

lateral occipital protuberances, 140; height from basion to top of occipital crest, 137; least breadth maxillary zygomatic process, 70; breadth across sockets of canines, 70; breadth across tips of canines, 290; length of palate, 270; least palatal breadth, between m^2 , 40; basal diameter of canine, 40; lower jaw, length, bone only, 325; breadth across symphysis at base of canines, 130; least breadth across diastema, 105; height at diastema, 55; tip to tip of canines, 225; basal diameter, outer face of canines, 22, inner face, 24, posterior face, 16; horizontal length of p^1 , 15, of m^1 , 19, of m^2 , 26.5, of m^3 , 45.

Dental formula: $i. \frac{1}{2}c. \frac{1}{2}p. m. \frac{3}{4}m. \frac{3}{4}$.

As I have said, this cranium is massive, the bones rugose on their outer surface, the nasals mostly fused together, and the frontal depression strongly marked.

HENRY H. GIGLIOLI.

Florence, Royal Zoological Museum, February 17.

Gambling and Mathematics.

YOUR reviewer "G. H. B." suggested in NATURE of January 31 (p. 318) that every schoolboy should know something about chance and chance in order that he may not develop into a gambler. I agree with him. But one may suspect that gamblers are either those who have not had the advantages of a mathematical education or those who belong to "slow dull" grade and are unable to appreciate those advantages; and yet one may be quite unable to prove that this is really the case.

Can any of your correspondents bring forward evidence to show that mathematicians gamble less than other men, or that gamblers really are mathematically defective?

The matter is important as indicating the point at which the efforts of an anti-gambling league should be most usefully applied. Is it in the intelligent teaching of mathematics? And are we right in distrusting the methods of exhortation when the methods of algebra will suffice?

Bootham School, York.

HUGH RICHARDSON.

THE subject of Mr. Richardson's letter raises a wide field of discussion, of which the few words in my notice convey a very imperfect idea. I should like to see the matter discussed in a suitable quarter when such can be found, but I believe it is a question for psychologists as well as mathematicians.

I take it that the ordinary gambler speculates in order to win, and that the prospect of winning is the incentive which does the greatest harm.

When a man speculates by staking, say, 1*l.* on the chance of winning 10*l.*, the notion of winning 10*l.* makes a big impression on his mind, and means something more real to him than the idea that the odds are 200 to 1 against him (say). He forms a clear mental picture of the prize, and the odds do not present the same picture to his mind. Consequently, he exaggerates his prospects. What I meant to imply is that schoolboys ought to learn to calculate probabilities, so that when they grow up they should think as clearly and form as strong mental pictures of the odds against them in a game of chance as they do of the value of the prizes, and that they should learn to calculate expectations and to think of these rather than of the prizes.

But when Mr. Richardson uses the word "algebra" he implies something different from what I mean, which is more correctly described as arithmetic. What I should like would be to see a chapter on probabilities treated in an elementary course of arithmetic, and boys familiarised with the idea of probability calculations, the representation of probabilities by fractions, and the calculation of expectations, without any algebra being put in to puzzle them. Quite simple questions, in fact. I will not say that everyone who had studied probabilities would not indulge in a game of chance now and then, but they would go in with the expectation of losing rather than winning, and they would know it was no use to try to make up a loss by making false estimates of the probability of the luck turning. If nobody gambled except for the amusement, and if everybody before doing so made a calculation beforehand as to how much they were prepared to pay for that amusement, realising that their expectation in every case was a

loss (if playing against a bank), the worst evil of gambling would be eliminated. The only difficulty would be the psychological one of preventing a man from being carried away by his excitement.

What people should know is that to speculate against a bank or syndicate is a bad investment, and that even to speculate where all profits are distributed between players is not a paying investment, but is really also a bad investment even if the expectation equals the man's stake, on the ground that a bird in the hand is worth two in the bush. The loss of the bird in the hand means a definite loss of income; the expectation cannot be regarded as income.

G. H. B.

Some New Methods in Meteorology.

SINCE the appearance in NATURE of December 20, 1906, of my review of Prof. Bigelow's "Studies" under the above title, I have had some correspondence with Prof. Willis L. Moore, chief of the U.S. Weather Bureau. I am glad, with Prof. Willis Moore's sanction, to quote part of his letters to me, which will, I hope, allay any apprehensions which may have been aroused as to the methods of research likely to be adopted at the new Mount Weather Observatory. Prof. Moore writes:—"... Since June, 1905, Prof. William J. Humphreys, of Johns Hopkins University, and formerly Professor of Physics at the University of Virginia, has been Supervising Director at our institution at Mt. Weather. We wish to ascertain facts by experimentation, rather than to exploit theories, however beautiful they may be. We consider Prof. Bigelow's numerous papers as expressing simply his own views. . . . Neither myself nor any member of my staff desires to be considered responsible for any theories that may be advanced in the publications of the Bureau, except he be the author."

Prof. Willis Moore's explanation, and his recognition of experiment as the necessary and ultimate criterion, justify the expectation that, backed as it is by the resources of the U.S. Weather Bureau, the new research observatory at Mount Weather will prove a most useful institution for the advancement of scientific meteorology.

CHARLES CHREE.

PAGAN RACES OF THE MALAY PENINSULA.¹

THE scope of this work, which runs to nearly 1600 pages, is defined in the preface, where it is stated to be "essentially a compilation from many sources," but differing from most books of that kind, "first, in being based to a very large extent on materials hitherto unpublished, and accessible only through private channels of information, and secondly in having been constructed with special knowledge of the subject and in a critical spirit."

Accurate though these statements be, they offer but slight indication of how thoroughly the book is inspired with the experience and critical knowledge of the authors, and how well the subjects dealt with have been unified in their hands, a task the difficulty of which may be judged in part by a consideration of the unsatisfactory nature of much that has been written as well as by the length of the bibliography which follows the preface. The authors explain that the several parts of the book dealing with the physical and cultural characteristics of the tribes had been originally arranged under subject headings, and that the book was then re-written upon "a phylogenetic system, so as to throw into relief the differences which separate one race from another," a plan which no one will doubt has added immensely to the clarity of the work. Although the title-page bears the name of both authors, the greater part of the work has been written by Mr. Skeat, Mr. Blagden

¹ "Pagan Races of the Malay Peninsula." By W. W. Skeat and C. O. Blagden. Vol. i., pp. xi+724; vol. ii., pp. xi+855. (London: Macmillan and Co., Ltd., 1906.) Price 42s. net.

being responsible only for the section dealing with language, although each author has "as far as possible revised and checked the work of the other."

An introduction in which Mr. Skeat sketches with great skill and literary force the environment of the jungle-dwelling folk shows how this has produced characteristic forms of culture, and has compelled the jungle tribes to become perhaps the finest hunters and trappers in Asia. This is succeeded by the first section of the work, that on racial characters; and here, at the very beginning of the work, the reader is faced by its gravest defect; in the whole of the first volume there is no map of the Peninsula, the necessity for which soon becomes manifest and is most urgently felt, e.g. on p. 55, where the distribution of the Sakai is given. Indeed, the only map of the Peninsula appears at the end of vol. ii., where it forms part of a small-scale map of Indo-China (about two degrees to the inch), which includes the

family the individual members of which, to mention only one physical character, have wavy, curly, and tightly coiled, almost frizzly hair. A number of valuable data bearing upon questions of race are given in tabular form in an appendix; some of these are by Dr. W. L. H. Duckworth, who also contributes a note in the text upon the craniological collection made by Messrs. Annandale and Robinson.

A short *précis* of the distinguishing cultural peculiarities of the jungle people most usefully follows the description of their physical peculiarities. The Semang are the most nomadic, the wilder tribes "never staying it is alleged more than three days in one place"; their habitations consist of natural shelters under overhanging rocks or of the simplest form of leaf shelters. Their national weapon is the bow, with poisoned arrows, though the blow-pipe has been to some extent adopted; they are monogamous, and feel no such fear of the ghosts of their dead as

do the Sakai and Jakun. The Sakai, though largely nomadic, are less wild than the Semang, and, unlike the latter, tattoo the face, while body painting has been developed into a regular system. Their weapon is the blow-pipe, with poisoned darts. The Jakun are only partially nomadic, and usually cultivate rice, sugar, or other plants, especially durian trees; they make and use dug-out canoes and the blow-pipe. They have chiefs, who in some cases have regalia, their marriage and burial rites are peculiar, and they have many magic ceremonies and invocations, in other words, their culture is "proto-Malay."

The habitations of these jungle tribes, which are discussed in chapter iii., are particularly interesting. Starting with shallow rock shelters and the buttresses of trees, the series passes through the "primitive beehive" or round hut composed of a number of palm leaves thrust into the ground in a circle, and is continued through the communal shelter (which is originally only an

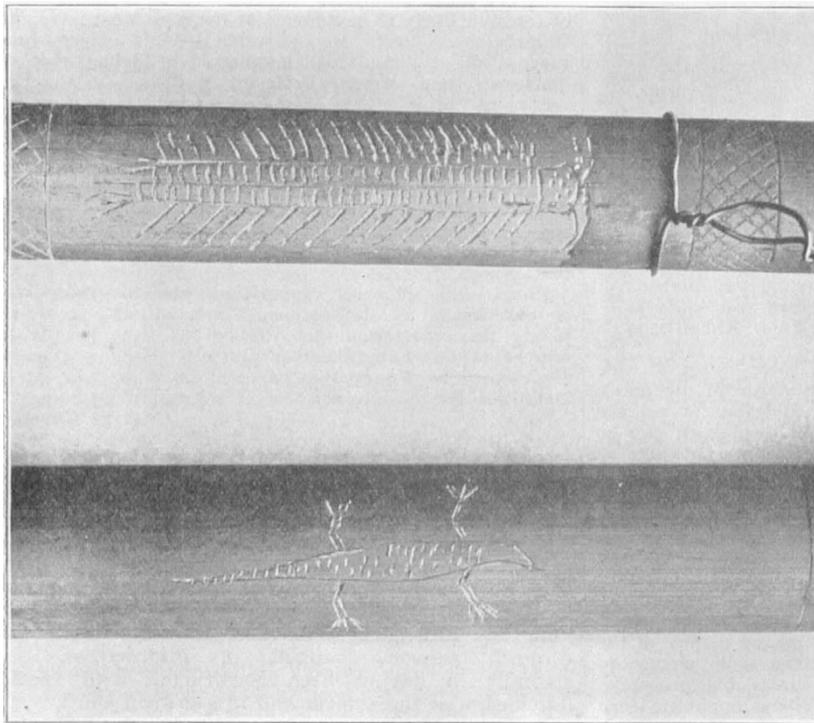


FIG. 1.—Besisi Zoomorphs. Centipede on Besisi flute; Lizard on shaft of Besisi blowpipe. From "Pagan Races of the Malay Peninsula."

Andamans, Sumatra, Cambodia, and part of Siam. But to return to the discussion of racial affinities; Mr. Skeat will have nothing to do with the pan-negrity beliefs of some of the earlier writers, but leaves it doubtful whether he follows Virchow in regarding the Sakai as Dravidian or as related to certain of the wild tribes of the interior of Cambodia, with whose language the Sakai dialects have an admitted affinity. The Jakun are regarded as a composite group of principally aboriginal-Malay tribes, many of which have intermarried freely with Semang and Sakai. It is only necessary to look through the numerous illustrations of individuals or groups, posed so as to show their physical characteristics, contained in these volumes to see how freely the jungle races have in certain instances mixed with each other, and the results of such intermarriage are shown, e.g., in a photograph of a Sakai

oval "beehive") until a break occurs, and a hut, originally probably a small granary or storehouse on one or more high posts, is reached, which, as the height and stoutness of the posts become reduced, tends to conform with the common Malayan hut type. In this series no mention has been made of tree houses, though Semang and Sakai alike make use of these, which may vary from a few roughly interwoven boughs to veritable houses in trees.

The houses of the less wild Jakun resemble in a general way those of the Malays, but are much smaller than the latter, while the eaves are often carried down to the level of the floor. It is among these people that tribal halls, called *balai* by both Malay and Jakun, first appear, and Mr. Skeat describes how some Besisi met with on the Selangor coast built a *balai* at right angles to, and in continuity with, the house of their tribal chief (*Batin*). Such

balai are mentioned in Besisi songs, and Mr. Skeat holds that their existence is not due to borrowing from the Malays, but is "rather an example of a custom sprung from their common origin."

Closely associated with the character of their dwellings is the form of agriculture of these backward people. A Malay chief of Selangor informed Mr. Skeat that the Besisi were originally in the habit of eating their jungle fruits in temporary shelters built where the fruit trees were most abundant, but that later, recognising that this practice resulted in overcrowding of the fruit trees which sprang from their rejected seeds, these folk took to carrying their fruit to a little distance before eating it, so as to spread the seeds over as wide an area of country as possible. It must be remembered that all these aborigines are adepts at tree-felling, and there seems no doubt that fruit seeds or seedlings of fruit-bearing plants may be planted by the wilder tribes, who do not eat rice or any grain, except when they obtain a small supply by barter. Those Semang who have reached an early stage of agriculture sow a species of millet. Hill rice comes later, but while the folk are still semi-nomadic, and to it is added small catch-crops such as bananas, tapioca, and sweet potatoes, and among the Sakai who have reached this stage of agriculture the preparation of the ground and the sowing and harvesting of the crops are alike accompanied by magic ceremonies and formulæ.

A full description of the weapons and implements at present used provides Mr. Skeat with the opportunity of discussing the origin of the stone adze blades found all over the Malay Peninsula. Unlike the up-country folk of Borneo, who highly value these and hang them in the verandahs of their houses among the skulls they have collected, the Semang and Sakai pay no attention to them, and it seems that these tribes "were not the manufacturers of the stone axes and chisels found in the Peninsula," which may perhaps be attributed to a race described by the jungle folk as once inhabiting their country, though different from themselves and the Malays.

Among all the jungle tribes of the peninsula, the marriage rite consists largely of a form of purchase, usually followed by the ritual sharing and eating of food by bride and bridegroom, but among some Jakun tribes a part of the marriage ceremony consists of a procession or race by the bride and bridegroom around a specially erected mound, while among the Benua of Johor a canoe race, in which the bride is given a considerable start, is substituted.

No less than a hundred pages are devoted to the subject of decorative art, *i.e.* to the art of the Semang and Sakai, described by Mr. Skeat as "by far the most difficult of the many difficult subjects that have had to be faced in compiling the description of these tribes," for it is necessary "to face the fact that with reference to part of this subject an edifice has already been reared upon a foundation of sand, and that though the bricks of which it was composed may to some extent be useful in laying the foundation of the new building, the original edifice is none the less inevitably doomed to irremediable destruction." This, of course, refers to Vaughan-Stevens's flower theory; and in spite of the no less generous than skilful editing and pruning to which the latter's work has been subjected, it is impossible to believe that Mr. Skeat would not have done better to have omitted by far the greater part of his account of Vaughan-Stevens's work, and this notwithstanding the writer's very hearty recognition that no one is so fit as Mr. Skeat to determine the value of Vaughan-Stevens's observations. The feeling that Mr. Skeat's modesty and desire to give the fullest credit to other

workers have for once run away with much of his critical faculty becomes stronger as the chapter is studied, and ends in the quite deliberate conviction that it was a mistake to reproduce pages of the patterns on combs copied from the *Zeitschrift für Ethnologie*, while the decorated dart quivers, combs, and boxes collected by Mr. Skeat himself are reproduced on so small a scale that it is impossible in most instances to see the designs at all clearly. Further, although the meaning of some of these is given on p. 419, it is by no means clear to which objects these refer, or whether pp. 416-8 are in fact descriptions, as they appear to be, of the quivers figured in the plate facing p. 414. Very little indeed is known about Jakun art. The two realistic zoomorphs shown in Fig. 1, representing a centipede and a lizard, occur on a Besisi flute and blow-pipe respectively, while two highly conventionalised patterns, said to be derived from the young shoot of plants, are also given.

The difficulty of obtaining information concerning the religious beliefs of these jungle-dwelling tribes was very great; it was only after many conversations with both eastern and western Semang concerning the existence of any supreme being, of whom they long professed entire ignorance, that one of them exclaimed, "Now we will really tell you all we know," and proceeded to tell Mr. Skeat about Ta Pönn, a powerful and benevolent, if otiose, deity, who made the world and who was "like a Malay Raja" in that "there was nobody above him." Although Ta Pönn is obviously identical with Vaughan-Stevens's "Tappern," nothing could be discovered concerning Vaughan-Stevens's superior deities of the Semang called by him Kari and Ple, although Mr. Skeat witnessed a "blood-throwing" ceremony among the eastern Semang resembling that by which, according to Vaughan-Stevens, Ple was appeased. As already stated, the Semang have little fear of ghosts, and their religion shows comparatively few traces of demon-worship and animism. The Sakai beliefs, on the other hand, although admitting a "god" Tuhan (or Peng), who in company with the giantess "Granny Long-breasts" inhabits the upper heavens, are almost entirely animistic, as are those of the Jakun, and for both peoples there are numerous demons to be propitiated.

It is particularly interesting to note that the two savage races of the peninsula that stand furthest apart, namely, the Semang and the Jakun, both have the idea that man at first multiplied so fast as to overcrowd the earth. When this occurred they were slain by the fiery breath of the Thunder Spirit (Semang) or turned into trees by the "high" god Tuhan Di-bawah (Jakun), but in both stories these checks do not suffice, and so death is instituted, and Mr. Skeat again suggests that such common features are mainly due to the "same savage Malay element of which there are such abundant traces in the dialects of both races."

As among Malays, so among these jungle tribes, the accredited intermediary between men and spirits is the medicine man or sorcerer. Among the Semang he is usually the chief, that is to say, the povang is, by virtue of his office, chief. Among Sakai and Jakun the offices are sometimes separated, though the chief is usually a medicine man of some repute.

In the last part of the work, devoted to the language of the jungle folk, Mr. Blagden points out that most aboriginal dialects have been for some generations in a process of decay, and that Malay is so widely known as to have become the *lingua franca* of the peninsula, so that many of the aboriginals are now bilingual, while others speak

only Malay, more or less modified according to the national idiosyncrasies of the speaker. Moreover, many of the Malayan loan-words are pronounced, not as the Malays of the peninsula pronounce them to-day, but as it would seem they were pronounced when Malay was first written in Arabic characters; thus the *k* still pronounced in Borneo also occurs in the aboriginal dialects. Besides unidentified elements, many constituents of both Semang and Sakai dialects agree with the Mon-Khmer languages, but whether this similarity be due to all these languages being essentially members of one family or to the direct contact of Semang and Sakai with Mon-Khmer peoples is uncertain, though, of course the two views do not necessarily exclude each other. There is a most interesting chapter on tabu language and other special forms of speech, and the work concludes with a comparative vocabulary of the aboriginal dialects which is so arranged as to be particularly easy to use.

C. G. S.

ELECTRIC POWER IN LONDON.

UNTIL a couple of years ago the problem of electricity supply in London was mainly one of interest to engineers and investors. Its introduction into the realm of municipal politics, however, has given it a wider interest, and one that tends to obscure the purely scientific aspect of the problem. Alike in connection with water, with gas, and with electricity, London has suffered from the fact of its slow growth and of its being composed of a number of separate towns and districts; its very magnitude, which to-day would enable it to be supplied with electricity more cheaply than any other great city, has been the chief hindrance to its getting such a supply. The enormous number of authorities authorised to supply electricity in Greater London, which at the present time exceeds seventy, has resulted in the establishment of nearly sixty generating stations, many of which are of comparatively small size and inefficient design. The municipal authorities have also been confined to their own boundaries and compelled to choose uneconomical sites, and any attempts at combination between the various authorities which might have enabled them to secure some of the advantages of production on a larger scale have been prevented by the restrictive legislation under which they operate, legislation which was originally passed before the future developments of electricity production were appreciated, while the still more remarkable developments in the uses of electric power were entirely unforeseen. An attempt at concentration was long ago made by the London Electric Supply Corporation, which established its great station at Deptford. That it was not successful was not due to any unsoundness of the principle upon which it was based, but to the fact that it was before its time. Fifteen years afterwards, in 1905, a fresh proposal embodying the first step in the policy of concentration was brought forward by a private company; several of the existing companies at the same time brought forward proposals, not for complete concentration, but for dividing London into three areas, in each of which a supply would be ultimately centralised.

The former scheme, due to its novelty and comprehensive nature, aroused considerable controversy. It was framed on the lines of the various Power Acts which Parliament has passed during the past five years. That is to say, it did not deal with retail supply of *lighting*, but only authorised wholesale supply of electricity and the retail supply of *power* in cases where the Board of Trade thought such supply should be given. Its main object was the

establishment of two stations, in which generation would take place on a scale much larger than that of any station in London to-day, and from which electricity would be supplied wholesale to the various distributing authorities by whom it would be retailed to the consumer. The limited right to supply the power consumer direct, in certain cases, was inserted by Parliament in order to ensure that the distributor should not absorb all the advantages of wholesale production.

This scheme naturally aroused much opposition from the existing authorities, both municipal and company. To a large extent, however, this disappeared as the real nature of the Bill became known; in fact, practically all the leading companies, and many of the most business-like local authorities, appreciating the advantages of purchasing a bulk supply in place of having constantly to expend further capital on extending their own smaller generating stations, entered into agreements with the promoters. The manufacturing interests of London also supported the scheme very warmly, and a deputation of leading manufacturers waited upon the Board of Trade, and showed that if the East End could obtain power at the prices fixed by the Bill it would mean an annual saving of nearly 3,000,000*l.* as compared with the present methods of power production. A petition, signed by employers of 100,000 hands, was also presented to Parliament in favour of the scheme.

It was, however, strongly opposed by the London County Council, which, in spite of numerous modifications and safeguards, such as the sliding scale of price and dividend, and the purchase clause, which were inserted in the Bill by Parliament, contended that it was not in the public interest that such a scheme should become law. It, however, passed Committees of both Houses, but so late in the session that it failed to become law.

In the next session of Parliament, 1906, the County Council itself introduced a scheme. The 1905 company's Bill was also re-introduced, and a new scheme was brought forward by the existing companies for linking up their systems and removing the restrictions upon mutual supply to which reference has already been made. The County Council's scheme alone received a second reading, and was sent to a special Hybrid Committee with instructions to consider the whole question.

The County Council's scheme dealt with wholesale supply only; it was strongly criticised by the Council's own Finance Committee, and unanimously rejected by the House of Commons Committee which had been instructed specially to consider it. The Report of that Committee recommended, however, that the Council should be made the controlling authority for electricity supply, but as regards the carrying out of the undertaking suggested that the Council should consider cooperation with private enterprise.

This year the Council has brought forward a more comprehensive scheme, involving nothing less than a monopoly of electricity supply for all purposes over 450 square miles, 330 of which are outside the county. Fourteen of the borough council undertakings are to be compulsorily acquired within five years, the thirteen company undertakings as their concessions lapse. Undertakings outside the county of London are to be acquired by agreement, but until it has secured this monopoly, and to assist in securing it, the Council takes powers to compete (for power supply only) with all these undertakings.

From a scientific point of view the principle of concentration would appear to be correct, but whether electricity supply has reached a state of development when such a big step forward as that proposed by