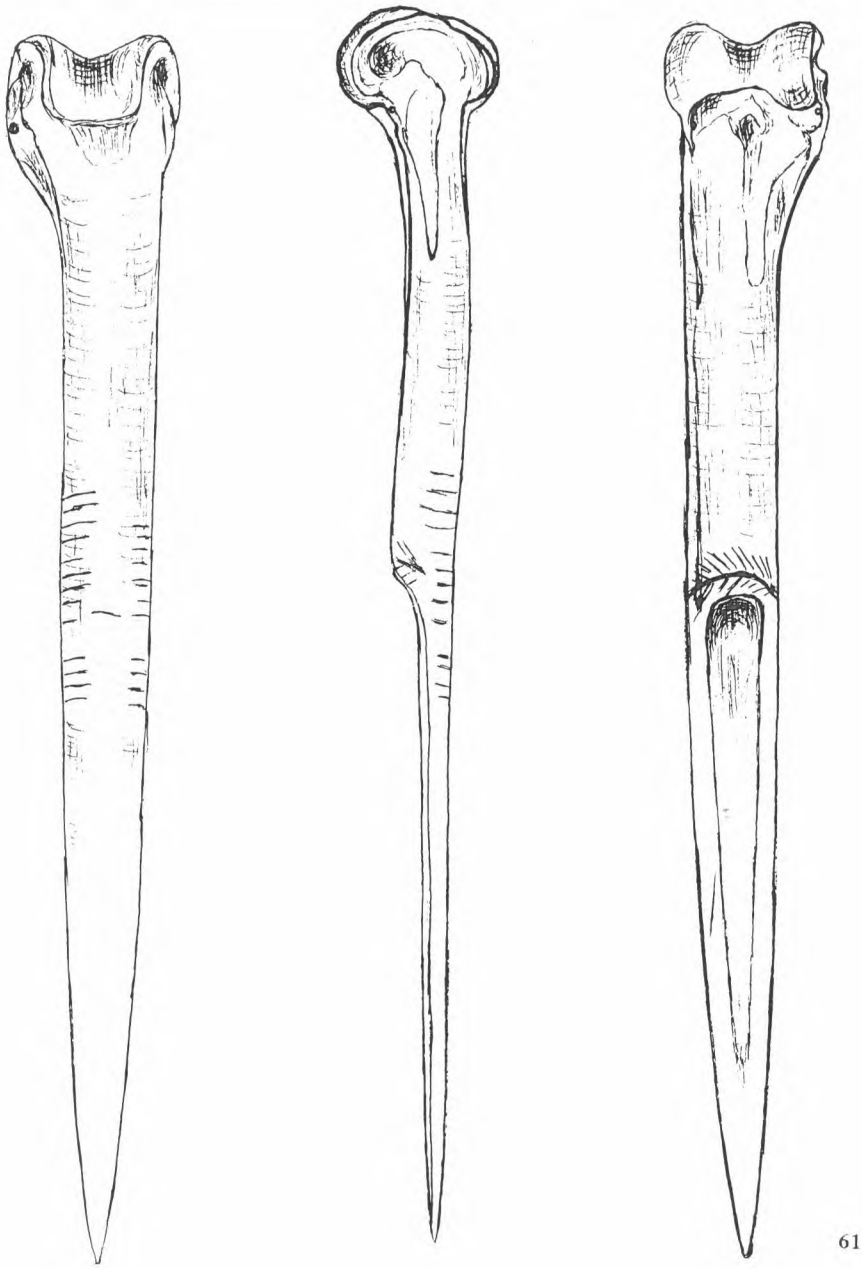

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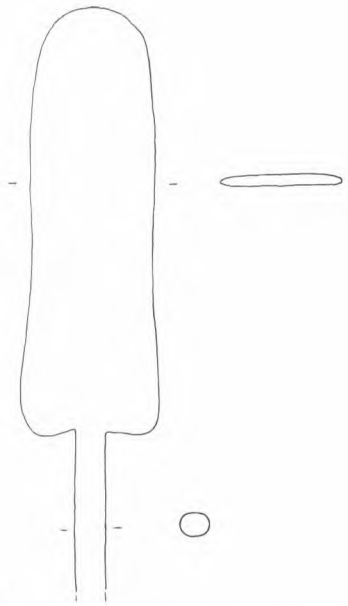

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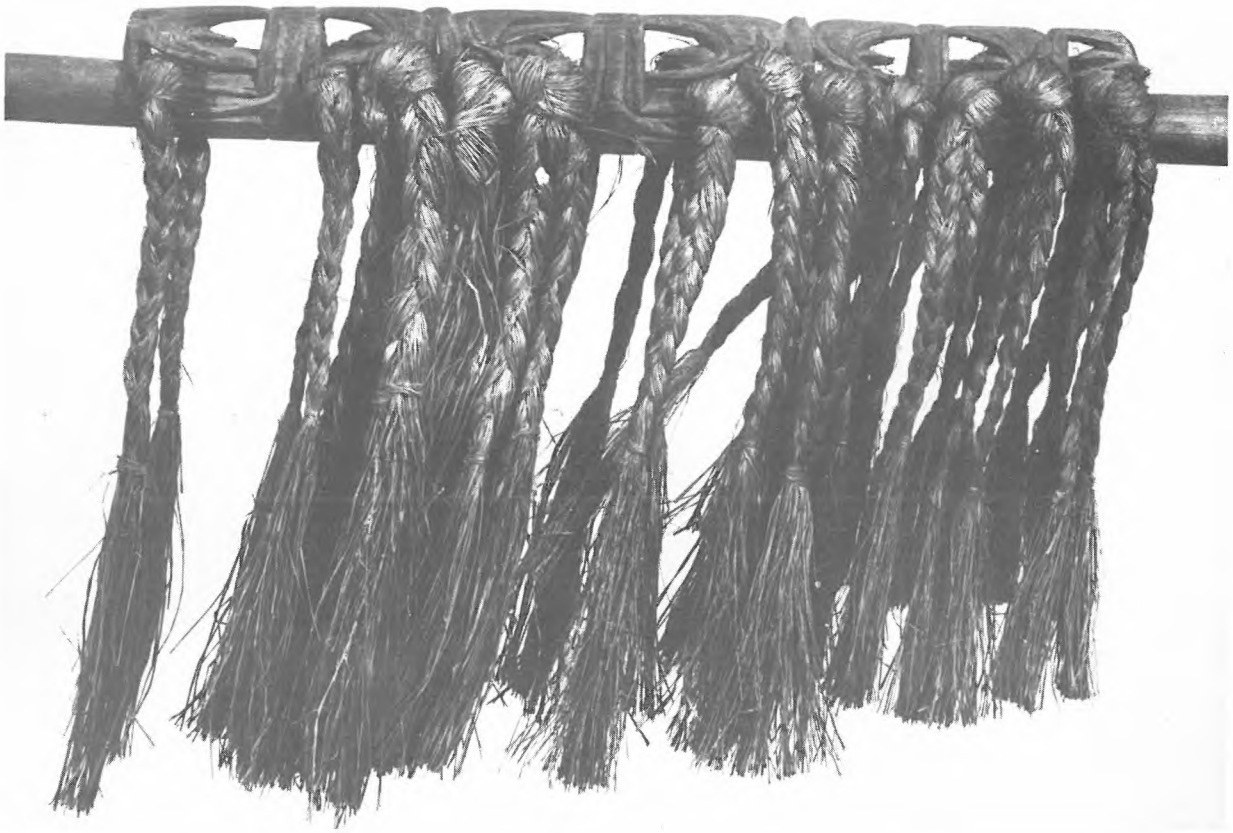

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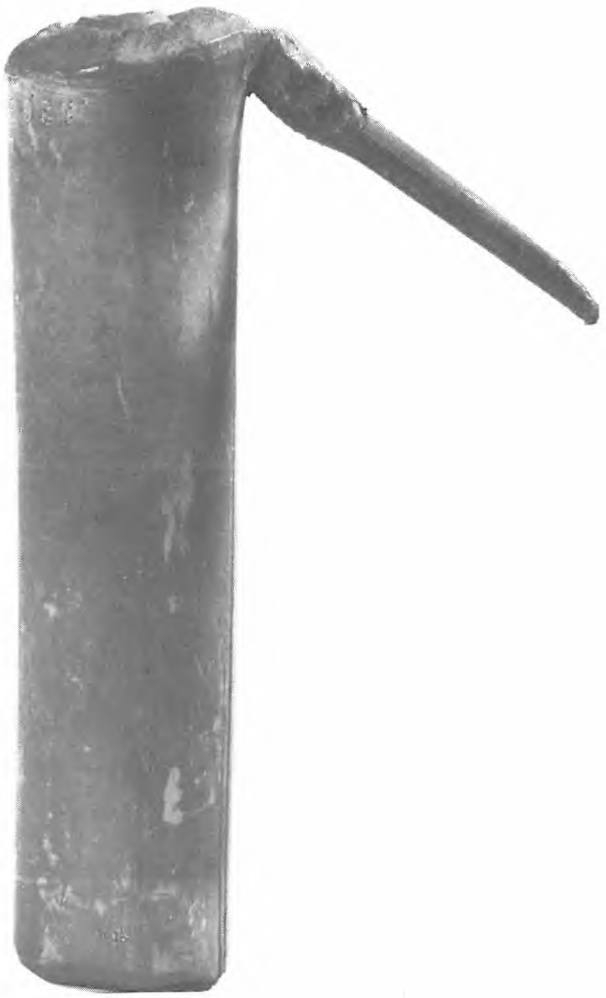

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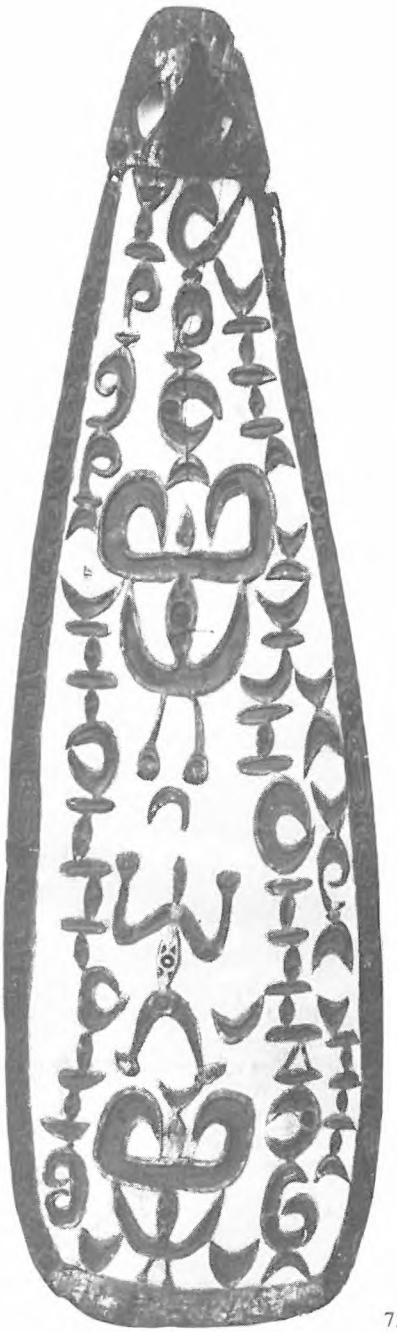

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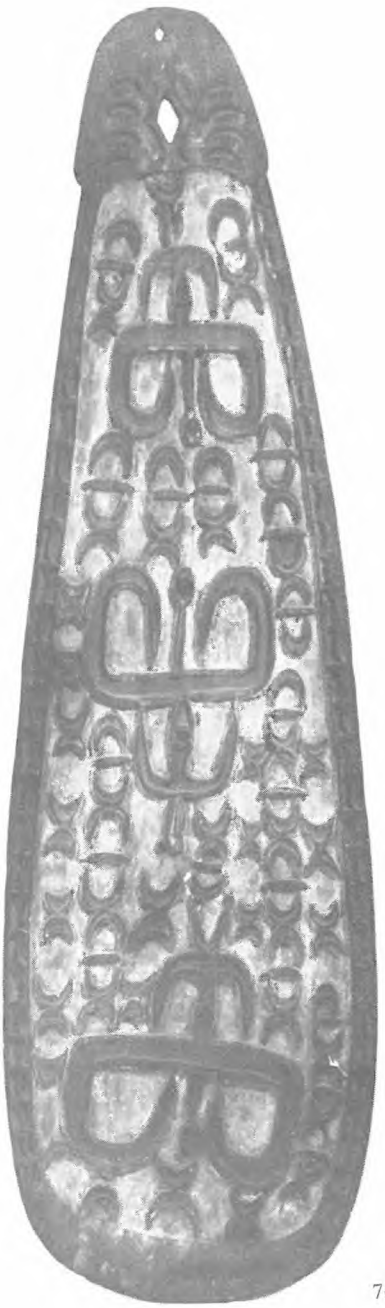

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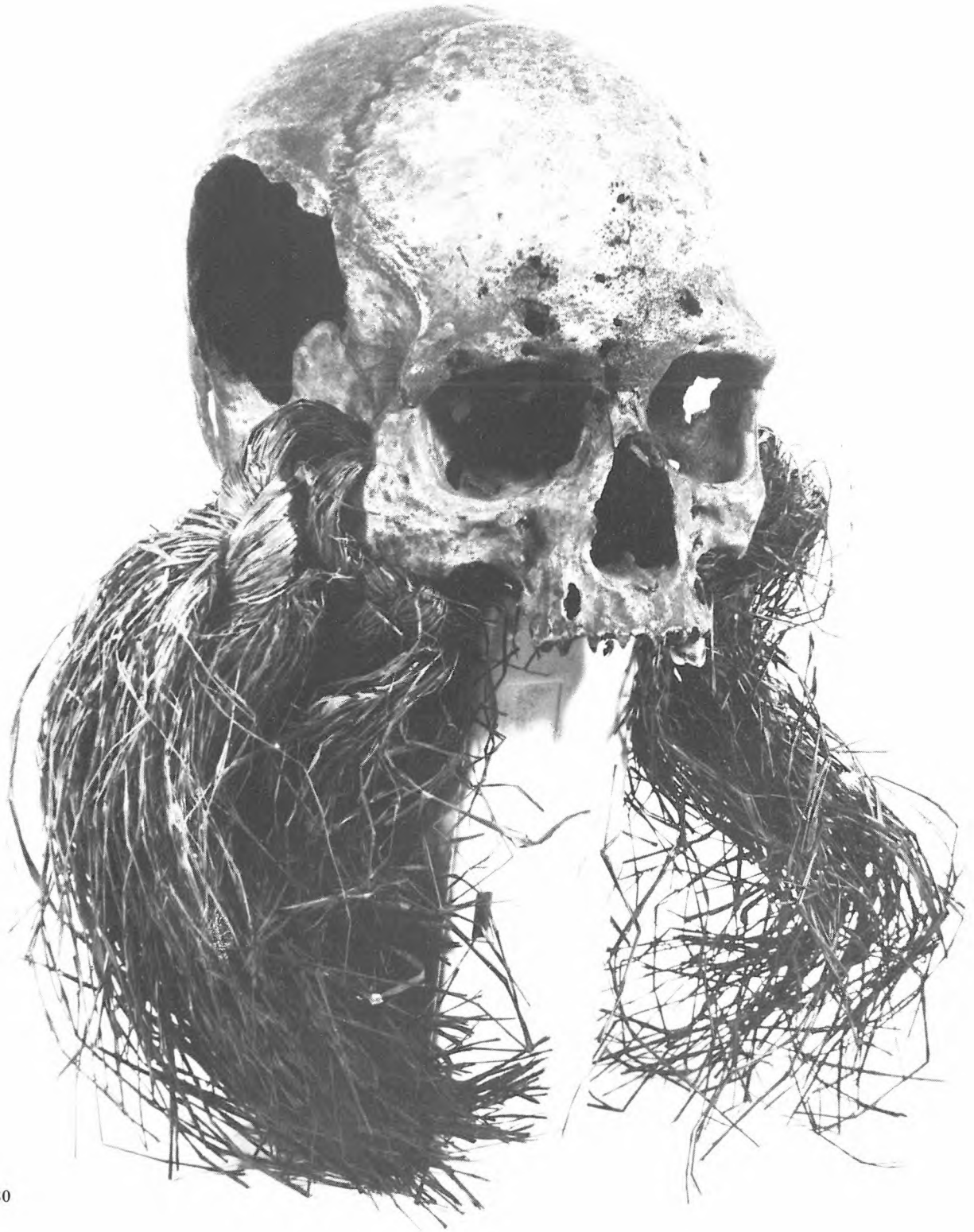

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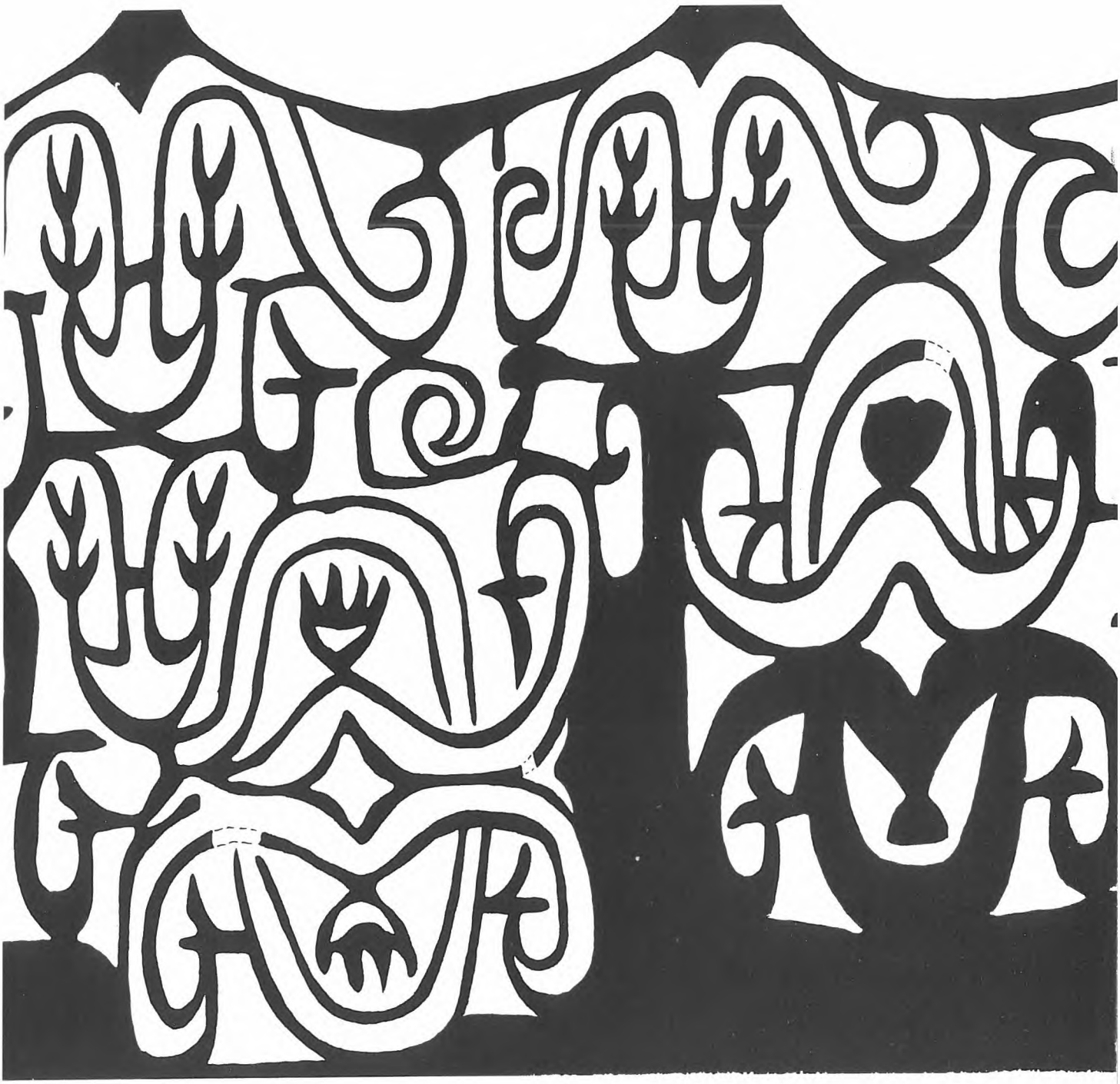

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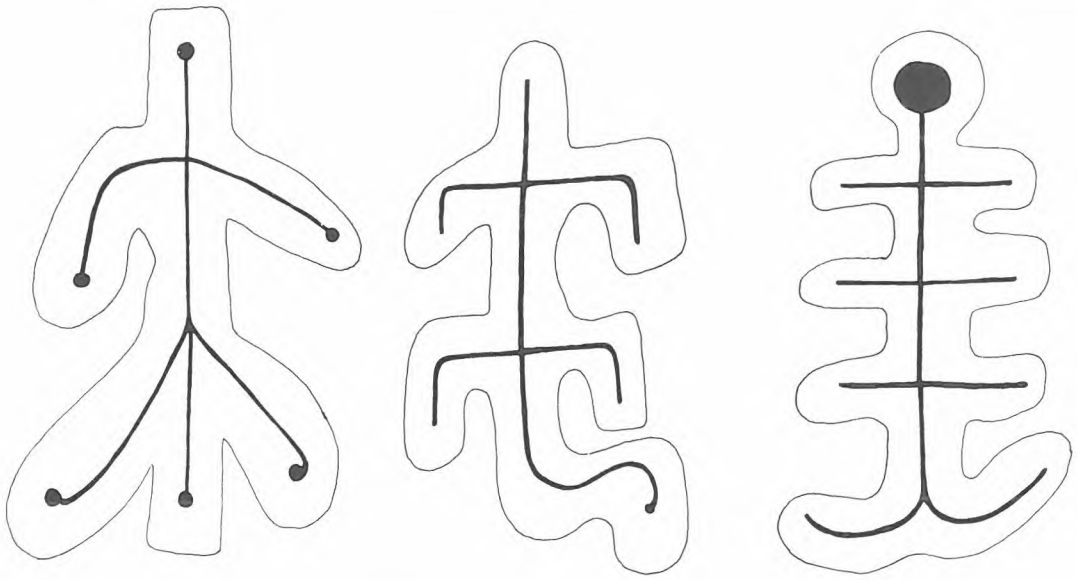

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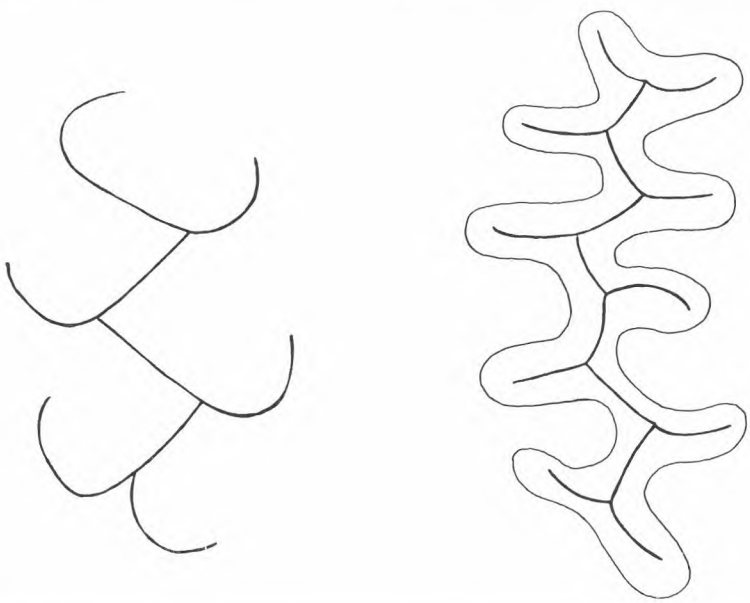

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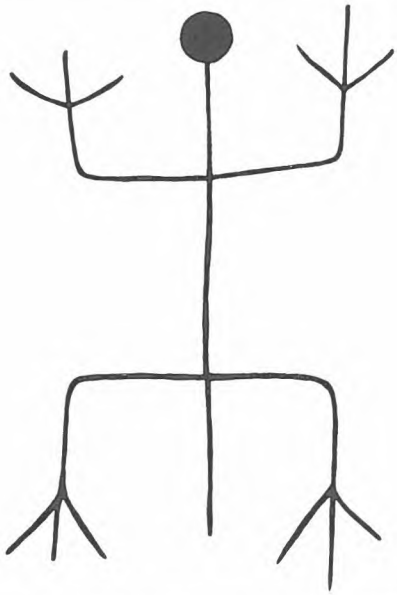

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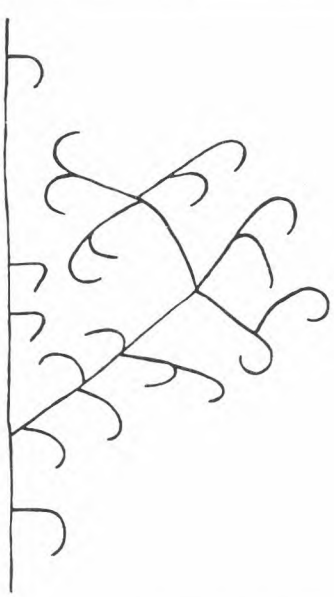

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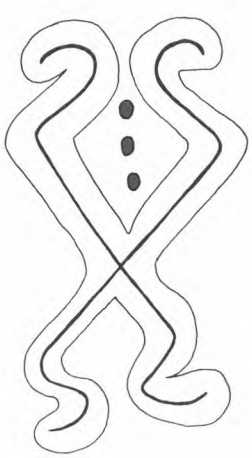

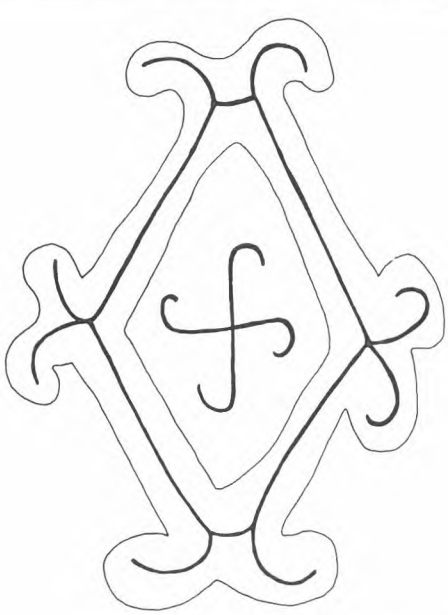

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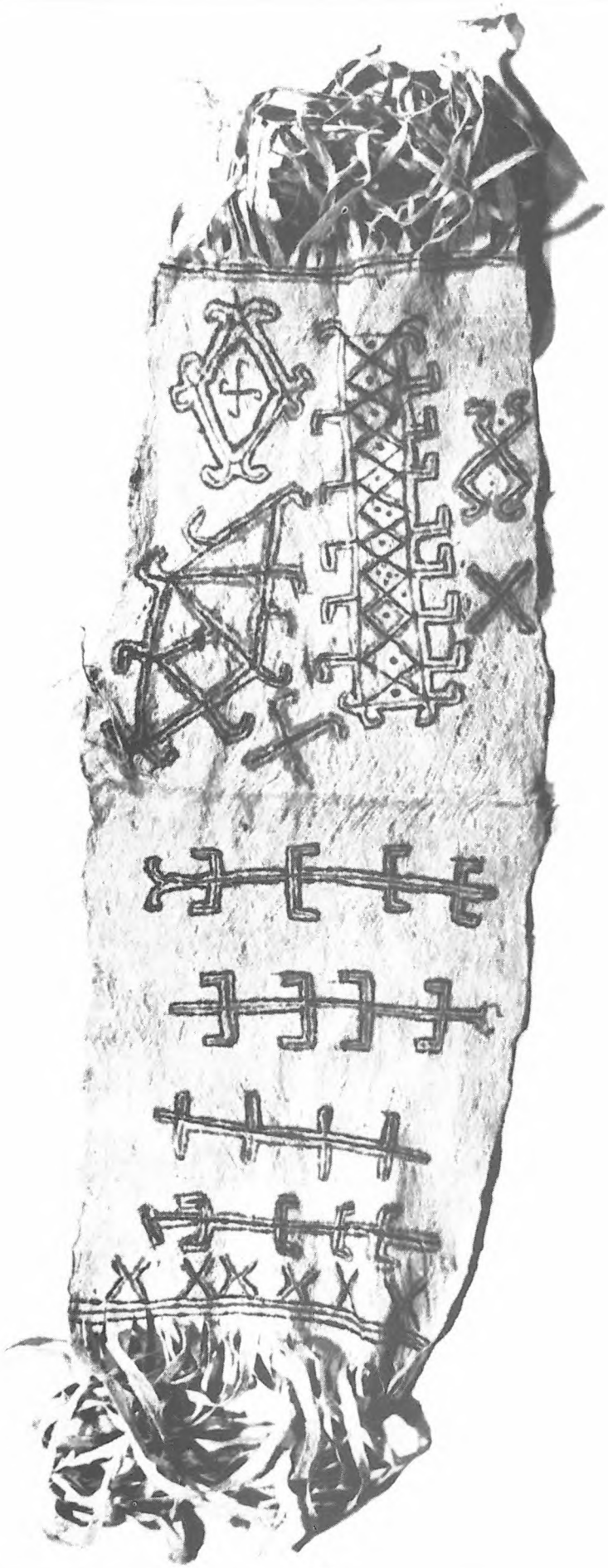

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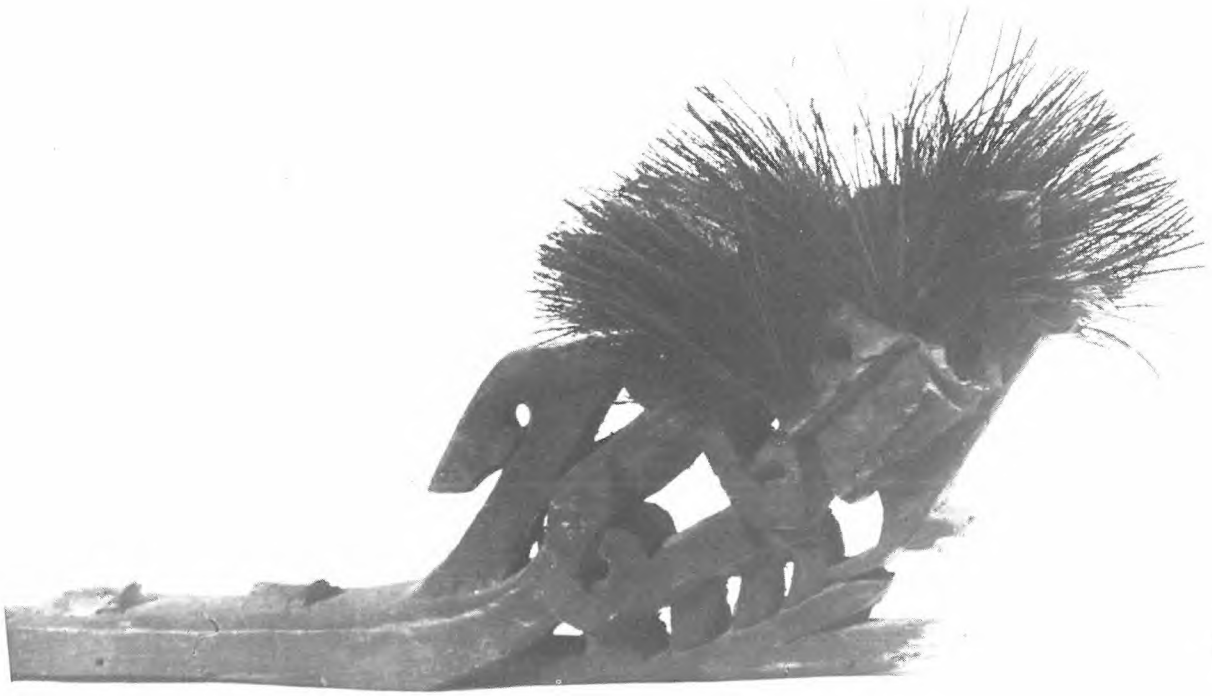

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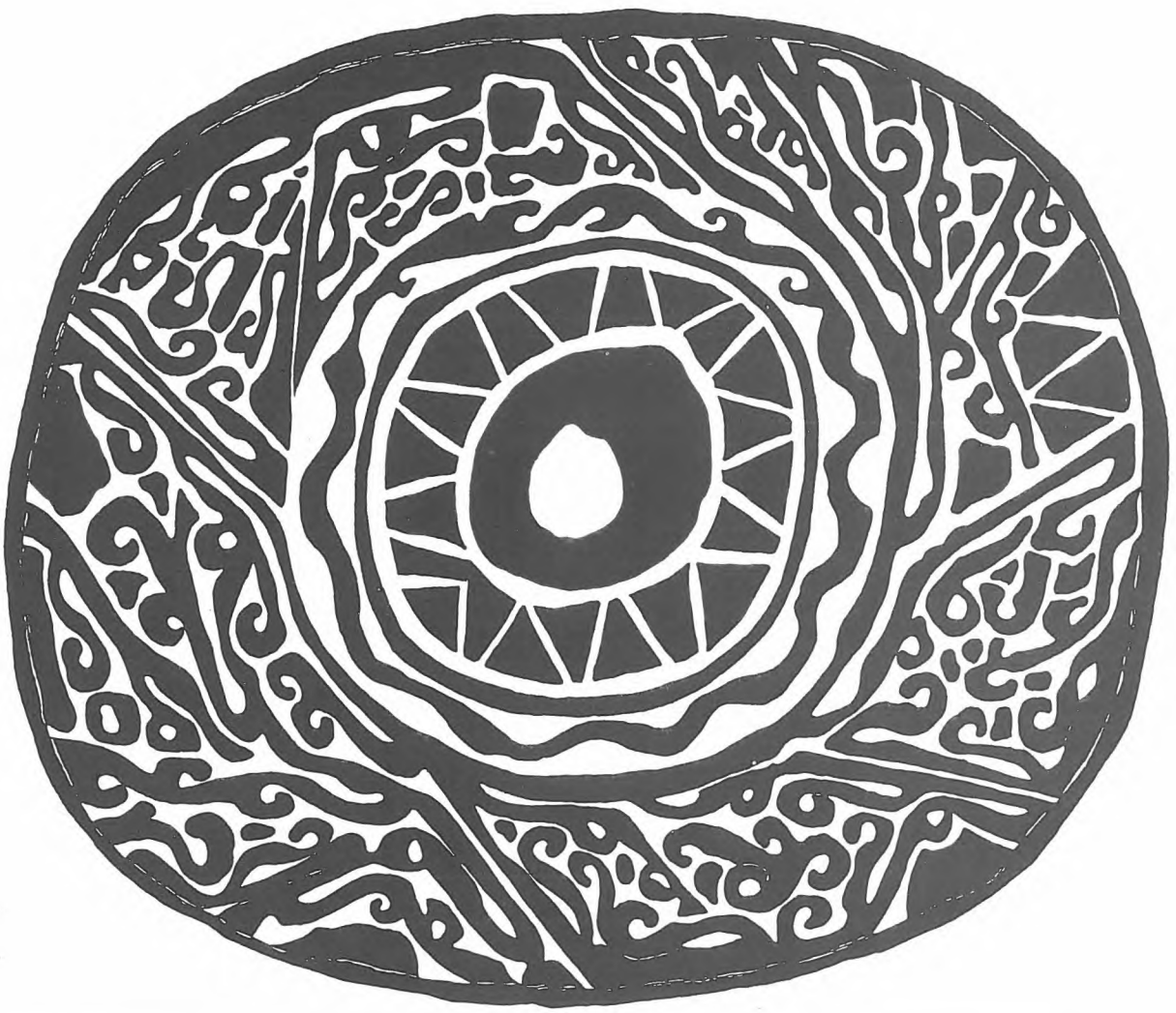

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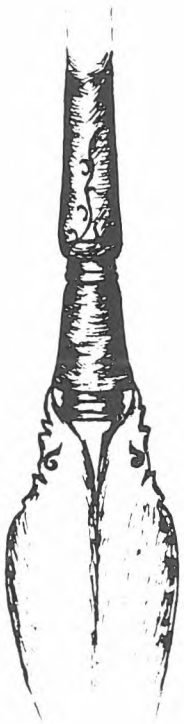

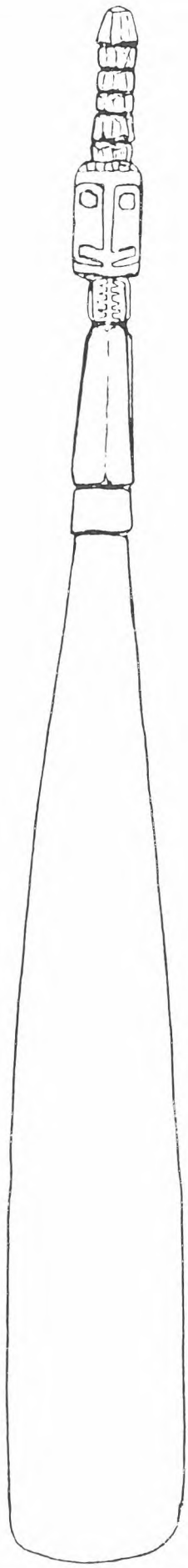

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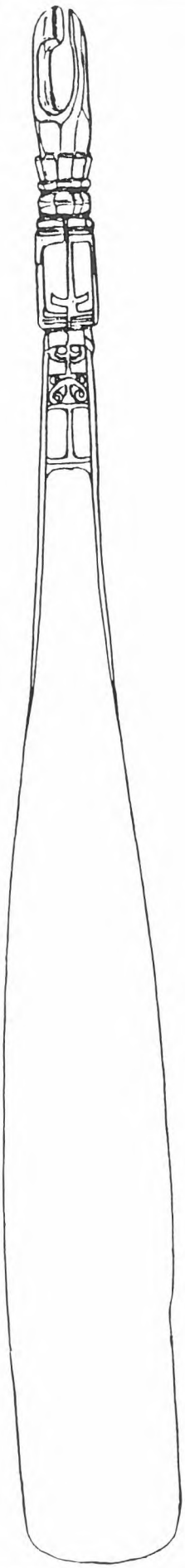

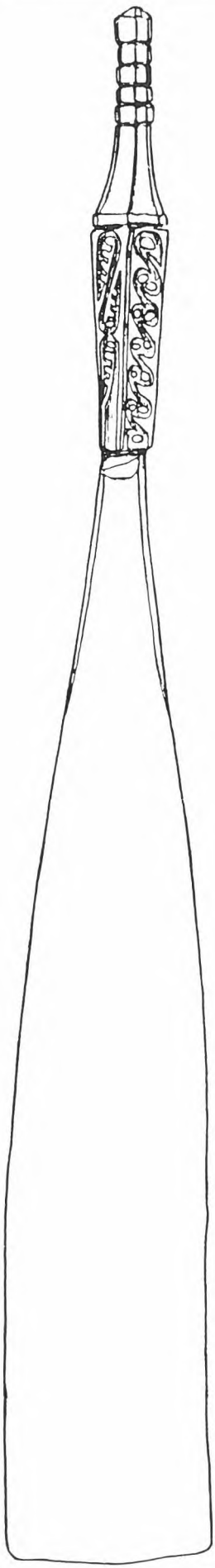

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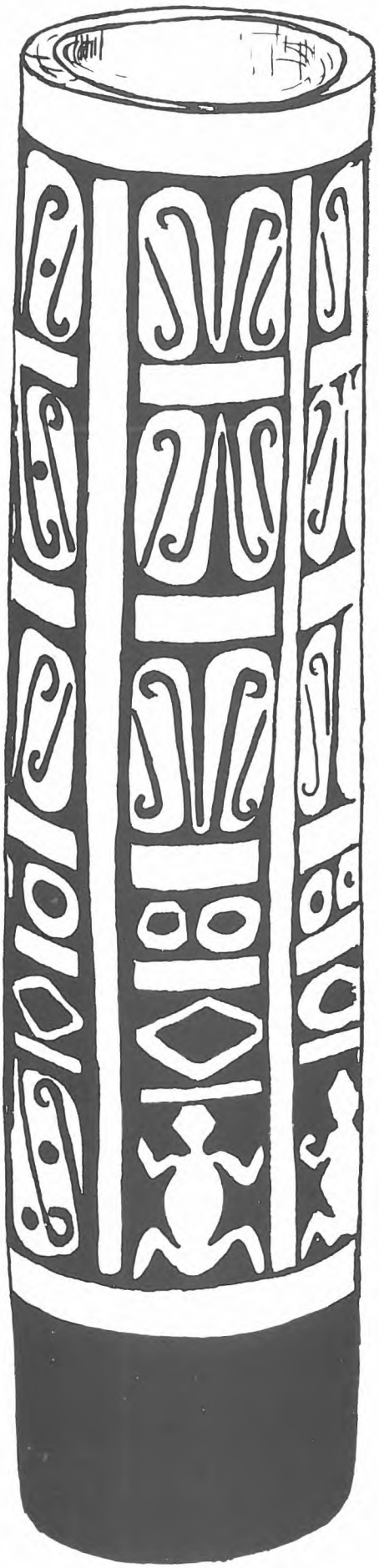

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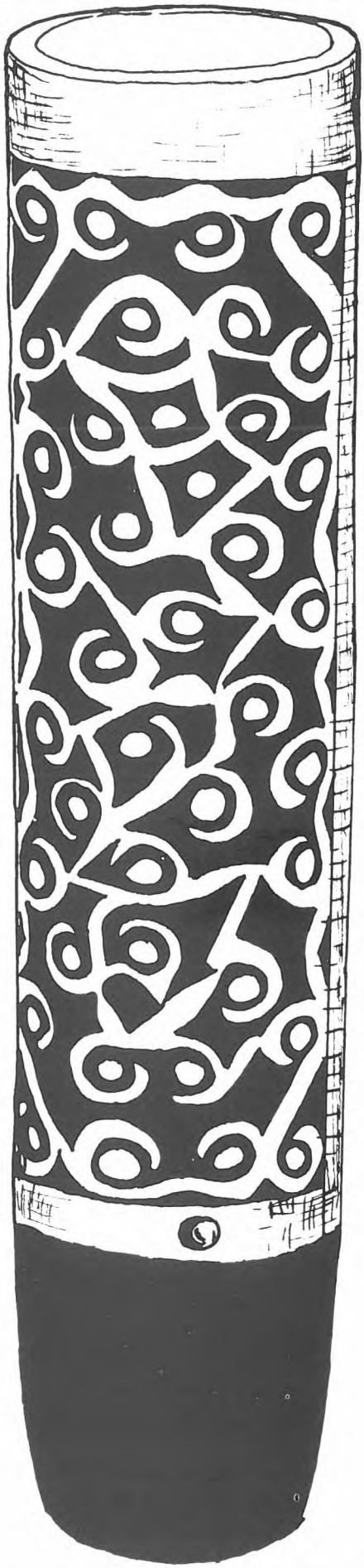

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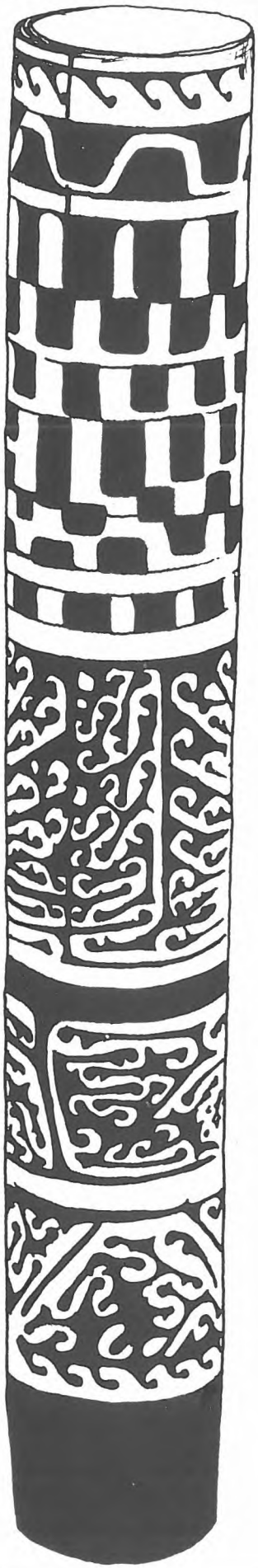

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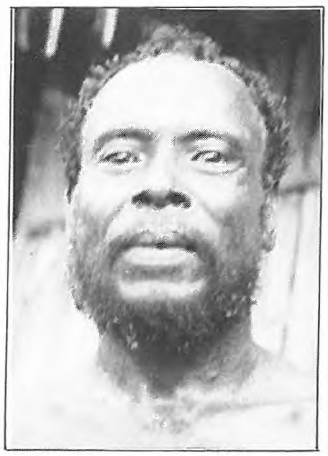

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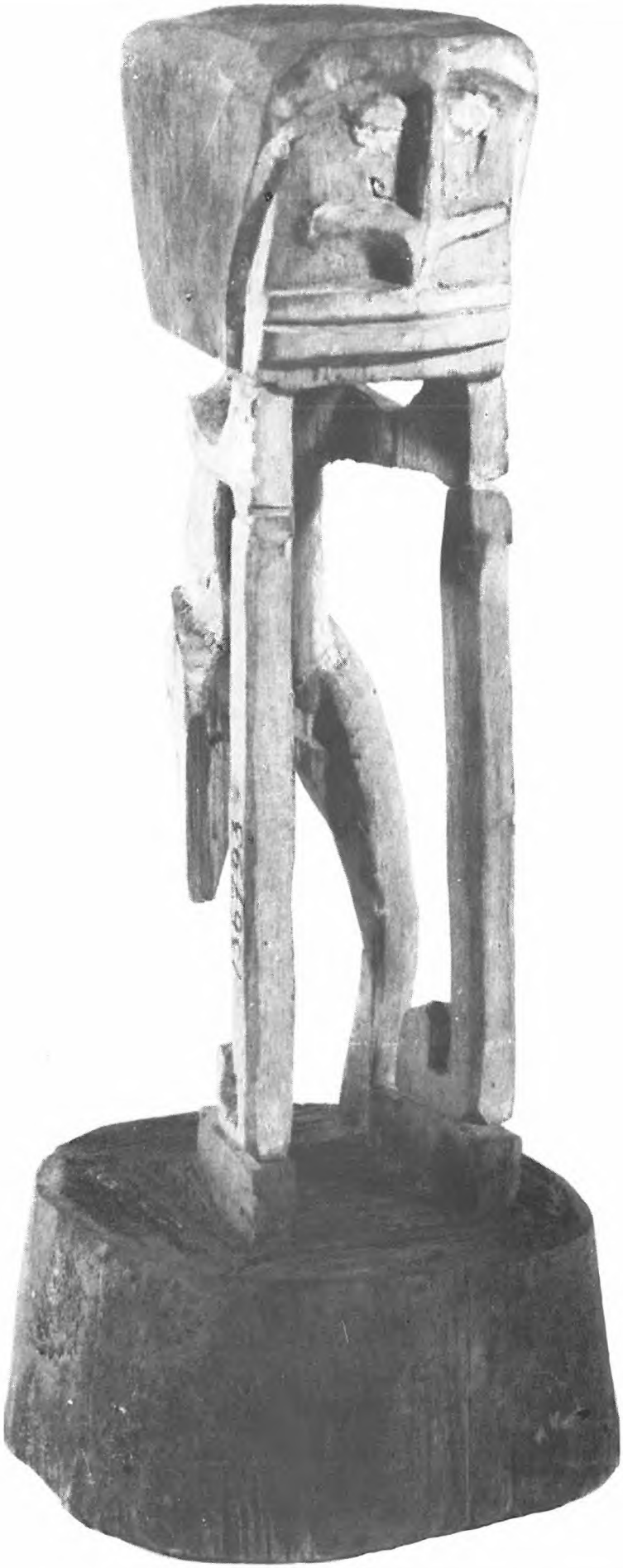

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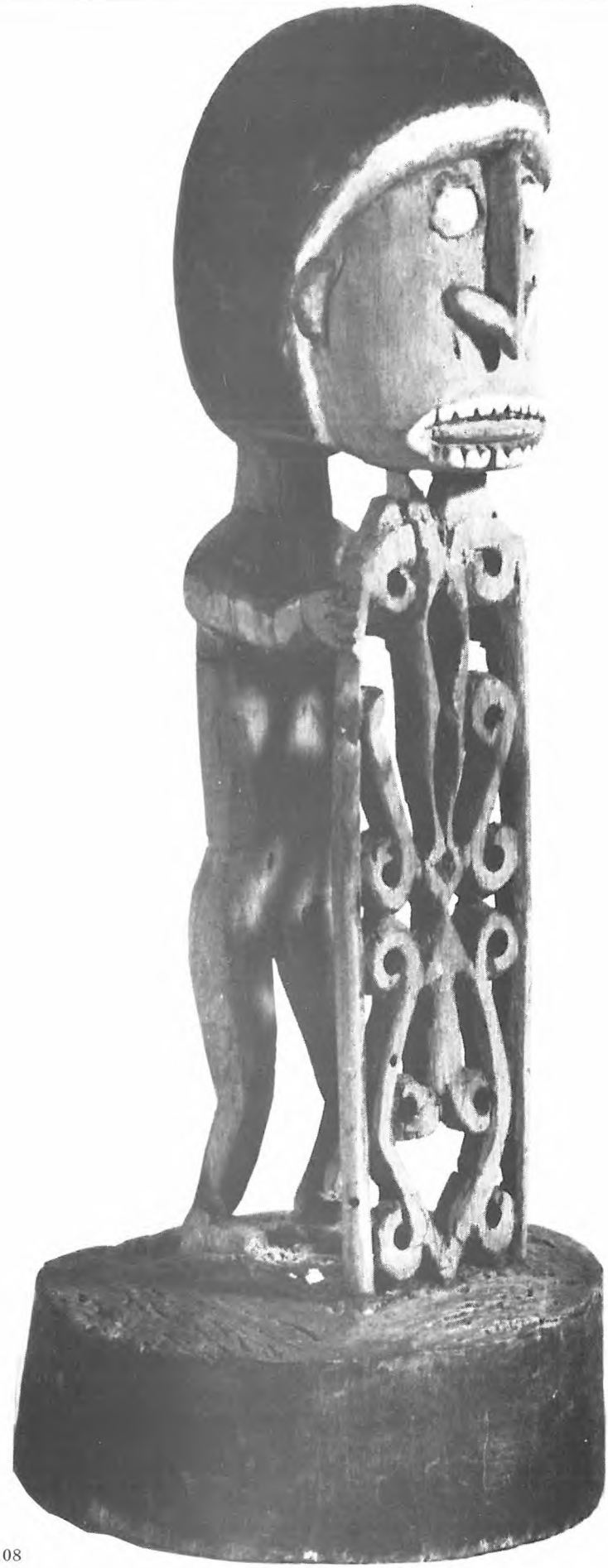

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