

THE MRABRI: ANTHROPOMETRIC GENETIC, AND MEDICAL EXAMINATIONS

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The second Mrabri ⁽¹⁾ expedition of the Siam Society gave the author of this report an opportunity to examine somatometrically and medically 18 of the 24 Mrabri encountered at the Meo village Ban Khunsathan (Nan Province) in January 1963. The examinations were carried out with the purpose of augmenting the general knowledge of the Mrabri people by a more complete description of their physical features, of pathologic conditions, and of genetic characteristics, such as blood groups, hemoglobin types etc. Furthermore, it was attempted to aid in clarifying some of the questions raised by previous reports concerning the so-called Phi Tong Luang and by the findings of the first Mrabri expedition of the Siam Society, reported by the leader of both expeditions, Mr. Kraisri Nimmanahaeminda, and Mr. Hartland-Swann ⁽²⁾: Are the Mrabri an ethnic and racial unit or are they a group thrown together in recent centuries by a caprice of fate? Do they show the expected criteria for people who have been called "autochthonic stock of Southeast Asia" (Condominas) and "protomongoloid" (Bernatzik), or do they exhibit things in support of the legend of the prince of Nan who released his slaves into the jungle? And finally, is there any truth in the tales describing the forest people as "negritoës", tales which have entered a recent ethnologic publication ⁽³⁾.

Before the results of the examinations are presented it should be mentioned that the author of this report is a physician with training and experience in hematology and population genetics. Some of the examinations were carried out in specialized laboratories, and for the evaluation of some of the results expert advice was sought. Due mention will be made in the appropriate places.

Results and Comments ⁽⁴⁾

A. Physical description.

Eight individuals of the group of Mrabri examined were members of the group encountered by the first expedition in 1962. Therefore, little has to be added to the apt description of the physical appearance by Kraisri Nimmanahaeminda and J. Hartland-Swann (2). Several points have to be stressed because of their importance in judging the homogeneity and the racial classification of the Mrabri.

The shortness of stature, the muscularity of the body, and the difficulty of estimating their age will be mentioned again under "physical examination" and "somatometrics". Conspicuous is the relative similarity of the build of the face, characterized by pronounced supraorbital ridges (brows); prominent cheek-bones which give the face below the eyes a triangular configuration; almond-shaped eyes with a laterally elevated ("mongoloid") lid axis. There is, however, no or only a hint of an epicanthal fold, the characteristic of the mongoloid eye *sensu strictiori* (as seen, for example, in Chinese). The nose exhibits the most distinctive features. It is straight, rather low in height, very wide at the base, and does not protrude much from the facial plane. This nasal configuration is most conspicuous in comparison to Europeans, but there are also differences in comparison with both Thai Nuea and Meo (see somatometrics).

Comment: The similarity of the physical features indicates a common genetic background of the members of this group. This is in contrast to the impression gained at the first Mrabri expedition (2). Some medical observations may explain the difference of opinion. The features of one member of the group differ considerably from the gros, giving the impression of a completely different type (Fig. 1). This man's facial configuration with laterally depressed lid axis ("antimongoloid"), squint, beaked nose, and receding chin, is characteristic of a hereditary malformation of the facial skeleton, dysostosis mandibulofacialis. In other members of the group differences in the length and style of scalp hair, in skin texture, a relative



Fig. 1 Mrabri with dysostosis mandibulofacialis (malformation of the facial skeleton).

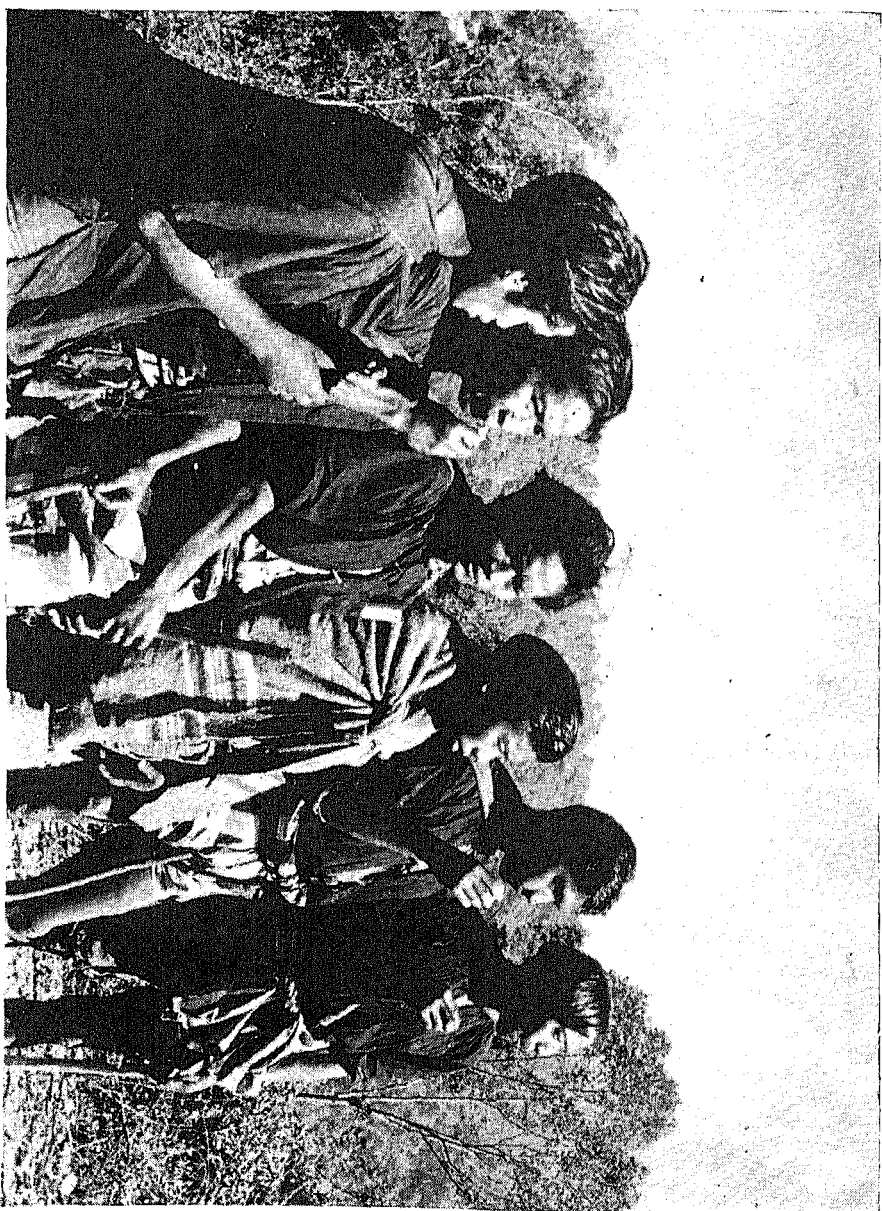


Fig. 2. Group of Mirabri. On the right: The man with facial malformation.

coarseness of the features in some men, and squints and corneal opacities tend to increase the variance. They cannot obscure the similarity of the facial and cranial configuration of most of the members of the group (Fig. 2).

B. Somatometrics.

The measurements obtained from 15 Mrabri men are given in table I. The short stature, the broad face, and the short wide nose are reflected in these measurements. The generally small standard deviation is an indication of the uniformity of the group.

Table II shows a comparison of the somatometric indices calculated for the Mrabri and three control groups, Thai Nuea, Meo, and Germans. All indices were calculated from measurements taken by the same examiner and the same technique. The nasal indices do not conform with the standard indices. Nasal length had to be substituted for nasal height because of the limited instrumentarium at hand.

The cephalic index (breadth of the head in percent of the length) shows the Mrabri to be mesocephalic, only two are in the lower ranges of brachycephaly. In contrast, the Meo and Northern Thai are predominantly brachycephalic. The variability in these groups is, however, much greater than in the Mrabri. The facial indices show little difference between Mrabri and Thai Nuea (both are broad-faced with indices near 80), as compared to the Europeans with high and narrow faces. The nasal indices are similar in mean and range for Thai Nuea and Meo, whereas Mrabri and Europeans are nasal antipodes. Fig. 3 illustrates the different nasal configurations. It is apparent that the Mrabri have the largest nostril area and circumference of the four populations.

Lateral photographs of the Mrabri showed a pronounced flatness of the face typical for mongoloids (Fig. 4.) The projected distance from the cornea to the nasal apex was near 3 cm for the Mrabri, as compared to 4 to 5 cm in Europeans.

Comment: Somatometric data and photographs were submitted to Doz. Dr. H. Walter of the Anthropological Institute of the

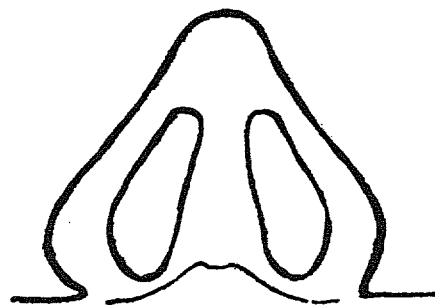
University of Mainz. He concurred with the opinion that the Mrabri are distinctly mongoloid. They show many characteristic of the type described by von Eickstedt⁽⁵⁾ as palaeomongoloid. According to von Eickstedt the palaeomongoloid race was present in the ancient population of the Southeast Asian subcontinent. Historically later it was separated by migrations from the North. The Mrabri could be a small relic of persons predominantly palaemongoloid. Dr. Walter believes, however, that they show some admixture of different origin, possibly sinid. The surprising uniformity of the Mrabri is thought to be due to endogamy, i.e. marriage limited to members of a ethnic or social group.

The author is of the opinion that the palaeomongoloids have contributed much to the composition of the present "immigrant" populations of Southeast Asia. Palaemongoloid types are frequent in the Wa⁽⁶⁾, Lawa (Fig. 5), Khmer, and also in the Thai population. The most distinctive palaemongoloid sign is the flat and wide nasal configuration. This configuration is not in itself a racial characteristic. It is found frequently in populations inhabiting areas with humid, hot climate.⁽⁷⁾

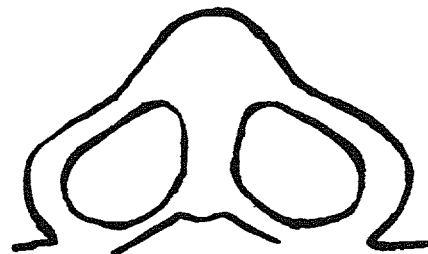
C. Physical examination.

15 members of the Mrabri group had a physical examination. Besides the detection of physical anomalies and pathologic conditions special attention was paid to the question of femininization in Mrabri males which was raised after the inspection of photographs taken at the first expedition. In the following, pertinent findings are listed under organs and systems :

1. Hair. Thick, straight, and black in all persons. Headlice were found in one. Body hair scanty, no beards.
2. Eyes. Vision could not be tested accurately, but was apparently good. Corneal opacities were found in two individuals. In one man the opacity occupied almost the entire cornea. He stated that an injury to his eye was caused by an insect sting. The pupillar reaction to light was prompt in all men.



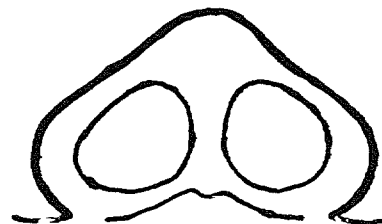
European



Thai Nuea



Mrabri



Meo

Fig. 3 Nasal configuration in Mrabri, Meo, Thai Nea and Europeans.



Fig. 4 Mrabri. Note the lack of facial depth.

3. Ears. Purulent discharge unilaterally in one man.
4. Mouth. No abnormalities of mucous membranes and tonsils. The teeth were all in surprisingly good condition. In the older men considerable grinding effects on the molar teeth were noticeable. No trace of caries or parodontia was detected.
4. Neck. In contrast to the Meo tribe none of the Mrabri showed any thyroid enlargement.
5. Lungs. Clear to percussion and auscultation in all men.
6. Heart. Conspicuous bradycardia in all men. Pulse rate (standing) varied from 44 to 62 per minute. This is most probably due to the enormous physical activity of the Mrabri. In more sedentary societies a low pulse rate is considered a characteristic of athletes.
7. Abdomen. The spleen was enlarged (2 to 5 cm below the costal margin) in all but one.
8. Lymphnodes. Palpable in the groins in all men. Enlargement obviously due to frequent injuries with infections on legs and feet.
9. Genitalia. Penis and testicles were of normal size. The pubic hair was scanty and limited by a sharp horizontal line above the symphysis. This distribution of pubic hair, quite abnormal for Europoids, is normal for Mongoloids, and was found in all Thai, Meo, and Chinese examined.
9. Skeletal system. With one exception, the man with the deformity of the facial bones (Fig. 1), no abnormalities were found.
10. Neuromuscular system. Normal deep tendon reflexes. Well-developed muscles of the extremities. Together with a paucity of subcutaneous fat this gives the Mrabri a muscular appearance. In comparison to the Meo, the arm musculature, particularly the pectoralis muscles, are very

prominent. This is probably due to frequent climbing of trees and digging in search of food. With the arms hanging the pectoral muscles are relaxed and create a soft prominence on the anterior chest wall which may be mistaken—especially on photographs—for undue breast development. There is, however, no abnormal amount of mammary tissue palpable and the suspicious surplus disappears readily when the arms are raised (Fig. 6 and 7).

11. Skin. The frequent tattoos and fungus infections have been well described⁽²⁾. Several members of the group had burn scars on their back, probably caused by the exposure to fire in the camp.

12. General impression. The Mrabri are well developed muscular males. Despite a paucity of subcutaneous fat there are no signs of malnutrition. The most frequent abnormalities seen to be fungus infections, burns, and splenic enlargement.

It is difficult to estimate the age of the Mrabri. The youngest members of the group were approximately twenty years old as judged by the eruption of only two third molars (wisdom teeth). This conclusion is, of course, invalid if the unknown schedule of dentition in the Mrabri is different from that in Europeans. The oldest of the group were the woman described below and one of the men who was obviously older than the rest, probably between 45 and 55. The majority must have been between 25 and 35 years old.

Addendum. The only Mrabri female seen by the expedition, a woman of approximately 50 years, permitted only a superficial examination. She was obviously ill. A reliable history as to the duration and the nature of her illness could not be obtained. The examination revealed a right middle lobe pneumonia for which she received treatment. It is astonishing that this frail woman who was quite short of breath and had a temperature of 39 C (102.2 F) was able to walk three hours over steep mountain paths to our camp and back. She was reported improved the next day.

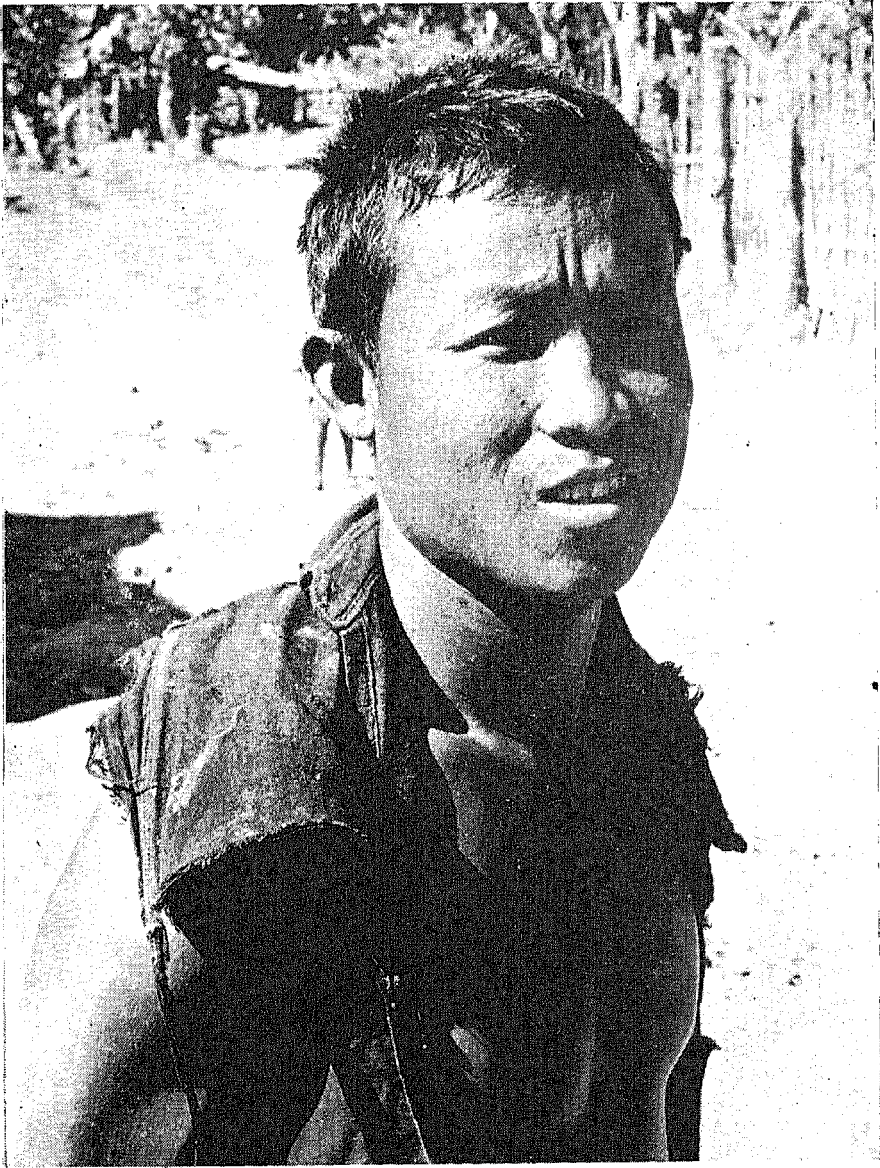


Fig. 5 Lawa from Baw Luang (Chiengmai) with facial configuration similar to the Mrabri.

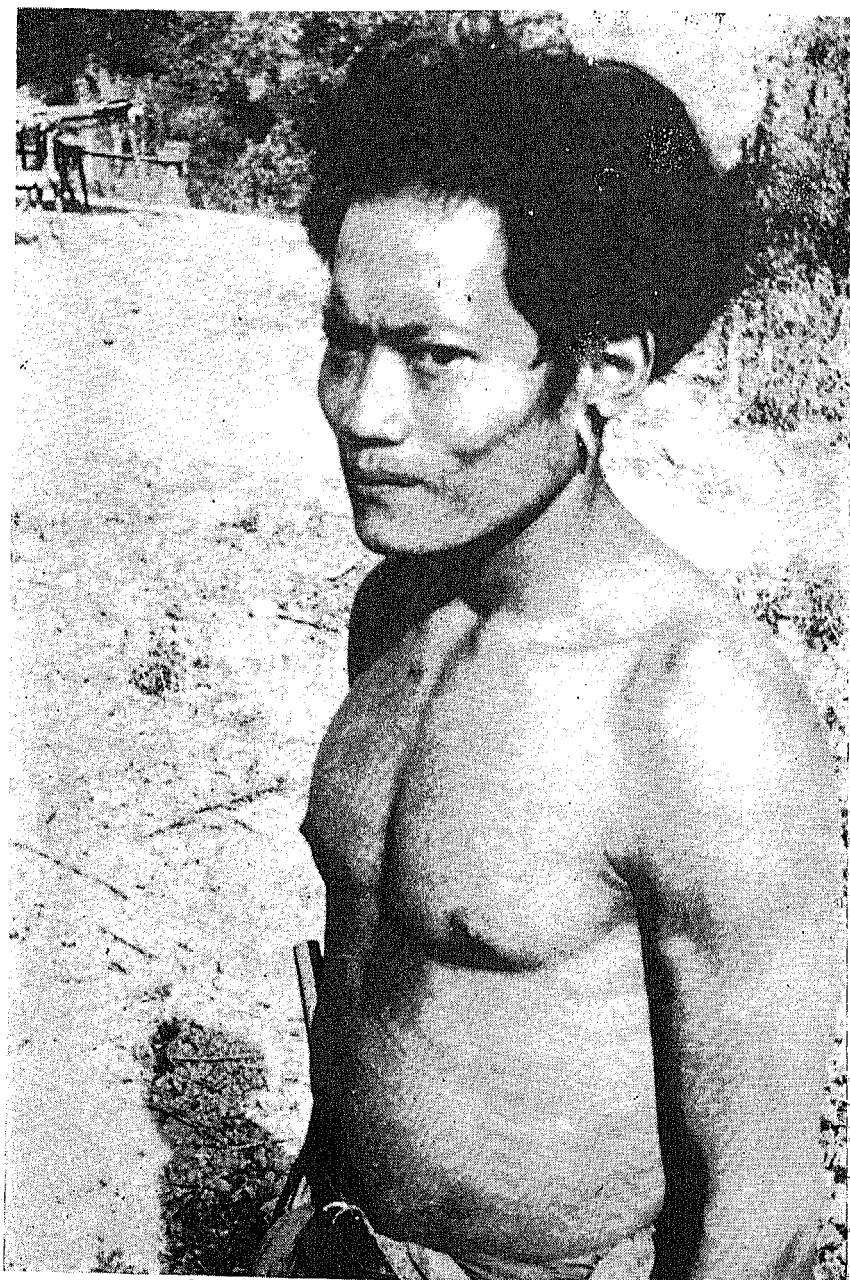


Fig. 6 Mrabri with chest wall prominence due to the relaxed pectoralis muscles.



Fig. 7 Disappearance of the bulge after extension of the pectoralis muscles

D. Blood examinations.

It may be surprising to hear that we were able to collect samples of venous blood from 18 Mrabri men. Initially, there was some hesitation on their part when they saw the blood collecting equipment. After the leader of the expedition, Mr. Kraisri Nimmanahaeminda, set an example by allowing blood to be taken from his antecubital vein, the Mrabri were relieved of any suspicions and submitted stoically to the same procedure. Their only comment was that "it hurts much more when you stick yourself with a thorn in the jungle".

Results.

1. Hemoglobin concentration.⁽⁸⁾

The concentration of hemoglobin (in the following abbreviated Hb) ranged from 11.2 to 15.6 g/dl (normal for adult males (15 to 16 g/dl). Six members of the group were frankly anemic (Hb below 13.5 g/dl).

2. Blood smears⁽⁸⁾

a) White blood cells. No pathological cell forms were seen. Five men showed a moderate monocytosis (12 to 18%) which is frequently seen in malaria. Eight men had a mild to moderate eosinophilia (8 to 17%), probably an indication of infestation with intestinal parasites.

b) Blood platelets were normal on all smears.

c) Red blood cells. The morphology of the red blood cells was conspicuously abnormal on several smears. Target cells were abnormally frequent on nine smears. Hypochromia and Anisocytosis were prominent.

d) Parasites. Ringforms of *Plasmodium falciparum*, the cause of tropical malaria, were seen on two smears.

2. Hereditary disorders of the red blood cells.

For the non-medical reader a short introductory note may be in place: Hereditary disorders of the red blood cells

are common in Southeast Asia, as in all tropical areas. Abnormal hemoglobin diseases are caused by an alteration of the normal chemical composition of the protein molecule hemoglobin, the red coloring matter of the blood. Besides the normal variant (Hb A) the abnormal Hb E is present in 5 to 40% of the population in different areas of Thailand. Thalassemia is a disease closely related to the abnormal Hb syndromes. If the abnormal gene for Thalassemia is present in a person in the homozygous state (i.e. double dose, inherited from both parents) a severe disease with chronic anemia and early death results. Deficiency of the red blood cell enzyme glucose 6 phosphate dehydrogenase (G-6-PD) is also common in Thailand. In affected persons ingestion of certain drugs and chemicals causes a rapid destruction of the red blood cells.

a) Abnormal Hb and Thalassemia. (8)

Of the 18 Mrabri examined six were heterozygous for Hb E. One had an increased amount of Hb A₂ indicative of the presence of the Thalassemia gene. The findings on the blood smears were in accord with these results.

b) Red cell enzyme G-6-PD

Normal activity of this enzyme in all 18 samples.

3. Blood groups (8)

All 18 samples were of the blood group A CDe/CDe (A Rh-positive).

4. Virus antibodies. (8)

In tropical areas the group of arthropod-born viruses is of special interest. Viruses of this group cause encephalitis and dengue fever, and have recently been shown to be the causative agent of Thailand hemorrhagic fever.

The blood sera of the 18 Mrabri were tested for antibodies against arthropod-born viruses at the Virus Dept. of the U.S. Component, SEATO Medical Research Laboratory, Bangkok.

An excerpt of the report furnished by Major Halstead, head of the department, is given verbatim: The "test results show a remarkably low incidence of group B antibodies and are essentially negative for group A. . . . "group A" (of the arthropod-borne viruses)" is represented in Thailand by at least one virus, chikungunya, which is found in urban areas in decreasing percentage as one progresses north of Bangkok. Group B is represented by the dengue viruses and Japanese encephalitis both of which occur widely in Thailand. These samples show rather nicely that there must not be any important wild animal reservoir of these viruses in remote Thailand or at least not at the altitude where these tribal people live".

The visits of the Mrabri to the valleys may have been the occasion for contracting these virus infections. As these visits are infrequent and short the chance for infection is small and this is reflected in the paucity of immunization against these viruses.

5. Syphilis (8)

This venereal disease is not uncommon in most urban societies. Lately, it is found in increasing frequency in the more enterprising tribal groups of Northern Thailand (9). Considering the seclusion of the Mrabri it would not be expected in them. None of the 18 sera was positive for syphilis.

The results of the blood examinations are summarized in Table III

E. Stool examinations. (10)

Two stools were available for examination. The consistency of this material was remarkable. The entire stool mass was interspersed with coarse fibers of approximately 1/2 mm diameter and 4 to 7 cm length. This fibrous mass made the division of the fecal material difficult. Microscopically the fibers appeared to be of plant origin. Probably they are indigestible remnants of chewed roots which form part of the

food of the Mrabri. In one of the stools eggs of *Trichuris trichura*, an intestinal parasite were found. The frequency of anemia in the members of the group makes one suspicious of hookworm infestation. The stools were rather old. Therefore, hookworm ova, if they had been present, may have hatched before examination.

DISCUSSION

The life of the Mrabri, paradisaical as it may look at first glance with its freedom of regimentation and taxation, is in truth endangered by many forces. Diseases which plague the man in the plains are also present in the Mrabri: infection with malarial plasmodia, with fungi, bacteria, and infestation with intestinal parasites. Hereditary diseases are present, and external forces as fire and the beasts of the forest threaten them. A relative protection seems to exist against certain viral diseases which are common in the valleys, and venereal diseases do not seem to have entered the Mrabri community. We know almost nothing of the health status of the Mrabri children and infants, but we may assume that selection by disease is rigorous, and only the fittest survive. Therefore, the Mrabri are well adapted to their rough environment; physical vigor and resistance to disease are essential.

With the knowledge gained an attempt can be made to aid in clarifying some of the problems mentioned at the beginning: Are the Mrabri a different generation of the people Bernatzik (11) encountered in the same area in 1936? Bernatzik's description of his "Yumbri" and the appearance of the men seen by us is similar in most details. The major difference, the absence of tattooing in Bernatzik's group and the frequency of tattoos in the Mrabri of 1963 is superficial in more than one sense of this word, and may be due to more frequent visits to the valley in recent years. Bernatzik does not give somatometric measurements except for the height which is similar to the height of the Mrabri. The only remaining means of comparison are the photographs. The sole discrepancy between his

"Yumbri" and our Mrabri seems to be the different hair style which is shorter, and in some similar to the manner of the Meo in Bernatzik's people (11, Fig. 60). The facial characteristics observed in our group are present in all adult males on Bernatzik's photographs. The prominent brows, the mongoloid eyes without epicanthal fold, the straight, wide, and flat nose, and the triangular configuration of the face are identical in both groups and can be verified on Bernatzik's figures 45, 54, 55, and 60. The interpretation of the evidence gained from the comparison of the physical features is in favor of the typological identity of Bernatzik's "Yumbri" and the Mrabri. The main argument in this question will, of course, have to come from the linguistic investigations.

Are the Mrabri descendants of a group of slaves released into the jungle? Despite the fact that one should not take historical legends too lightly it seems highly improbable that the Mrabri could have this origin. This is not the place to discuss the sociological aspects of this question (can people who have lived, even though as slaves in Nan, ever fall back to a primitivity as that of the Mrabri?). The results of the anthropometric and genetic examination cannot exclude this possibility. All characteristics present in the Mrabri could have been present in a small founder group of a few couples. The prince of Nan is, however, supposed to have released two hundred slaves (2). If the Mrabri were their descendants the high degree of uniformity of their appearance and their blood groups would be surprising (especially if these findings can be substantiated by examination of more Mrabri individuals).

Are the Mrabri an ethnic unit? Medicine and anthropology have no contribution to this question. The result of the linguistic and sociologic investigations will tell us whether the Mrabri are a separate ethnic unit. The clarification of their linguistic affiliation will, however, be of great interest for the anthropologist. If it can be proved that their language belongs to the austroasiatic (Mon-Khmer) group their presence in Southeast Asia can be dated back 2000 years.

PROBLEMS OF ENDOGAMY AND ISOLATION

The greatest handicap in the valuation of the results of the examinations of the Mrabri is the small number of individuals and our ignorance of the size of the Mrabri population, and their marriage customs. If the total number is indeed not more than 100 (estimate G. Young, 9), endogamy (i.e. marriage exclusively within their own group which seems to be customary among the Mrabri) will lead to a high degree of inbreeding. There is, of course, the possibility that the Mrabri are a small, isolated, inbred group. This is, however, not a plausible explanation for the fact that all members of our group belonged to blood group A, a group which is rare in Southeast Asia. This could only be explained by a small founder group in which by chance only group A was present, or by genetic drift. There are, however, other explanations for this finding. The results of the hemoglobin analysis speak against a high degree of inbreeding. In a highly inbred group with Hb E one would expect a few persons homozygous for the Hb E gene (doubly inherited from both parents). The absence of persons homozygous for Hb E from the Mrabri group may be due to a decreased chance for survival of homozygous Hb E carriers. This is improbable. Homozygosity for Hb E causes only mild anemia and no disability (many members of the Armed Forces were found to be homozygous for Hb E). Furthermore, it is likely that Hb E furnishes protection against malaria and thereby increases the fitness of the carrier. It is therefore quite possible that the size of the Mrabri population is much larger than expected and that inbreeding is reduced by contacts with various groups during migrations. A selective advantage for blood group A may exist under the environmental conditions of the Mrabri. Increased resistance of group A individuals to enteric infection is possible and could have lead to the elimination of the genes for blood group O and B in the Mrabri.

Racial classification.

The application of the term "race" to human populations has become problematic in the view of modern human genetics (12).

The "creation" of a race was often not more than the arbitrary selection of a type of human and its designation as the prototype of a "race". There is hardly ever proof that such a prototype is not in itself a mixture between more ancient "races" whose existence may be shrouded in prehistoric darkness. In the end, the genetic analysis of race leads to the view that mankind is a genetic continuum. It is easy to find conspicuous differences between people whose origin is geographically distant (e.g. Chinese and Europeans). Their equally conspicuous similarities prove that they must carry a significant proportion of common genetic material. Any division of the human species in races will inevitably separate large groups of men who may be apart in some characteristic, but belong together in others. Therefore, the term race has not much scientific significance and is best restricted to a descriptive use for the great, more or less well defined groups (e.g. mongoloid, europoid, negroid).

In 1934 the German anthropologist von Eickstedt described a human type in Southeast Asia which he considered characteristic of a palaeomongoloid race. The reservations with which "race" has to be viewed let it appear advantageous to limit the acceptance of the term "palaeomongoloid" to a human type which may have been preponderant in the prehistoric population of Southeast Asia. We may, therefore, speak of a palaeomongoloid type with reference to the three types described by H. Liu (cit.a. 3) in the Chinese population. According to von Eickstedt, the palaeomongoloids are distinguished by prominent zygomas (cheek bones), mongoloid eye configuration without epicanthal fold, and a short, wide, flat nose, characteristics strongly expressed in the Mrabri, but also present in individuals of other Southeast Asian populations (see comment to somatometrics).

The classification of the Mrabri as protomongoloid does not seem justified. Observations on a few individuals (Bernatzik, 11) are not sufficient to create a new racial or typological class. Furthermore, the term protomongoloid induces the association of a common origin of all mongoloids from this race, an assumption which is neither proved nor likely.

Are the Mrabri autochthonic in Southeast Asia? The following remarks to this problem are also made with all the reservations appropriate for an analysis of observations on a small number of individuals. The somatic analysis leaves no doubt that the Mrabri are mongoloids. No traces of negrito characteristics are present. It seems doubtful that the Southeast Asian subcontinent ever harboured a negrito population north of the Malayan peninsula. The area of origin of the Mrabri must therefore be limited to the area of the mongoloids. The clue for a further delimitation may be found in some somatic characteristics of the Mrabri, particularly in the nasal configuration. The flatness of the nose with a large nostril area is an indication of a domicile in the tropics for many generations. There is good evidence that the different nasal configurations developed as an adaption to environmental temperature by selection over many generations. In cold climates the narrow nose with small nostrils conveys an advantage because of the more efficient warming of the breathing air. In hot climates wide flat noses with a large nostril area are preponderant.⁽⁷⁾ Thus, there is some likelihood that the Mrabri as a population are a part of the mongoloid race that has not participated in the adaption to colder climatic conditions (or has adapted itself to a hot climate in the course of millenniums). Therefore, Southeast Asia is probably their original habitat.

It is, however, evident from the somatic measurements that the present Mrabri show an admixture of foreign elements, most likely Lao and/or Meo. The indices for skull and nose of a few Mrabri (No. 1, 8, and 14, table I) differ widely from the majority. The hemoglobin analysis shows, besides Hb E in six, one with Thalassemia. Hb E has most probably originated in ancient Southeast Asian populations. It may well have been present in the prehistoric populations before the formation of the ethnic groupings (Mon, Khmer etc.). It is therefore not surprising to find this abnormal Hb in the Mrabri. Thalassemia was, however, introduced into Southeast Asia later by Thai, Tibeto-Burmese, and Chinese migration. Thalassemia is present in a significant percentage in most hill tribes in Northern Thailand. Thalassemia may have entered the

Mrabri population incidentally in recent times.⁽¹³⁾ Bernatzik (11) relates a story of the rape of a Mrabri woman by a foreign tribesman. The combination of *Thalassemia* and *Hb E* in one person causes a severe chronic illness leading to premature death in many cases. The presence of both genes in the Mrabri population will, unfortunately, lead to a decrease of their genetic fitness.

Outlook on further Mrabri research

The fate of the Mrabri people appears to be predictable. Those who will have survived the forces leading to extinction will finally be absorbed by the superior hill tribes and probably later into the Thai community. Bernatzik (11) claims that many Mrabri (respectively, Phi Tong Luang) have mixed with the Lahu in Northwest Thailand. The present author was unable to detect any Mrabri characteristics in the population of several Lahu villages in Ampoe Fang and Ampoe Wang Nuea. In Ban Doi Khun Sathan there were, however, several Meo who differed considerably from the majority of their kinsmen. Their facial configuration was very similar to that of the Mrabri. The coming years will still provide an opportunity to study the Mrabri in their present cultural state and in their present environment. A thorough ethnological investigation of other Mrabri groups and a more complete survey of genetic traits and environmental conditions (more complete in the number of different examinations as well as in the number of individuals examined) will not only increase our knowledge of human life at an early primitive stage but may also provide a solution to some problems of human evolution.

REFERENCES, ANNOTATIONS, AND ACKNOWLEDGEMENTS

- (1) As it was established that the people previously known under the names Khon Pa and Phi Tong Luang call themselves Mrabri, the latter name will be used exclusively unless reference to previous reports is made.
- (2) Kraisri Nimmanahaeminda and J. Hartland-Swann.
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- (3) Bernatzik, H., editor. Die grosse Voelkerkunde.
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- (4) The description of the various methods would take undue space in a journal not primarily directed to the medical reader. Information concerning methods may be obtained from the author.
- (5) Von Eickstedt, E. Rassenkunde und Rassengeschichte der Menschheit. Fischer. Stuttgart 1934.
- (6) see (3), figure 95.
- (7) Schwidetzky, I. Die neue Rassenkunde. Fischer. Stuttgart, 1962.
- (8) The author is indebted to the persons listed for their support by aid in or carrying out the mentioned examinations at their laboratories :

Prof. Dr. J.H. Jonxis, Director, and Dr. C. Pik, Chief of Laboratory, Department of Paediatrics, University of Groningen, The Netherlands (Hemoglobin electrophoresis) Dr. Sommai Sringam, Chief of the Blood Bank at Queen Saovapha Institute, Bangkok (Blood group determination) Major S.B. Halstead. Affiliation and contribution described in the text.

Miss Pradap Ramabutr, Chief of Laboratory, McCormick Hospital, Chiangmai. (Hemoglobin, blood smears, and serologic tests for syphilis).
- (9) Young, G. The Hill Tribes of Northern Thailand. The Siam Society. Bangkok, 1962.
- (10) Special thanks are due to the Honorary Treasurer of the expedition for the collection of this delicate material.
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- (12) For a discussion of these problems, see :
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- (13) These views are not in complete agreement with the opinion derived from the first investigations of abnormal hemoglobins in Thailand. The results of French workers in Cambodia and of a study of 6000 individuals in Thailand by the author (to be published) are in favor of this interpretation.

I wish to thank the leader of the Mrabri expedition of the Siam Society, 1963, Mr. Kraisi Nimmanahaeminda, for the invitation to participate in the expedition; and Prof. Dr. Hungerland, Director of the Dept. of Pediatrics, University of Bonn, for his encouragement and for the permission to extend my stay in Thailand.

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TABLE I.
Somatic measurements (in centimeters)

No.	Weight in kg	Height	Cephalic Length	Cephalic Breadth	Facial Height	Interzyg- Distance	Nasal Length	Nasal Breadth	Nasal Depth
1.	49.0	151.0	18.5	15.3	10.8	13.9	6.2	4.4	1.9
2.	47.0	147.0	18.8	14.5	11.1	14.0	6.1	4.4	1.8
3.	54.0	159.0	18.7	14.6	11.3	13.9	5.6	3.9	1.8
4.	53.0	156.0	18.9	14.7	10.9	13.6	5.6	4.2	1.7
5.	45.0	156.0	18.1	13.6	11.2	13.7	5.7	4.0	1.9
6.	46.0	153.5	18.3	14.5	11.4	14.0	5.6	4.1	1.8
7.	51.0	151.0	19.3	14.9	10.9	13.9	5.5	3.9	1.6
8.	50.0	158.5	18.2	14.9	10.7	12.9	5.7	3.9	2.1
9.	52.0	157.0	19.0	14.4	10.9	13.5	5.7	4.0	1.6
10.	50.0	148.0	18.9	14.7	11.0	14.2	5.8	4.4	1.8
11.	50.0	153.5	19.0	14.5	11.3	14.0	5.2	3.8	1.7
12.	54.0	158.0	18.5	14.1	10.8	13.5	5.5	4.2	1.8
13.	43.0	149.5	18.2	14.1	10.9	13.4	4.9	4.0	1.6
14.	42.0	149.0	18.8	14.2	10.6	12.9	4.8	3.7	2.2
15.	45.0	146.0	18.2	14.6	11.3	13.8	5.2	4.1	1.6
Mean	48.8	152.9	18.6	14.5	11.0	13.7	5.5	4.1	1.7
Standard Deviation	3.9	4.4	0.36	0.4	0.24	0.41	0.38	0.25	0.16

TABLE II
Cephalic and facial Indices

Ethnic group	Number	Cephalic Index		Facial Index		Nasal Breadth I.		Nasal Depth I.	
		Mean	Range	Mean	Range	Mean	Range	Mean	Range
Mrabri	15	78.0	75.1-82.8	80.3	77.5-82.8	73.7	68.4-81.7	43.0	38.4-52.7
Meo	17	81.9	77.1-87.3	—	— —	64.6	59.0-72.2	54.8	44.4-66.7
Thai Nuea	25	84.9	75.9-94.2	81.6	75.7-88.3	62.0	53.2-70.2	56.0	43.0-68.9
Germans	28	76.3	68.2-80.8	92.1	86.2-99.6	56.2	48.3-63.1	78.5	66.3-94.6

TABLE III
Blood examinations

No.	Hemoglobin concentration (g/dl)	White blood cells per cent						Red blood cells per cent					Hemoglobin electrophoresis	G-6-PD activity (red cells)	Malaria parasites (smear)	Serologic Test for Syphilis	Virus antibodies* Titer		Blood group
		Nt	St	Eo	Bs	Mo	Ly	An	Pk	Ov	Tg	Hy					Group A	Group A	
1.	13.2	—	—	—	—	—	—	—	—	—	—	—	normal	normal	neg.	neg.	0	0	A CDe/CDe
2.	13.2	57	3	5	0	12	23	0	0	0	3	0	normal	normal	neg.	neg.	0	0	A CDe/CDe
3.	14.4	49	4	11	1	8	27	0	0	0	2	0	normal	normal	neg.	neg.	0	0	A CDe/CDe
4.	11.8	60	2	6	0	18	14	+	+	0	22	+	AE	normal	neg.	neg.	0	0	A CDe/CDe
5.	14.8	51	3	10	0	6	30	+	0	0	33	0	AE	normal	pos.	neg.	0	0	A CDe/CDe
6.	15.3	75	8	2	0	3	12	+	0	0	13	0	AE	normal	neg.	neg.	0	0	A CDe/CDe
7.	15.6	35	4	5	0	8	28	+	0	+	17	0	AE	normal	neg.	neg.	0	0	A CDe/CDe
8.	15.0	61	4	10	2	6	17	0	0	0	4	0	normal	normal	neg.	neg.	0	0	A CDe/CDe
9.	15.2	35	2	17	1	5	40	0	0	0	0	0	normal	normal	neg.	neg.	0	0	A CDe/CDe
10.	12.8	40	2	12	0	13	33	+	+	+	27	+	Hb A ₂ 4.0%	normal	neg.	neg.	0	1:20	A CDe/CDe
11.	13.2	48	5	3	1	12	31	+	+	0	8	+	normal	normal	neg.	neg.	1:20	1:80	A CDe/CDe
12.	15.2	49	3	9	0	8	31	+	0	0	38	0	AE	normal	neg.	neg.	0	0	A CDe/CDe
13.	11.2	48	2	4	0	15	31	+	+	0	17	+	normal	normal	pos.	neg.	0	0	A CDe/CDe
14.	15.0	65	2	1	0	14	19	+	0	0	6	0	normal	normal	neg.	neg.	0	0	A CDe/CDe
15.	15.6	60	5	3	1	3	28	0	0	0	5	0	normal	normal	neg.	neg.	0	0	A CDe/CDe
16.	15.6	51	5	8	0	5	31	0	0	0	2	0	normal	normal	neg.	neg.	0	0	A CDe/CDe
17.	—	63	4	1	0	4	28	+	+	0	45	+	AE	normal	neg.	neg.	0	1:40	A CDe/CDe
18.	15.8	56	4	10	0	8	22	+	0	0	4	0	normal	normal	neg.	neg.	0	1:20	A CDe/CDe

Abbreviations: Nt=Neutrophils, St=Staphylococci, Eo=Eosinophils, Bs=Basophils, mo=Monocytes, Ly=lymphocytes; An=Anisocytosis, Pk=Poikilocytosis, Ov=Ovalocytosis, %Tg=%Target cells, Hy Hypochromia, AE heterozygous for hemoglobin E, G-6-PD=glucose-6-phosphate dehydrogenase.

*see text